

REPORT

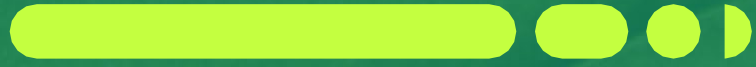
biore

Diversity 2023

Brown howler monkey (*Alouatta guariba*). Atlantic Forest Biome.

CEMIG

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CEMIG AND THE ENVIRONMENT

The commitment to sustainable development is a value that **Cemig** puts into practice, daily, as a decision-making strategy. There are hundreds of initiatives – including projects, programs and environmental actions – implemented in the areas covered by its hydroelectric, solar and wind farms, in addition to transmission and distribution lines.

Throughout its history, with 70 years of operation and more than eight million consumers, there has been a constant search for balance between the environmental, social and economic pillars during generation, transmission, commercialization and energy distribution.

Cemig develops and executes actions together with interested parties that influence “or are influenced by the company’s activities. Always based on dialogue, engagement, ethics and transparency of information, the company aims to generate shared value, identify opportunities between the parties and manage social and relationship capital.

There is a permanent effort to provide clean and accessible energy solutions to society, in an innovative way,



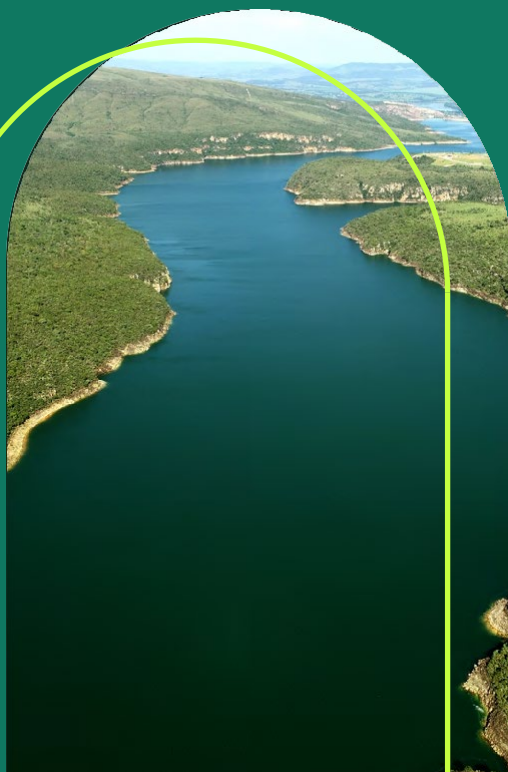
sustainable and competitive, in all its installed capacity. To this end, the assessment, recognition and responsible management of the impacts that energy generation activities can cause to nature are part of the routine. The company’s Environmental Policy includes all phases of the projects, including planning, implementation, operation and even the possible deactivation of some of these phases.

“There is a permanent effort to provide clean and affordable energy solutions to society, in an innovative, sustainable and competitive way”

Cemig tem has worldwide recognition for its good practices in the environmental area. It remains the only company in the electricity sector outside Europe to be part of the **Dow Jones Sustainability Index (DJSI World 2021/2022)**. It has been part of this index for more than 20 years, since its creation in 1999. DJSI World is made up of shares from the largest companies in the world that stand out for their sustainability performance.

Cemig's socio-environmental responsibility and the development of work strategies are always supported by the company's Environmental, Water Resources and Biodiversity Policies. Internal indicators are also used to monitor actions.

All this commitment to dealing with the environmental issue and the various challenges arising from it are explicit in the countless projects, actions and programs involving the conservation of water, fish, terrestrial and semi-aquatic fauna, flora and, also, socio-educational activities.



MAIN ACTIONS FOR SUSTAINABILITY

Among the projects, programs and activities developed by **Cemig** for environmental sustainability, there is a constant stimulus for research and innovation of actions that seek to mitigate, compensate and control negative impacts, as well as enhance the positive impacts of all the ventures.

To create more efficient strategies, partnerships are established with research centers and universities. Thus, it is possible to deepen scientific knowledge of biology, ecology, physiology and the behavior of native fish species, water quality, control of invasive species, preservation and restoration of riparian vegetation and conservation of fauna in general.

Cemig also develops reforestation projects, environmental education, monitoring programs (fish, water quality, fauna), among others. Specific actions are also carried out, such as the management of solid waste, sanitary and industrial effluents from its projects.

One of the prominent programs carried out by the company is Peixe Vivo, whose mission aims to protect and conserve ichthyofauna (fish) in the rivers covered by hydroelectric projects.

To this end, the Service Instruction "Protection of ichthyofauna in the operation and maintenance of hydroelectric plants" was created. The program also carries out prior and periodic monitoring to avoid fish mortality in operational procedures.



Cemig also monitors water quality in accordance with the guidelines of the company's Biodiversity Policy and the Water Resources Policy, with the premise of developing more effective conservation strategies.

The reservoirs of its hydroelectric plants are constantly monitored with a sampling network distributed throughout the area of operation. This monitoring integrates physical and chemical aspects that provide momentary information about the system, in addition to biological aspects, which reflect the ecological integrity of ecosystems.

The conservation of biodiversity, terrestrial and semi-aquatic fauna and flora is part of the company's policy and is periodically monitored in its various programs and projects. To

preserve terrestrial ecosystems, **Cemig** has been developing important actions in the reforestation of riparian forests, urban afforestation and the recovery of degraded areas, counting on the collection and production of quality seeds and seedlings, promoting research and maintenance of conservation units.

In the social sphere, several programs bring education and energy efficiency to cities, rural communities, schools, hospitals and other sectors of society. For several decades, **Cemig** has developed socio-environmental activities with the populations surrounding the projects or users of the services it provides. The work also aims to improve communication with communities and encourage protagonism and environmental co-responsibility.



With all these conservation and environmental preservation actions, **Cemig** reaffirms its commitment to providing a better service to communities. And it is convinced that the satisfaction of its customers is linked not only to the quality of the work offered, but also to the commitment to actions

that mitigate the impacts of their activities, that promote the improvement of the environment and that, therefore, stimulate sustainable development.

FIND OUT A LITTLE OF WHAT CEMIG'S POLICIES SAY IN RELATION TO THE ENVIRONMENT:



ENVIRONMENTAL POLICY

SUSTAINABLE DEVELOPMENT

- Balance economic development, biodiversity conservation and use of natural resources.
- Reduce impacts of the activity.

LEGISLATION

- Respect environmental laws and standards.

DIALOGUE

- Stimulate awareness (improved communication and environmental education).

INTERNAL PROCEDURES

- Integrate areas of the company and structure



BIODIVERSITY POLICY

STRATEGY

- Include biodiversity in planning and actions.

IMPACTS

- Develop activities that minimize negative impacts and enhance positive ones.

FAUNA, FLORA AND WATER

- Execute programs with attention to vulnerable areas and threatened species.

INNOVATION

- Carry out research and develop technologies for biodiversity conservation.



WATER RESOURCES POLICY

MANAGEMENT

- Improve the use of resources and offer security to communities.
- Promote partnerships with public bodies and society to conserve water and preserve water sources.

TECHNICAL CONTRIBUTION

- Actively participate in the public management of water resources by contributing to bills and regulations.

MONITORING

- Carry out climatological, quantitative and qualitative monitoring of water and sediment.

COMMUNITIES

- Involve residents and other interested parties in reservoir management.



S E T I S I T

VANGUARD IN THE
SEARCH FOR SOLUTIONS
FOR CONSERVATION OF
ICTIOFAUNA



Any initiative to implement a hydroelectric plant generates impacts on the environment, changes the condition of the river and affects the fauna. The installation of a plant interrupts the reproduction path of fish, which can influence their development and also cause injuries or deaths to these animals during operation and maintenance procedures. In an attempt to reduce this damage, Cemig has been at the forefront of solutions, always acting with great transparency, promoting science and serving as a model for other companies in the sector.

According to the professor of the Department of Ecology and Conservation at UFLA (Federal University of Lavras), Paulo dos Santos Pompeu, “Cemig has been a pioneer in looking to academia to better understand the behavior of fish and, thus, seek solutions to mitigate the damage caused by hydroelectric generation”.

Some environmental bodies, both federal and state, for example, have been adopting part of the methodologies used by Cemig as a standard procedure for all companies in the sector. Cemig is also constantly sought out to provide consultancy on this topic.

This recognition is the result of the activities of the Peixe Vivo Program, which covers: monitoring programs, which meet the licensing process; fish death risk assessment program, which aims to minimize impacts on fish and reconcile energy generation with the conservation of native species, involving the community; and the generation of knowledge, through Research and Development – R&D projects.

INTERVIEW

SCIENCE AS A SOLUTION

UFLA (Federal University of Lavras), through the Fish Ecology laboratory, has been developing several works in partnership with Cemig since 2007.

For professor Paulo Pompeu, by moving towards exposing the environmental problems that can be caused by the implementation and operation of a hydroelectric plant and, at the same time, investing in science as a solution, Cemig encourages other companies in the electricity sector to adopt similar attitudes. Read the interview with him below.

HOW IMPORTANT IS THE UNIVERSITY-CEMIG PARTNERSHIP?

This partnership has enabled the training of several professionals, graduates, masters and doctors, in problems related to the conservation of our rivers. It has also made it possible for us to work with various technologies that, due to their high cost, we would hardly have the chance to use if we only depended on financing from state and federal funding agencies.

WHAT IS THE RELEVANCE OF THE WORK THAT CEMIG CARRIES OUT WITH THE OBJECTIVE OF MITIGATING ENVIRONMENTAL DAMAGE IN RELATION TO THE FISH THEME?

Cemig has been a pioneer in looking to academia to better understand fish behavior and, thus, seek solutions to mitigate the damage from hydroelectric generation. By moving towards exposing the problem and betting on science as a solution, it ended up inducing other companies in the electricity sector to adopt similar attitudes.

WOULD YOU LIKE TO MENTION ANY SPECIFIC RESEARCH OR ANY RESULTS FROM THIS UNIVERSITY-CEMIG PARTNERSHIP?

Through this partnership, not only with UFLA, but with other universities in Minas Gerais, we now understand, much more clearly, the migratory processes of our fish and what

“Cemig has been a pioneer in looking to academia to better understand the behavior of our fish”

Paulo dos Santos Pompeu has a PhD in Sanitation, Environment and Water Resources, professor at the Department of Ecology and Conservation, at UFLA.

“Peixe Vivo, for example, in addition to the marked reduction in fish mortality episodes, is an important contribution to personnel training”, says professor Paulo, citing masters and doctors who develop projects financed by the program and, also, the publication of books and scientific articles.

INVESTMENTS

The dimension of what the UFLA professor reports can be exemplified in some numbers that the company keeps in its portfolio. There are more than 690 technical-scientific publications developed in partnership with the Peixe Vivo Program since its creation in 2007 – the result of 23 scientific projects with the participation of 324 collaborators, researchers and students.

On average, Cemig invests R\$1.3 million per year directly in Peixe Vivo. There are over R\$ 2.3 million per year in research projects with the theme of fish and almost R\$ 500 thousand per year in monitoring actions. The company is one of the first concessionaires in Brazil to deal with this issue, not only during the installation of its plants, but also after the activity has started.

With all these actions, Cemig entered into a vanguard plan, with the objective of making the generation of electrical energy safer from the point of view of fish conservation. Monitoring programs, which involve licensing, are part of the long-term strategy of understanding how plants will impact the environment over the years, predicting risks and implementing improvements.

INTERVIEW

Paulo dos Santos Pompeu

leads to their agglomeration just below dams. As a result, Cemig has been able to adopt and test a series of measures that have ended up significantly reducing the death of fish in turbines.

WHICH WORK, IN ANY CEMIG HYDROELECTRIC PLANT, COULD YOU COMMENT ON?

In Irapé (in Grão Mogol and Berilo, in Vale do Jequitinhonha/MG), we are working on the possibilities of monitoring the fish fauna with three different methodologies, applied simultaneously: captures with nets (the most traditional method), the use of sonar (which quantifies the fish in the water column) and environmental DNA (in this method, we are able to identify which species exist in the environment with a water sample).

With this, we are proposing improvements in the assessments of local fish communities, in order to obtain more reliable data, without many fish specimens needing to be captured.

THE PEIXE VIVO PROGRAM COMPLETED 15 YEARS IN 2022. WHAT IS YOUR EVALUATION OF IT?

For me, the Peixe Vivo Program represents an unprecedented initiative in the Brazilian electricity sector, which substantially changed the way Cemig treats aquatic environments. It is a national reference.

In addition to the marked reduction in episodes of fish mortality, I highlight the important contribution to the training of personnel (numerous masters and doctors trained within the scope of projects financed by the program) and to the production of science (books and articles published, also through the program support).

“(…) a Cemig has been able to adopt and test a series of measures that ended up significantly reducing fish deaths in turbines.”

“The Peixe Vivo Program represents an unprecedented initiative in the Brazilian electricity sector, which changed the way Cemig treats aquatic environments. It is a national reference”

INVESTMENT IN RESEARCH, MONITORING AND CONSERVATION

**R\$ 2.3
million:**

average annual investment in fish-themed research projects. In 2021, it was **R\$ 3.4 million**. Over five years, **Cemig** invested **R\$ 11,7 million** in research projects.

**R\$1.9
million:**

amount invested over five years in fish monitoring programs. In 2021, it was **R\$ 482,8 thousand**.

In the **Programa Peixe Vivo**, an average of **R\$ 1,3 million** is invested per year. More than **R\$ 6,6 million** in five years.

For this, indicators are used that help in all processes and that allow, for example, categorizing plants in relation to the risk of fish deaths.

Compliance with environmental legislation and the commitment to continue monitoring the majority of its plants, especially those where there are greater risks, is part of Cemig's routine.

77% REDUCTION IN FISH KILLS

The flagship of Cemig's actions to preserve ichthyofauna is the Peixe Vivo Program, which completed 15 years in June 2022. This initiative seeks to reduce impacts after the plants are already in operation and provides

guidelines for new ventures. To give you an idea of how the actions reflect extremely positive results, since its creation in 2007, fish deaths at the company's hydroelectric plants have reduced by around 77%.

In addition to this enormous environmental gain, there is also an impact on the fall of more than 99% in financial losses in relation to fines applied by supervisory bodies. The program is an example of how interactions between the environmental and engineering areas, together with company-university partnerships, were decisive in defining solutions and implementing new operational rules, which makes work more efficient, both in planning, execution and maintenance of generating units.

“The partnership between university and company is essential for the development of processes that reduce this mortality.”

Professor Alexandre Godinho, coordinator of the Fish Transposition Center at UFMG (Federal University of Minas Gerais), PhD in wildlife conservation, works together with Peixe Vivo and tells a little about this path of searching for solutions solid through scientific research:

“An important example for reducing fish deaths is in relation to what can be done to drain the turbines, which are the structures of the plant that generate electrical energy. It is through the turbines that water from the reservoir passes, and they need maintenance from time to time. This maintenance may require draining the water inside the turbine. If many fish become trapped inside when draining occurs, the risk of fish deaths is high. It is necessary to prevent fish from entering there when there is drainage. To achieve this, knowing the time of year when more fish can enter the turbine when drainage occurs is of great value. The Peixe Vivo Program, through studies, determined the best time of year to plan drainage and, as a result, markedly reduced fish mortality. Mortality in hydroelectric plants also occurs for other reasons, and research helps to find solutions to reduce it. Hydroelectric turbines do not generate energy 100% of the time. There are spikes in increased energy demand. When starting the turbines to meet this demand, there are fish deaths. Learning how to reconcile the start-up of turbines

LEARNING FROM THE CRISIS AND SEEKING SOLUTIONS

In the early 2000s, there were a series of environmental accidents involving the death of fish in Cemig hydroelectric plants. These occurrences totaled more than 52 tons of fish killed during operation and maintenance procedures. Environmental fines also grew over the years, reaching around R\$40 million, from 2000 to 2007. In addition to the ecological and financial impacts, Cemig's image was strongly affected, generating problems, not only with regulatory agencies, but also with the community. Peixe Vivo emerged after a serious accident at HPP Três Marias. Over the years, the program has become a reference for generating efficient solutions that protect the environment.

CURIOSITY

with the reduction of fish mortality is a more complex process that demands studies. In addition to the impacts of installing a dam to generate energy, the operation of a hydroelectric plant always carries the risk of fish deaths. This can happen with a few of them or with tons. In this sense, the partnership between university and company is fundamental for the development of processes that reduce this mortality”.

The knowledge generated in partnership with universities, in some cases,

NUMBERS

Present in around **50** hydroelectric plants.

Provided the development of **690** technical-scientific products.

It involved more than **300** professionals and students in projects.

Reduced fish deaths at plants by **77%**.

156 scientific articles published and more than **2,400** citations.

becomes operational practices, that is, it leaves the field of research and becomes routine actions. One of the main activities that make it possible to reduce the impacts that the operation of plants can cause to fish is the carrying out, by the Peixe Vivo Program team, of the Fish Death Risk Assessment Program in Hydroelectric Power Plants in Brazil. Cemig Group. Since 2018, carrying out this Program has been consolidated as a routine activity, but the development and validation of the methodology was only possible with the execution of two research projects carried out in partnership with UFMG between the years 2009 and 2018.

TRÊS MARIAS THE GREAT WORK

Cemig's first large-scale project, with several purposes and which mobilized more than 10 thousand workers, was the Três Marias Hydroelectric Plant (UHE). Installed on the São Francisco River and named after the city in Minas Gerais that received it, the plant attracted people from

several Brazilian states during the construction period.

The former worker camps became neighborhoods that still bear cultural signs from the time, in the municipality located in the Central region of Minas Gerais. It was in 1957 that works began, and operations began in 1962.

The inauguration of HPP Três Marias was carried out by then president Juscelino Kubitschek. JK wanted to develop the São Francisco River region. Today, the plant has six generating units and a reservoir measuring 1,054.6 km²..



LEARNING FROM THOSE WHO DO IT

Dozens of environmental projects are developed at UHE Três Marias to conserve fish life, in partnership with several universities. The Três Marias plant is a national and international reference for the application of control measures and reduction of impacts on ichthyofauna (fish).

Professor Alexandre Godinho, coordinator of the Fish Transposition Center at UFMG (Federal University of Minas Gerais) and PhD in Wildlife Conservation and Fisheries, explains some projects developed in Três Marias.

"One of the studies in Três Marias is linked to the flood of the São Francisco River. These floods are essential for the abundance of fish. When the river goes without flooding for a few years, there is a reduction in the number of these animals. Every year, in the São Francisco River, arribação occurs, which is the upstream migration of young fish. This process takes place a few weeks after the end of the rainy season. When floods are very intense, like the one that occurred in

rainy season of 2021-2022, the quantity of fish that participate in the arrival is extraordinary. Many of them reach the plant, where they gather. This brings difficulties to the operation as the risk of death is imminent. Any carelessness can lead to the death of thousands of fish. Knowing details of the arrival is essential to reduce fish deaths in the operation. We are studying this issue of flooding, determining for several municipalities along the São Francisco River what is the flow that floods their floodplains. We seek to know the years in which the most intense arribation will occur to help plan the operation. Another study that I highlight in Três Marias is the monitoring of the abundance of fish in the region immediately downstream of the plant.

When the number of fish there is high, the risk of deaths is also high. We are studying, with Cemig, the use of sonars (equipment that uses sound waves to locate and even visualize fish underwater) that allow a quick and accurate assessment of this abundance. If it works well, it will be a measure to be applied to other plants as well".

"We are studying, with Cemig, the use of sonars (equipment that uses sound waves to locate and even visualize fish underwater) that allow a quick and accurate assessment of this abundance".

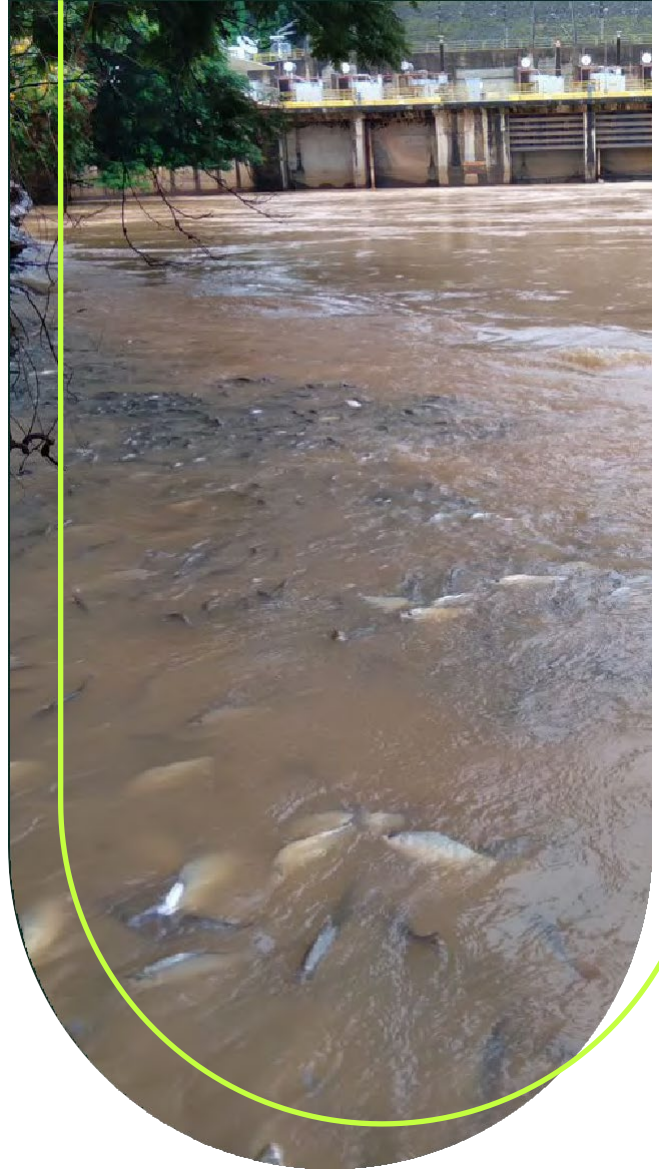
DISCOVER TWO OTHER PROJECTS AT TRÊS MARIAS HPP:

BEHAVIOR OF FISH DOWNSTREAM OF DAMS - SUBSIDIES FOR CONSERVATION

- Know factors that determine the occurrence of fish and their distribution near turbines.
- Improve the programming of maneuvers with the potential to cause damage.
- Improve the relationship between hydroelectric generation and conservation of fish species, with useful information for other hydroelectric projects.

IMPORTANCE OF SECTIONS OF FREE RIVERS FOR THE ENVIRONMENTAL CONTEXT IN BARRED REGIONS: INTEGRATING NEW TECHNOLOGIES FOR THE STUDY OF ICHTIOFAUNA (FISH)

- Show the importance of free rivers for the conservation of fish in hydroelectric plant basins.
- Understand the migration of fish from the Upper São Francisco and evaluate the distribution of fish in the São Francisco River channel and in tributaries upstream of the Três Marias HPP reservoir.
- Evaluate the need or not to install a transposition system in the Três Marias dam, complementing previous studies on the topic.



DOWNSTREAM OR UPWARD?

Downstream is the name given to the stretch of river after the dam, below the plant, towards its mouth. This is where the river becomes a river again, after the water leaves the turbine. Upstream is the section above the dam, where the reservoir is formed.

CURIOSITY

**“CEMIG IS CONCERNED ABOUT THE IMPACTS IT CAUSES”.
“WITHOUT FISH, WE HAVE NO SUSTAINMENT”.**

“I was born in Três Marias and raised in Rio São Francisco. My father, who has passed away, was a fisherman. He supported our family with this work. I followed the same profession. Since I was little, I accompanied my father on the boat and I have many memories of this river. I was going to have fun. It wasn't work. My father liked me to be with him. I watched the fishing and fell in love.

In 2006, at the age of 25, I became a professional fisherman. Today, my livelihood, that of my wife and my three daughters comes from this work. Therefore, for us, and also for the other approximately 150 fishermen in the city, it is very important to preserve the fish. Without fish, we have no sustenance. Fishing is a job market. Not only for people who fish, but for those who sell equipment, make instruments, tools, nets, cast nets, and maintain boats. In this sense, I am grateful to know that Cemig has made efforts to prevent fish deaths. When I was born, Cemig was already here. And my vision was not positive. It was a closed view. Many people look at the hydroelectric plant and only think that it will harm the rivers. But today, I can see it differently.

I know it has an impact. Sometimes fish die while maneuvering. But I think that, without Cemig, it would be worse. We wouldn't have multiple jobs and we wouldn't have energy. Furthermore, I changed my thinking when I learned about what Cemig does. I have been providing services to the Peixe Vivo Program for some years now. On my boat, there is always a biologist. If we find a large quantity of fish at a point in the plant, we notify it, and Cemig postpones, for example, machine maintenance or other procedures. Cemig is concerned about the impacts it causes. I feel privileged to be able to be close.

I had to open my eyes. I'm happy to contribute with my experience on the river. It's great, as a fisherman, to feel useful and heard. It's a joy to realize that my opinion, at a certain point, is worth it, in terms of preserving the fish..”

IRAPÉ: INSIDE DIVERSITY

When the Irapé Hydroelectric Power Plant (UHE) was being built, in the 2000s, around 36 species of fish were identified in the Jequitinhonha River basin, in the Northeast region of Minas Gerais. Today, after much research, some with support and funding from Cemig, this number has risen to more than 100 known species.

Some of them are threatened with extinction, due to predatory fishing, river silting, damming and the introduction of non-native species. Therefore, knowing the ichthyofauna (or group of fish) that live in rivers and reservoirs is essential to better understand the environment and work with a focus on sustainable actions.

“It is very important to monitor what happens to the fish community over time, considering that the implementation of a plant changes the animal's environment. It is important not only for environmental reasons, but also because many people depend on fish to survive”, says biologist Francisco de Andrade, who worked on the implementation of Irapé and today carries out research with UFLA (Federal University of Lavras).

Andrade remembers some of the first sensations at the time of the plant's implementation. “The Jequitinhonha River basin is known for being poorer in

REMEMBER PIRACEMA?

From Tupi-Guarani, pira + cema = exit of the fish. It is the migratory movement of fish upstream, in the opposite direction to the river current, for reproduction purposes. Occurs during the rainy season.

CURIOSITY

terms of fish, especially due to the smaller volume of water. But the interesting thing is that, at that time, most of the river's diversity was not known. Even large species took a long time to be described.”

The biologist cites, for example, the piabanha, which feeds on fruits and other fish, and which was identified in the region a few years ago. “We estimate that it is larger, 30 cm to 40 cm, or even more”, he comments. Another important species studied in Irapé is the curimba, which feeds



“We know that its abundance in the Jequitinhonha River has greatly reduced. But we were also able to see that, even though it is made from piracema, the curimba manages to remain there in Irapé and reproduce.”

on river debris and plays a fundamental role in recycling the environment and contributing to the balance of water courses.

According to Andrade, the curimba is a species of piracema, which migrates up the river to reproduce. “We know that its abundance has greatly reduced in the Jequitinhonha River. But we were also able to see that, even though it is made from piracema, the curimba manages to remain there in Irapé and reproduce.”

SOME STUDIES IN IRAPÉ

- Monitoring of fish in the plant's area of influence, to monitor changes in the fish community, evaluating the increase in the abundance of non-native species.
- Inventory of fish diversity.
- Molecular identification of fish.
- Study of migratory species and their reproduction.

SOME RESULTS

- Description of new species.
- Monitoring the invasion by pirambeba.
- Migration studies of piracema species.
- Expanding efforts to conserve fish.

A BARRAGEM MAIS ALTA DO BRASIL

HPP Irapé, which has the official name of Usina Presidente Juscelino Kubitschek, was inaugurated in July 2006, on the Jequitinhonha River, in the northeast of Minas. It has the highest dam in Brazil and the second largest in Latin America, measuring 205 m high. It is one of Cemig's most important hydroelectric plants. It is located between the municipalities of Berilo, right bank, and Grão Mogol, left bank, approximately 540 km from Belo Horizonte.

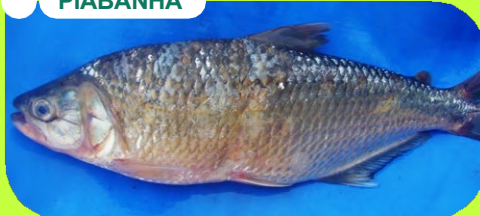
CURIOSITY

IMPORTANT SPECIES OF JEQUITINHONHA

CURIMBA



PIABANHA



PIAPARA



RONCADOR



SURUBIM



EMBORCAÇÃO MONITOR TO MAINTAIN

In addition to several research projects and other important actions for fish conservation, Cemig carries out routine monitoring of fish fauna every three months in at least nine of its reservoirs, including Emborcação. These procedures comply with environmental legislation and are provided for in the plants' operating licenses.

The Emborcação HPP reservoir has almost 500 km² of flooded area. It is located on the Paranaíba River, in Araguari, in the Triângulo Mineiro. There, monitoring began in 2014 and has already identified 79 different species of fish. Most species are medium-sized (from 15 cm to 30 cm). Among them are migratory species, such as piau-três-pintas and piapara, and endemic species, such as lambari-cachorro.

Exotic species were also collected in Emborcação, such as the yellow tucuna and the red piranha. Cemig's systematic work at this plant identified two endangered species, the pirapitinga and the silver pacu.

In these periodic monitoring, Cemig seeks to understand variations in the abundance of species in the region, as well as the relationship with environmental and plant operating variables. With this attentive look at environmental issues involving the plants,

Cemig observes and assesses whether the conditions found are in accordance with sustainable standards, whether any changes are occurring and how the fish are behaving.

SONARS TECHNOLOGY AS AN ALLY

To assess the abundance of fish and thus improve conservation work, Cemig has been testing the use of sonars in reservoirs. The equipment works by emitting sound waves and detects objects at the bottom of water courses. Currently, sonars are useful in navigation, fishing, research in aquatic environments in general and in atmospheric studies.

"It is a very powerful sonar that allows, practically with video quality, to obtain images of fish underwater. These are acoustic images. It is a sonar developed by a North American company, which allows you to quantify the fish present in a given place and time. Something that we could not do with methods such as nets, hook and line or net, for example", explains researcher Alejandro Giraldo Pérez, biologist and doctor in Ecology, Conservation and Wildlife Management.

Recently, Alejandro gave training at HPP Emborcação on the

use of this technology. According to him, with the equipment, it is possible to 'see' the fish swimming, 10 m or 15 m away from the sonar, or even more, depending on the image quality in which the equipment is configured. Alejandro has been a researcher and environmental consultant for around 20 years. Colombian, his professional life has always passed through Colombia, Brazil and Venezuela.

He says that, more than ten years ago, he began interacting with Cemig's hydroelectric plants when he developed his doctoral thesis. He currently works on the Peixe Vivo Program, has participated in other projects with the company and today has 100% of his professional life focused on fish and hydroelectric plants. "The foundations that the Cemig project gave me opened up many opportunities for my professional training."

PARA NÃO ESQUECER

Ichthyofauna is a term widely used when it comes to hydroelectric plants and the environment. The word means grouping of fish that live in a certain environment and/or region.

Ichthyofauna

PERIODIC FISH MONITORING. WHY IS IT IMPORTANT?

Monitoring is important for companies in the electricity sector to assess the impacts of their activity. Hydroelectric dams transform rivers, regulate flow, alter the flow of sediments and nutrients and modify the physical-chemical parameters of the water. This affects the diversity of organisms and the ecological integrity of aquatic systems. Therefore, monitoring programs are fundamental for environmental sustainability.

A yellow outline of a water droplet, positioned in the lower right quadrant of the image, partially overlapping the text area.

**CONSTANT
SURVEILLANCE FOR
QUALITY**

Brazil has the largest amount of fresh water available in the world. This potential of Brazilian rivers, combined with climatic and geographical conditions, favors the generation of electrical energy through hydroelectric plants (which have water as a fundamental raw material).

At Cemig's 47 hydroelectric plants located in different municipalities, there is constant surveillance to promote the sustainable use of water in their projects. The idea is to monitor so that the water that enters the reservoir leaves with the same quality, returning to the course of the river without having its conditions altered by the operation of the hydroelectric plant.

To this end, Cemig has around 200 collection stations, integrating the Water Quality Monitoring Program network. For example, possible changes in physical and chemical aspects and also in biological aspects are observed, which may reflect the integrity of ecosystems and the existence of disturbances in the environment.

With monitoring, Cemig hopes to collect and provide diagnostic data on water quality in order to contribute to minimizing impacts on biodiversity and conserving aquatic species, through the assessment of composition, abundance and diversity. There is also progress in these assessments through an information system. Cemig has been working to make its historical data series from monitoring dynamic, which allows acquisition, storage, manipulation, integration and display of water quality results.

A database management platform, called Simbiosis, shows a complete view of the basins where the reservoirs are located and provides historical information and analysis, through robust data, for decision making.

Therefore, the water quality program makes hydrobiological collections available, that is, it promotes free and open

“...ensure that “current and future generations have the necessary availability of water, with adequate quality standards”

access to data and information about aquatic biota obtained through monitoring.

Cemig encourages the consolidation of an integrated information network on Brazilian biodiversity, which allows the adoption of important measures to restore communities and conserve aquatic resources, based on the responses obtained during the implementation of the programs.

LAWS THAT CARE OF THE WATERS

All information produced by Cemig is made available to universities, public bodies and other entities interested in water quality. In addition to the importance of this collection of data, monitoring complies with the legal operating conditions of hydroelectric plants, complying with state and federal resolutions.

The guidelines of the Water Quality Monitoring Program are also aligned with the Water Law, as Federal Law No. 9,433, of January 8, 1997, is known. This legislation establishes the National Water Resources Policy, which contemplates the use of hydroelectric potentials, among other diverse topics relating to water use.

The first objective defined by the Water Law is to ensure “current and future generations the necessary availability of water, with quality standards appropriate to their respective uses”, which is in line with Cemig's actions.

RESEARCH PROJECT

In addition to monitoring, Cemig encourages research and development projects in partnership with universities and other research centers.



These initiatives are management instruments that enable the identification of internal improvement opportunities and the implementation of socio-environmental innovations referenced by best national and international practices.

According to the company, the research results are fundamental in delivering solutions for adaptations and mitigations of possible impacts caused by the plants. This is yet another action by Cemig with the aim of reducing environmental risks and promoting biodiversity, always prioritizing the sustainable management of water resources.

WHAT IS WATER QUALITY MONITORING?

The National Water Agency (ANA) defines monitoring the quality of natural waters as a set of practices that aim to monitor changes in the physical, chemical and biological characteristics of water, which occur due to various human and natural phenomena.

WATER QUALITY: WHY MONITOR?

Care for water, one of the main inputs used by the company in the development of operations, is present in all of our activities. Therefore, in order to establish a

WATER LAW

Find out more about Federal Law No. 9,433, of 1997, which established the National Water Resources Policy

MAIN FUNDAMENTALS:

→ Water is a public asset

It is a limited natural resource,
→ with economic value

If there is a shortage, the
→ priorities are human consumption and the end of animal thirst

→ Management must provide multiple use and rely on public authorities, users and communities

MAIN OBJECTIVES:

→ Ensure availability to current and future generations, with quality for use

→ Prevent and defend water against critical hydrological events, of natural origin or due to inappropriate use

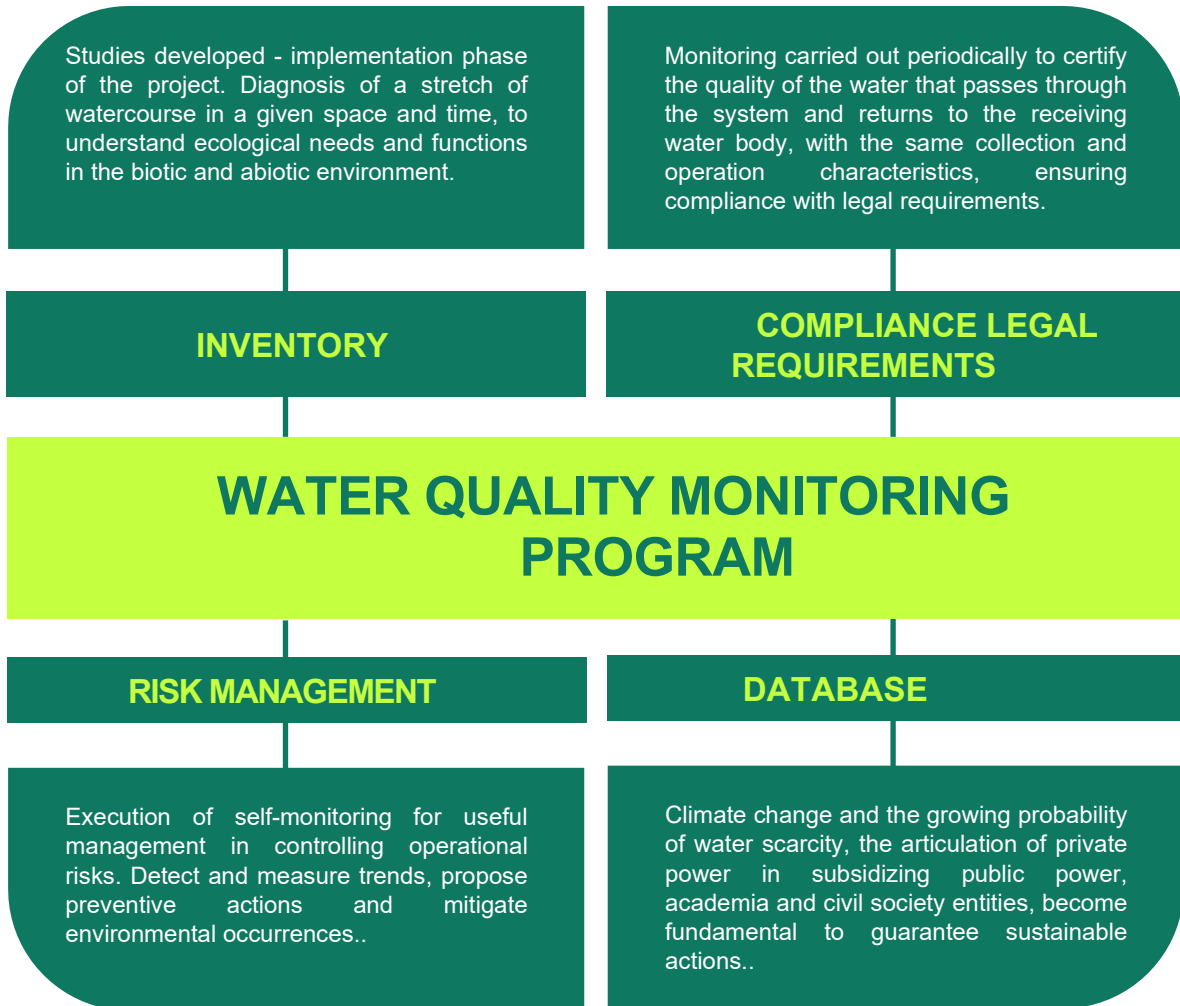
→ Encourage and promote the capture, conservation and use of rainwater

sustainable balance between the necessary economic development and water availability in quantity and quality, which takes into account the different uses of water, it is essential to establish a water quality monitoring program, which provides subsidies for prevent environmental damage and promote sustainability and operational safety

in all phases of its projects, from project conception to operation..

Monitoring aims at evaluation. Therefore, different configurations can be used, which vary depending on the objectives and the phase the project is in, as shown in the following figure.

MONITORING OBJECTIVES



To monitor water quality in its various objectives, Cemig carries out a water quality monitoring program, periodically, in 43 plants, covering more than 180 collection stations in the main basins of Minas Gerais, where they are located. physical-chemical and biological aspects were evaluated. This collection of integrated data in specific locations (georeferenced), with a certain regularity of time, provides extensive information gathering, which can be used to define current water quality conditions.

WHAT DO WE MONITOR?

PHYSICAL-CHEMICAL TESTS

As can be seen in the organizational chart on the previous page, the study of water quality is carried out based on the analysis of a set of physical, chemical and bacteriological variables in the aquatic environment, which allows the immediate identification of possible changes in the waters.

However, this approach is not very efficient in detecting changes in the diversity of habitats and micro-habitats and is insufficient in determining the consequences of changes in water quality on hydrobiological communities. This inefficiency reinforces the importance of integrating studies of physicochemical data and hydrobiological communities,

1 - Indicative of the acid-base and ionic balance of water - maintenance of aquatic life
Ex.: pH

2 - Indicative of fecal contamination
E.g.: thermotolerant coliforms

3 - Organic enrichment indicator

E.g.: phosphorus, biochemical oxygen demand (BOD), nitrate and ammonia nitrogen

4 - Indicative of erosion and siltation outbreaks E.g.: solid content, transparency and dissolved compounds in water

5 - Indicative of hazardous waste for the environment Ex.: copper, mercury, phenols, oils and greases

to assess the total ecological integrity of the ecosystem.

Routine monitoring promotes, in parallel, advances in the inventory of aquatic flora and fauna, which contributes to expanding knowledge of the occurrence and distribution of species in phytoplankton, zooplankton and benthic macroinvertebrate communities.

Cemig, always seeking continuous improvement of processes, emphasizes that the laboratories contracted to analyze water quality act in line with the company's environmental policies, seeking excellence in their processes and using as a reference the Standard /ISO IEC 17025:2017.

HYDROBIOLOGICAL COMMUNITIES WHAT ARE THEY?

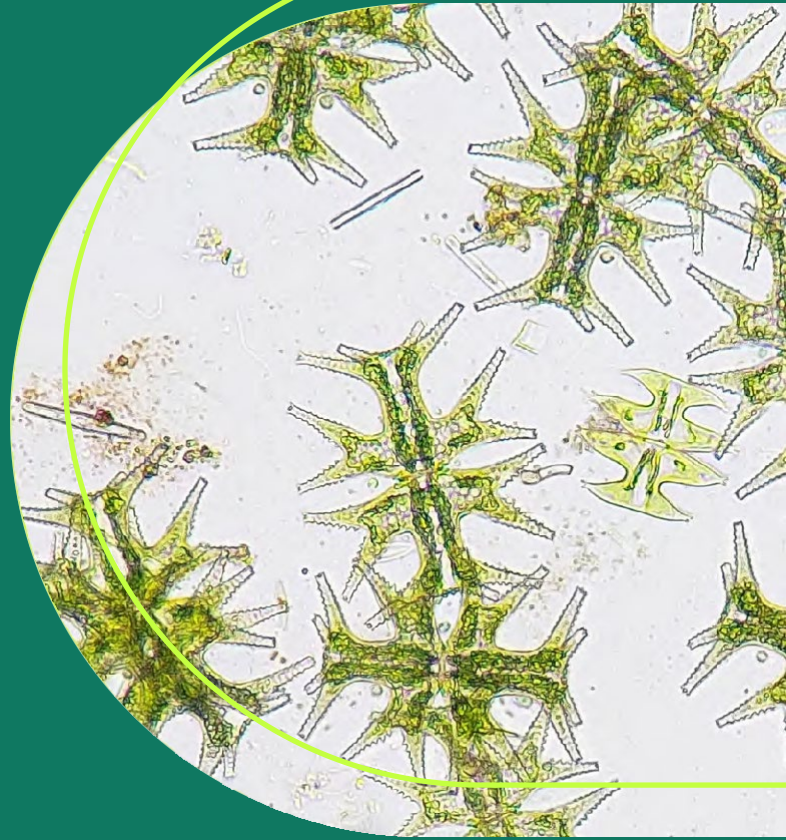
Hydrobiological communities bring together a large group of 'living beings', which have in common the fact that they live at least one stage of their life cycle in the aquatic environment. They are formed by algae and cyanobacteria (phytoplankton community), zooplanktonic organisms and benthic macroinvertebrates (zoobenthos), with the first two groups having their species living in aquatic ecosystems throughout their entire life cycle.

Within the group of hydrobiological communities, the phytoplankton community plays a relevant role in the production of organic matter and the input of energy into the food webs of a body of water. Furthermore, due to the short life cycle and sensitivity of some species to environmental changes, phytoplankton organisms are considered key elements for understanding the changes occurring in aquatic ecosystems, being considered important bioindicators of water quality.

In addition to the characterization of phytoplankton communities, knowledge about the densities of cyanobacteria becomes important due, among other factors, to the adaptations that have made them excellent

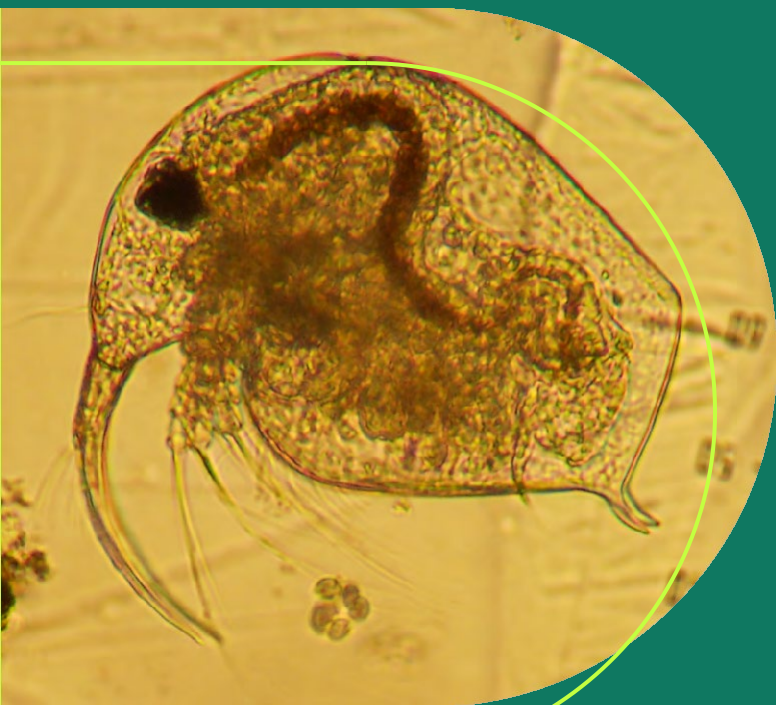
competitors in aquatic environments, making their dominance common in some locations, a phenomenon that can lead to ecological problems. and economic, given the presence of potentially toxic species in this group. Therefore, knowledge about this specific group of algae becomes important in diagnosing hydrobiological communities.

Zooplankton organisms are responsible for incorporating and transferring a significant portion of the energy produced by primary organisms, performing an important function of



connection within the food chain of aquatic ecosystems. They are also important for providing information about the ecological quality of the aquatic environment, as they are home to both sensitive and resistant species to changes in water quality. This group, which is mainly made up of protozoa, rotifers and crustaceans, still represents an important source of food for high levels of the trophic chain, such as fish.

Finally, the freshwater benthic macroinvertebrate community is composed of organisms larger than 0.5 mm in size, therefore visible to the naked eye. The group is composed



by a very broad and varied set of organisms, including herbivores, detritivores and predators. They can inhabit the bottoms of rapids, streams, rivers, lakes and dams.

In continental waters, the benthic fauna is predominantly insects, with greater diversity in rivers and streams. Among hydrobiological communities, benthic fauna is of special interest, as it is considered the best indicator of the quality of these environments, due to the presence of bioindicators in both preserved and impacted waters.

The initiative aimed to ensure that these analyzes meet the standards established in the aforementioned standard, which guarantees the quality and reliability of the results presented.

Next, learn a little more about some of the water quality monitoring at the Emborcação, Salto Grande and Queimado hydroelectric plants.

EMBORCAÇÃO

The Emborcação hydroelectric plant (UHE) is located on the Paranaíba River, in Araguari, in the Triângulo Mineiro, and began construction in 1977. It began operating in 1982, with two generating units. Today, there are four in operation.

Through the monitored physical-chemical parameters, it is possible to generate a

Water Quality Index (WQI), which expresses water quality for various purposes. To arrive at a classification as shown in the following table, nine parameters are selected, considered relevant for the assessment of water quality: fecal coliforms (thermotolerant), pH, biochemical oxygen demand, nitrate, total phosphorus, water temperature, turbidity, total solids and dissolved oxygen.

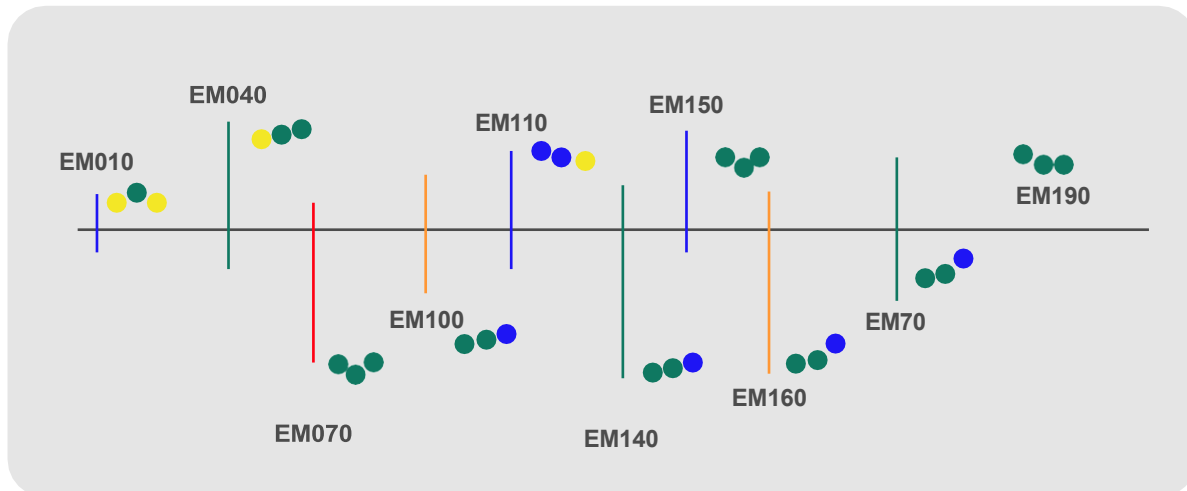
In order to serve as basic water quality information for the general public, as well as for environmental management, the indicators fulfill the objective of quantifying and simplifying a set of information. In the year 2022, water quality values in the Emborcação HPP reservoir varied between medium, good and excellent,

Classification according to the Water Quality Index (IGAM, 2019)

IQA VALUE	CLASSES	MEANING
90 < IQA < 100	EXCELLENT	Water suitable for conventional treatment for public supply.
70 < IQA < 90	GOOD	
50 < IQA < 70	MEDIUM	Water unsuitable for conventional treatment for public supply, requiring more advanced treatments
25 < IQA < 50	BAD	
IQA < 25	VERY BAD	

in collections in the months of February/2022, May/2022 and August/2022, as can be seen observe in the following figure.

One of the main points of attention in our management related to the aquatic environment is the monitoring and combat of invasive species,



Schematic drawing of Water Quality in the monitored sampling sites of HPP Emborcação.

that can bring imbalance to the ecosystem. As a result, Cemig also monitors the golden mussel, an invasive crustacean that causes enormous damage to the plant and the aquatic environment. Considered one of the most harmful invasive freshwater species, it is a bivalve (two shells) originating from Southeast Asia.

The golden mussel arrived in South America in 1991, through the port of Buenos Aires, in Argentina. It came through the ballast waters of ships and spread from the River Plate. Today it is found in several basins and their watercourses in Brazil, such as the

Rio Grande, the Paranaíba River and the Lower São Francisco. This species has been affecting the integrity of natural communities, impacting biodiversity.

Another important monitoring carried out at this plant is that of cyanobacteria in the water body. These organisms have a high capacity to produce toxins and can cause harm to the community by making the water unfit for consumption and recreational use. Although the water quality at HPP Emborcação presents a satisfactory rating, it is necessary to highlight constant vigilance for this group.

“Monitoring the history of water quality in Salto Grande is of great importance to better understand the environment”

SALTO GRANDE

The Salto Grande HPP began to be built in 1949, and operations began in 1956. It has two reservoirs, one located on the Santo Antônio River and the other on the Guanhães River, whose dams are located in the municipalities of Joanésia and Braú - in, respectively, the Rio Doce Valley.

The Santo Antônio River has a very great biological relevance due to the composition of its aquatic biota (diversity of living beings).

By periodically monitoring water quality at this plant, Cemig shows its concern in aligning the electricity generation activity with environmental conservation.

The two reservoirs are monitored in Salto Grande. An important characteristic of these reservoirs is their shallow depth, which guarantees the circulation of bottom and surface waters throughout the year. This condition allows the distribution of nutrients and aquatic organisms throughout the water column.

Monitoring the history of water quality in Salto Grande is of great importance to better understand the environment and generate data that can be used by public authorities.

Monitoring also helps Cemig to define the strategic management of the enterprise and encourage the conservation of the species that live there.



QUEIMADO

Construction of UHE Queimado began in 2000, and the plant began operating in 2004, with three generating units in operation. The plant is located on the Rio Preto, in the northwest region of Minas Gerais, but its reservoir also covers part of the state of Goiás and the Federal District.

When developing its activities, both in the implementation and operation of assets, the Cemig group remains committed to complying with environmental legislation. At the same time, it directs additional efforts to voluntary initiatives, which go beyond legal requirements and effectively contribute to the conservation of the ecosystem.



UHE Queimado monitors the quality of water in the reservoir and downstream quarterly, using physical-chemical parameters and hydrobiological communities, including aquatic macrophytes. In a complementary way, it promotes socio-environmental education and involves people in the region in the search for environmental conservation, encouraging activities that can lead to improved water quality.

ECOTECHNOLOGIES

Two research and development projects aimed at gathering information and improving useful and functional management tools, with the aim of supporting proposals for improving water quality and protecting biodiversity, are being developed at the Três Marias hydroelectric plant (UHE), with a planned investment of R\$19 million. This is Cemig investing in the generation of knowledge, with practical effects on its projects.

One of them is the Intelligent Monitoring of Water Quality in Hydroelectric Reservoirs (R\$ 7.1 million), and the other evaluates the Ecological Integrity of Marginal Lagoons for the Conservation of Biodiversity on the São Francisco River (R\$ 12 millions).

These initiatives are promoted in partnership with entities such as UFMG (Federal University of Minas Gerais), Instituto Teia, Fundep (Funda-



Foundation for Development and Research), PUC Minas (Pontifical Catholic University of Minas Gerais). The Federation of Industries of the State of Minas Gerais (Fiemg) and Agência Peixe Vivo are also key partners.

In these projects, there is also a strong interaction with the population, seeking to raise awareness among local fishermen about the importance of preserving water resources and disseminating the knowledge generated to the community. Cemig therefore invests in promoting the exchange of knowledge.

SMART WATER QUALITY MONITORING

Conventional monitoring of reservoirs involves field campaigns to collect water, which requires time for specialized staff to travel and subsequent analysis in the laboratory.

This intelligent monitoring seeks to develop methods for analyzing and remotely monitoring water quality in reservoirs. In practice, satellite images and others captured by drones are used.

ZERO WASTE UNDER FISHING

Uma An important action in the region of the Três Marias dam, carried out by fishermen, other partners and encouraged by Cemig, is the Pesca Sub Lixo Zero – Rio São Francisco project. Around 100 people are involved in collecting rubbish at the bottom of the river, including 30 to 40 divers, in addition to riverside residents and other partners.

“People embraced the cause, and the riverside residents are going to clean up together. Companies sponsor and divers, fishermen and the entire community work in this project. We realize that people end up becoming more aware and throwing less trash. One action actually leads to another”, says the fisherman and boatman.

In two actions, almost 500 tires were removed from the bottom of the river and three garbage trucks were removed, according to boatman and fisherman Jardel da Silva Leite. Anyone who wants to know more about this initiative can access Instagram: Pesca_sub_lixo_zero.

Thus, complementary technological alternatives are created that assess water quality quickly, more frequently and in less time. Several satellites provide georeferenced images of the reservoir on a daily or weekly basis.

At the same time, water collections continue in the field. “We collect water every month for analysis and, every week, we catch some fish, weigh them and release them back into the environment. I'm going with the biologists. The quality of the water is assessed with a probe, to check the pH and oxygenation”, comments boatman and fisherman Jardel da Silva Leite, who participates in the actions.

The boatman highlights the importance of Cemig being closer to the community in the Três Marias plant region. “One action ends up stimulating another, and the information is disseminated within the community. Therefore, everyone cares more about preserving. Good examples are to be followed”, says Jardel.

Among the activities related to the project that the company carries out with the community aiming to protect the waters in the reservoir region, there are also partnerships and collaboration networks via WhatsApp group, Olho Vivo na Água Program (with video sharing) and exchange of information on land use and occupation around the reservoir.



CONSERVATION OF VELHO CHICO MARGINAL LAGOONS

As the name of the research project indicates, the “Ecological Integrity of Marginal Lagoons for the Conservation of Biodiversity of the São Francisco River” is being evaluated by Cemig in the region downstream of the Três Marias HPP. This study includes a set of management actions for the integrated operation of the reservoir with the filling of marginal lagoons aimed at conserving biodiversity, especially fish species.

Strong integration with local communities is also promoted through participatory actions. Thus, Cemig seeks to promote citizen management of marginal lagoons. Fisherman Wagner Jansen, resident of Matias Cardoso,

“We know that there is no life in São Francisco if it weren't for the marginal lagoons. Therefore, it is very important to monitor and have Cemig close to us”

in the North of Minas, collaborates, together with other fishermen, in monitoring the actions of researchers from Cemig and entities such as PUC Minas, UFMG and Senai.

For around five years, Wagner has participated in the Carta de Morrinhos Movement, the creator of the project. “We know that there is no life in São Francisco if it weren't for the marginal lagoons. Therefore, the importance of monitoring and having Cemig with us is great”, he explains.

This project arose from a demand from the community. During the rainy season, the São Francisco River overflows water into lagoons located on its banks, and this enables the reproduction process of some species. The idea is to evaluate the possibility of Cemig releasing some water from its reservoir to fill the lakes, if their level is low, and the contribution that the Três Marias plant would have in this process.

Thus, the lagoons function as a nursery for fish that, when they develop, return to the river. Since this dynamic depends not only on the water that passes through the Três Marias HPP, but also on several tributaries along the São Francisco River, the study takes into account all

this system to model flow scenarios and evaluate how this management could be done effectively. Therefore, a technical cooperation agreement was also established between Cemig, the São Francisco Hydrographic Basin Committee and the Peixe Vivo Agency, to carry out studies that will bring greater understanding of the river's hydrodynamics.

“We have the Morrinhos Charter, which, through a ‘Communication Network’ created with the participation of our riverside residents, is very grateful for Cemig's participation”, says Wagner. The project has a multidisciplinary team from the community, made up of environmental activists. These leaders have a support group made up of residents of cities close to the lakes.



FAUNA

MISSION TO CONTRIBUTE
TO THE CONSERVATION OF
BRAZILIAN FAUNA



Brazil has an enormous diversity of species of birds, reptiles, amphibians and mammals. To give you an idea, just regarding birds, there are more than 1,900 identified (including resident and visiting species), with almost 200 threatened with extinction globally, and more than 100 at risk of extinction in Minas Gerais.

In relation to mammals, the country has the greatest variety in the world, with more than 700 species, most of which are present in the Cerrado and Atlantic Forest. For another important group, the herpetofauna (reptiles and amphibians), the number reaches at least 1,800 records.

Most of the company's hydroelectric plants, for example, are located in areas of Cerrado and Atlantic Forest, which concentrate great wealth of Brazilian fauna. Hydroelectric plants, agriculture, pasture areas and other types of land use, all of this interferes with the lives of animals, impacting diversity. Cemig is aware of this and has played its part in trying to mitigate the environmental impacts caused by electricity generation, distribution and transmission activities, constantly investing in monitoring, studies and various projects. This unique biodiversity of the largest country in South America needs to be conserved.

In these 70 years of operation, Cemig has produced vast material on the fauna in the regions of the projects and has sought to encourage research.

Professor Marcelo Passamani, PhD in ecology from the Department of Ecology and Conservation at UFLA (Federal University of Lavras), who carries out work with Cemig, explains the impacts that a hydroelectric plant can cause to living beings and highlights the importance of creating actions aimed at conserving ecosystems and species that live in these environments.

“Enterprises such as hydroelectric plants modify the course and dynamics of rivers. This directly interferes with aquatic fauna and flora, as well as terrestrial environments. Normally, when the reservoirs fill, several vegetation areas become submerged, eliminating the dam's native fauna and flora and modifying the ecological processes in its surroundings”, says the professor.



***Lycalopex vetulus* (field fox)**

It is one of the smallest canids in South America and the species has been classified in the threat category as vulnerable (VU) (MMA, 2022).

"Producing knowledge and sharing the results with society has been a working method for Cemig on different fronts of action".

Cemig seeks daily to preserve biodiversity in the regions where its projects are located, thus complying with legislation and fulfilling its role of working for sustainable development.

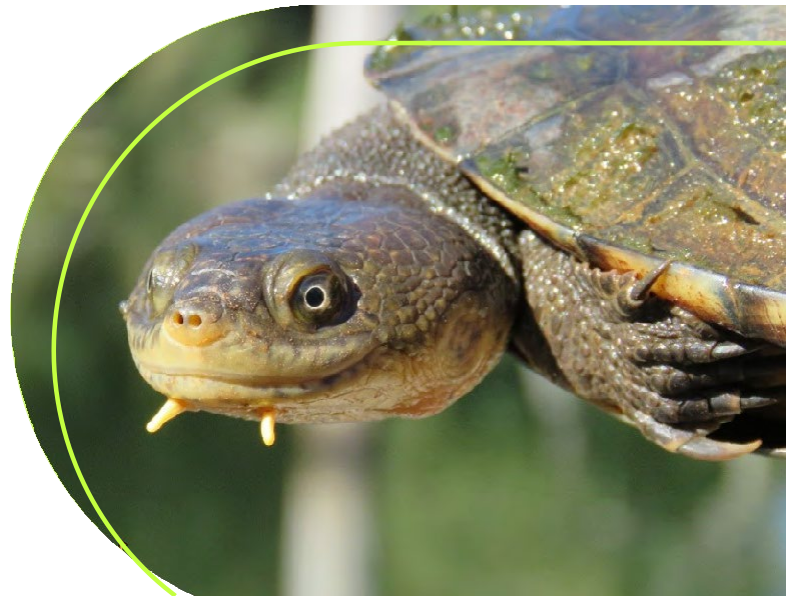
GUIDES FOR SPECIES IDENTIFICATION POPULARIZE KNOWLEDGE ABOUT WILD ANIMALS

Producing knowledge and sharing results with society has been a working method for Cemig on different fronts. In 2020, in partnership with researchers and experts, Cemig produced a collection of Illustrated Fauna Guides for the Emborcação Hydroelectric Plant, available free of charge on the Internet. These books characterize the animals that live in the Emborcação HPP region, whose reservoir covers the municipalities of Araguari, Cascalho Rico, Estrela do Sul, Douradoquara and Abadia dos Dourados in Minas Gerais, and Três Ranchos, Davinópolis, Ouidor and Catalão in Goiás.

Three guides were produced: birds, reptiles and amphibians and mammals.

As soon as the material was ready, Cemig sent kits to 84 municipal, state and private schools in the 11 municipalities in the area of influence of HPP Emborcação, and also to the Education and Environment departments of these cities. These actions aim to expand the community's knowledge about the fauna that surrounds it, bringing diverse information about the species to new generations. Attitudes like this bring a sense of belonging to the community, which awakens care and the desire to preserve.

According to Cemig, projects of this nature aim to support educational actions, making people aware of the importance of preserving the environment, through knowledge of important species of Brazilian fauna.



“The motivation for conserving these species is closely related to popular knowledge, and these works aim to bring the lay public closer to scientific knowledge”, explains Cemig's Environmental Management Department.

The guides bring photos of the animals and a short text with their scientific name, popular name, physical characteristics, food, social behavior, among other information. In the Illustrated Bird Guide, 231 species were recorded, distributed in 54 families. In it, there is an encouragement to the practice called birdwatching (“bird watching”), an activity that is very popular in several countries around the world and has been gaining several followers in



Brazil. Birdwatching is an activity carried out outdoors, which promotes knowledge and assists in environmental preservation, in addition to being an activity that is very accessible to all audiences and requires very little material (just binoculars, a field guide and patience is enough).

In relation to mammals, 40 species have been identified, including the maned wolf – the largest wild canid in South America (yes, despite being called a wolf, this species is evolutionarily closer to dogs!). It measures up to 75 centimeters in height and 170 centimeters in total length. The maned wolf is considered an endemic species of the Cerrado, that is, it only resides naturally in this biome, and feeds on fruits, mainly from the wolf tree. This causes it to disperse seeds throughout the environment, which helps in the recovery of degraded areas.

The guide to reptiles and amphibians includes, among the dozens of animals, the bullfrog, which has large venom glands positioned just behind its eyes. These glands are this animal's defense mechanism and, when pressed by a predator, they release a toxin capable of causing discomfort or even killing that predator.

“The motivation for conserving these species is closely related to popular knowledge, and these works aim to bring the lay public closer to scientific knowledge.”

The guide shows that, contrary to popular belief, the poison is only released when the glands are pressed; therefore it is not squirted voluntarily.

By producing this work, Cemig reinforces its commitment to society, providing extensive material that can be used by schools, libraries, municipal governments in cities surrounding the plant's reservoir or other municipalities, and also by environmental agencies, universities and all those who may be interested in the topic.

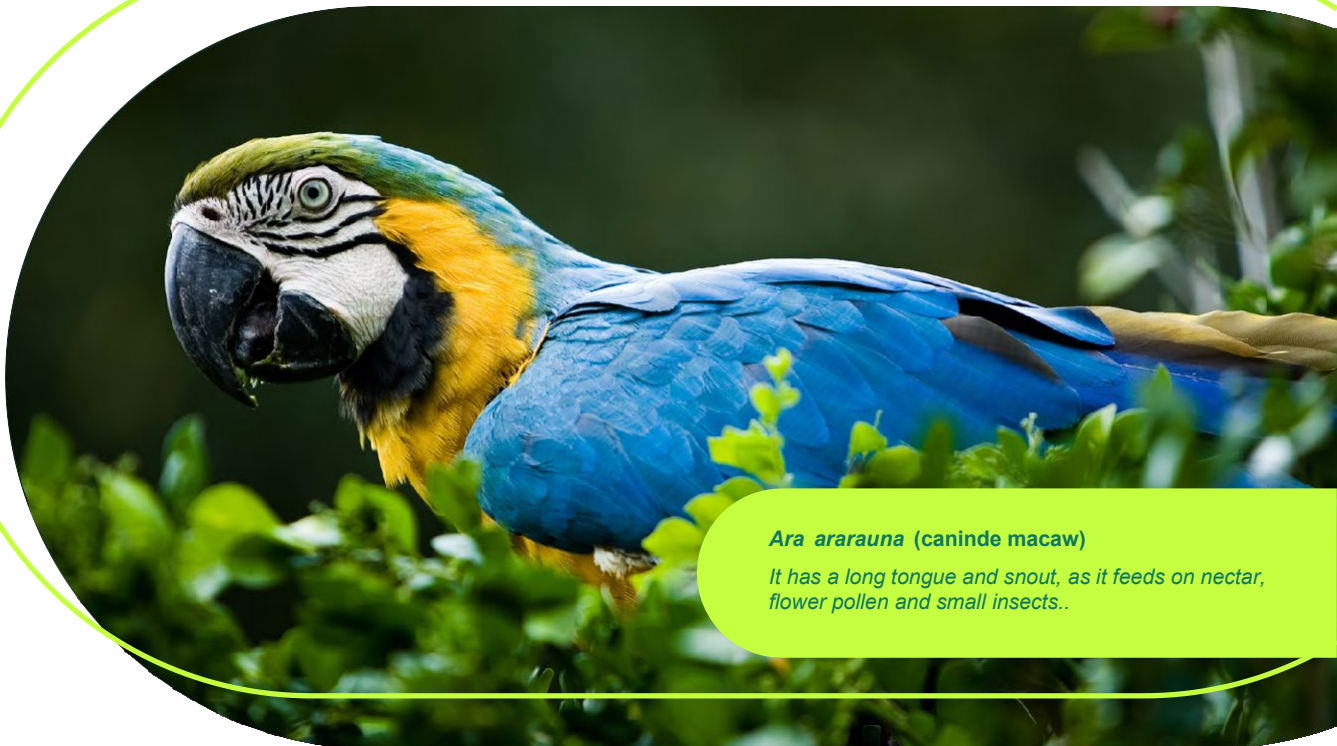
To learn more about the guides, visit: <https://www.cemig.com.br/usina-do-conhecimento/coletanea-de->

[-livros-traz-informacoes-valiosas-sobre-a-fauna-da-usina-hidreletrica-de-emborcacao/](#).

ABOUT BIRDS... DID YOU KNOW?

Brazil is home to around 1,919 species of birds.

- 10% of them are considered endemic;
- 171 species of birds in Brazil are threatened globally;
- 234 are on the national red list;
- 113 are at risk of extinction in Minas Gerais.



Ara ararauna (caninde macaw)

It has a long tongue and snout, as it feeds on nectar, flower pollen and small insects..

HERPETOFAUNA... DO YOU KNOW THIS WORD?

These are animals classified as reptiles, which depend on external heat to regulate their body temperature and crawl; and also amphibians, which depend on water for part of their life cycle.

The greatest richness of herpetofauna species is found in Brazil.

REPTILES:

- São conhecidas pelo menos 795 espécies.
- Among them, 276 lizards and 405 snakes.

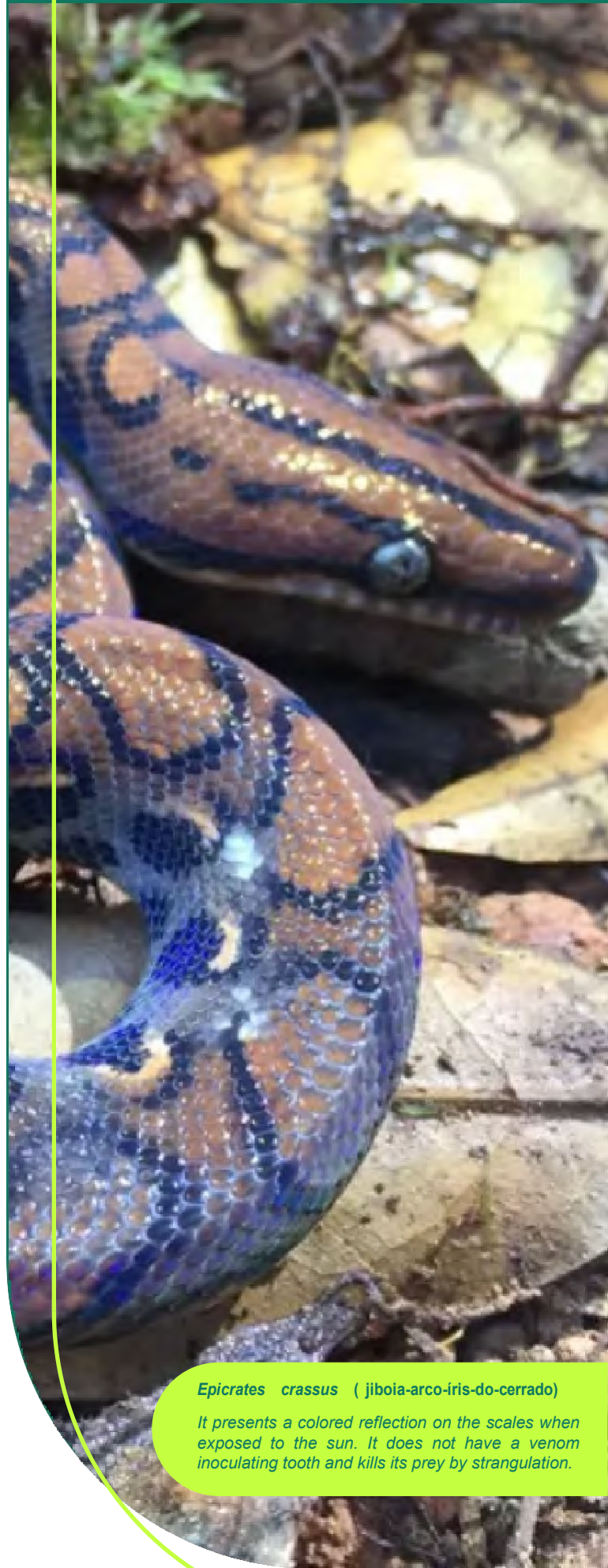
AMPHIBIANS

- 1,136 species are known.
- The majority (1,093) are anurans, which include toads, frogs and tree frogs.



***Barycholos ternetzi* (cerrado frog)**

The male Cerrado frog takes care of the eggs until the offspring are born, which is an unusual characteristic among amphibians, as most of the 41 species just lay the eggs and leave them "to their own devices" immediately after fertilization.



***Epicrates crassus* (jiboia-arco-iris-do-cerrado)**

It presents a colored reflection on the scales when exposed to the sun. It does not have a venom inoculating tooth and kills its prey by strangulation.

KNOW WHAT IT MEANS MASTOFAUNA?

These are animals classified as mammals, whose striking characteristic is the presence of mammary glands, as is the case with rats, jaguars, giant anteaters and humans.

In Brazil, the mammal fauna reaches significant numbers, constituting one of the largest in the world.

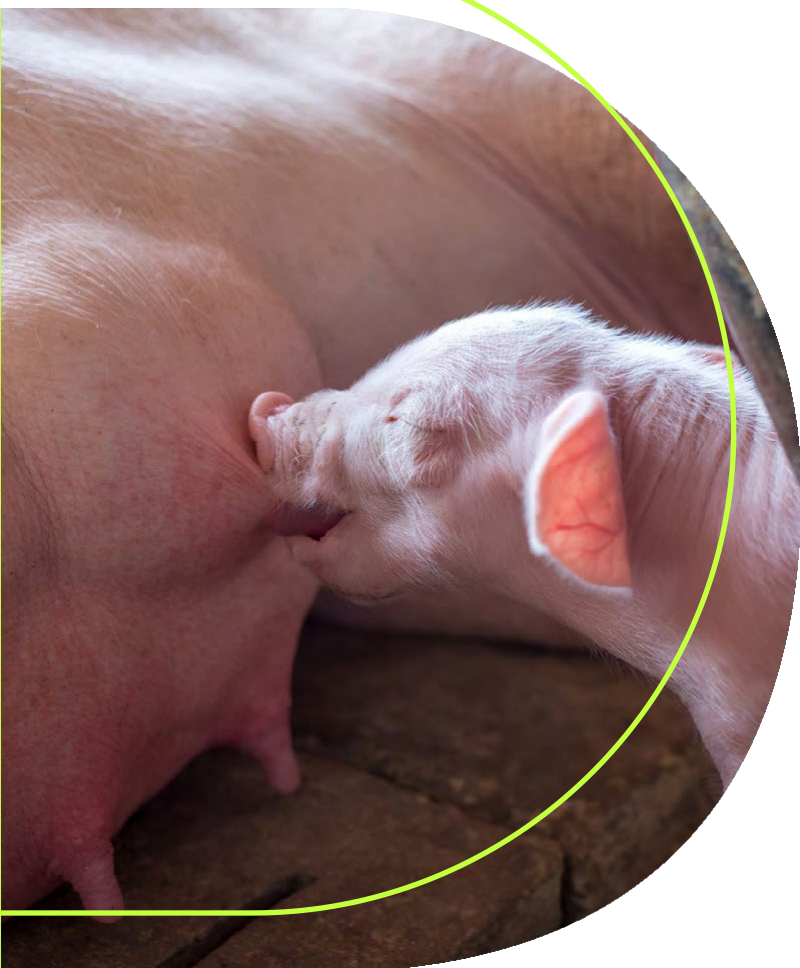
Mammals have great ecological importance.

They are essential for seed dispersal and the food chain.

- Cerrado: around 251 species (32 endemic)
- Atlantic Forest: around 298 species (90 endemic)

BATS:

- They are the least known among mammals in terms of distribution, habitat and shelters.
- They constitute one of the most diverse groups of mammals in the world, with 18 families, 202 genera and 1,120 species.
- In Brazil, 9 families, 68 genera and 178 species are known.



Glossophaga soricina (hummingbird bat)

It has a long tongue and snout, as it feeds on nectar, flower pollen and small insects.

RARE SPECIES ARE IDENTIFIED IN GALHEIRO

Near the reservoir of the Nova Ponte Hydroelectric Plant, on the Araguari River, the Galheiro Private Natural Heritage Reserve (RPPN) is located. The plant is in the municipality of Nova Ponte, and the reserve is in Perdizes, both in the Triângulo Mineiro. In the second half of 2022, a team of researchers from the Federal University of Lavras (UFLA), in partnership with Cemig, went on an expedition to the reserve.

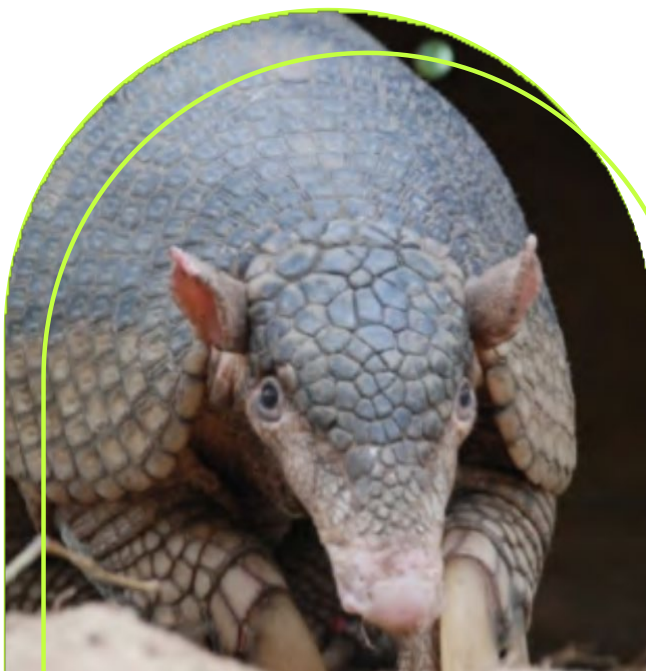
The result was the recording of important fauna species, highlighting the giant armadillo (*Priodontes maximus*), considered a rare species, the maned wolf (*Chrysocyon brachyurus*) and the jaguar (*Puma concolor*). The giant armadillo is classified as “vulnerable”, according to the global list of the International Union for the Conservation of Nature (IUCN) and the Red Book of Brazilian Fauna Threatened with Extinction from the Chico Mendes Institute of Biodiversity Conservation (ICMBio).

Five professors, a postdoctoral fellow and 17 students participated in the expedition. The work took place as part of the

Field Course discipline of the Postgraduate Program in Applied Ecology at UFLA.

“It was very useful and we had an excellent opportunity to help students have experience evaluating ecological aspects in practice. This contributes to the training of professionals committed to environmental causes”, says professor Marcelo Passamani, from the Department of Ecology and Conservation at UFLA, who works especially with mammals.

“The first time I went to Galheiro, I was impressed. In addition to the physical structure that allows researchers-



PROFESSOR MARCELO PASSAMANI EXPLAINS:

Giant armadillo: “It is the largest species of armadillo alive and is very rare. It can reach more than 1 meter in length. There are few records of this species for Minas Gerais. Therefore, it is considered vulnerable to extinction. It feeds on termites and ants. It needs a large intact area to survive.””.



and students to be accommodated, the reserve is large, well preserved, and easily accessible. It is one of the most important preserved areas in the region, which is surrounded by agricultural areas. The RPPN is an oasis of biodiversity.”

With a PhD in ecology, Passamani says that, in 2022, it was the third time he participated in the field course in Galheiro, with master's and doctoral students. He considers this to be “an opportunity to experience ecological aspects in the natural environment, encouraging students to carry out scientific projects related to environmental themes.”

Professor Passamani also highlights that 17 species of native medium and large mammals were recorded, in addition to the wild boar, which is an exotic species (which does not occur naturally in that environment) and has caused serious environmental impacts.

WILD ANIMALS ARE RELEASED INTO THE RESERVE

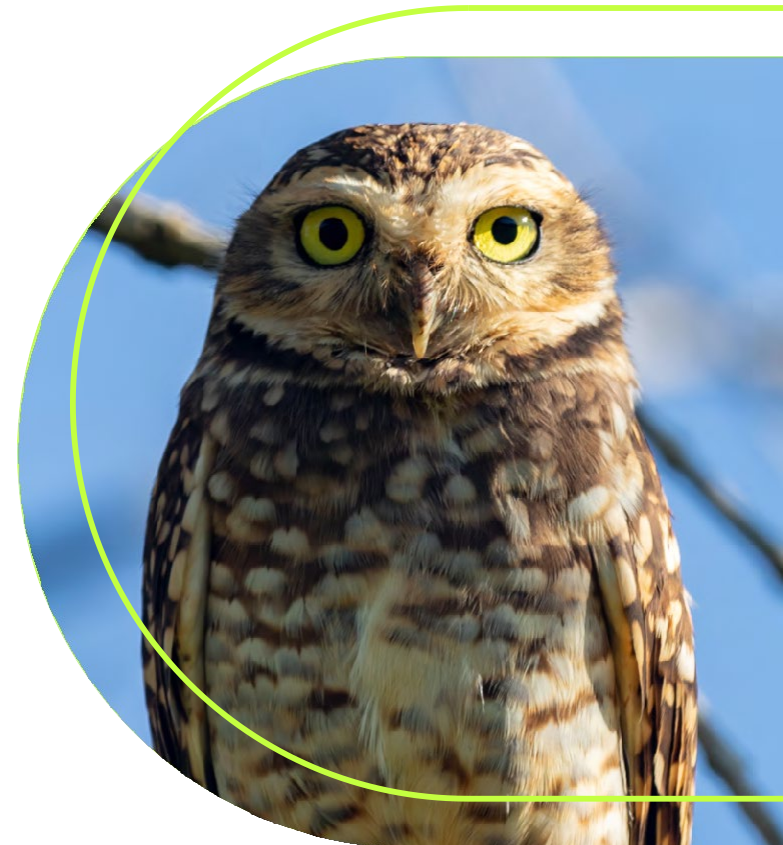
The RPPN (Private Natural Heritage Reserve) Galheiro received, in 2022, species of wild animals through the partnership between Cemig and the Brazilian Institute of the Environment and Renewable Natural Resources (Ibama). Among the species that were rescued by Cetas (Wild Animal Triage Center) of Pato de Minas (MG) and released in the RPPN are: burrowing owl (*Athene cunicularia*), carcará (*Caracara plan-*

cus), seriema (*Cariama cristata*) and ferret (*Gallictis cuja*).

Thus, Cemig makes clear its commitment to protecting fauna and encouraging actions that demonstrate the importance of wild animals. Ibama's choice for this RPPN shows the relevance and degree of conservation of the reserve.

ON THE ANIMALS ROUTE

In Minas Gerais, at the point where the Southeast of Brazil meets the Center-West, the Queimado Hydroelectric Plant began operating in the early 2003s. A great diversity of Cerrado animals is concentrated in the region. Since the beginning of the implementation of this plant, Cemig has developed environmental programs to monitor various groups of fauna.



The idea is to better understand the changes generated by the construction and operation of the hydroelectric plant to mitigate its negative effects on the environment. Five animal monitoring subprograms are developed at this plant: fauna growth, swifts, crocodilians and chelonians, *Lontra longicaudis* and landscape ecology.

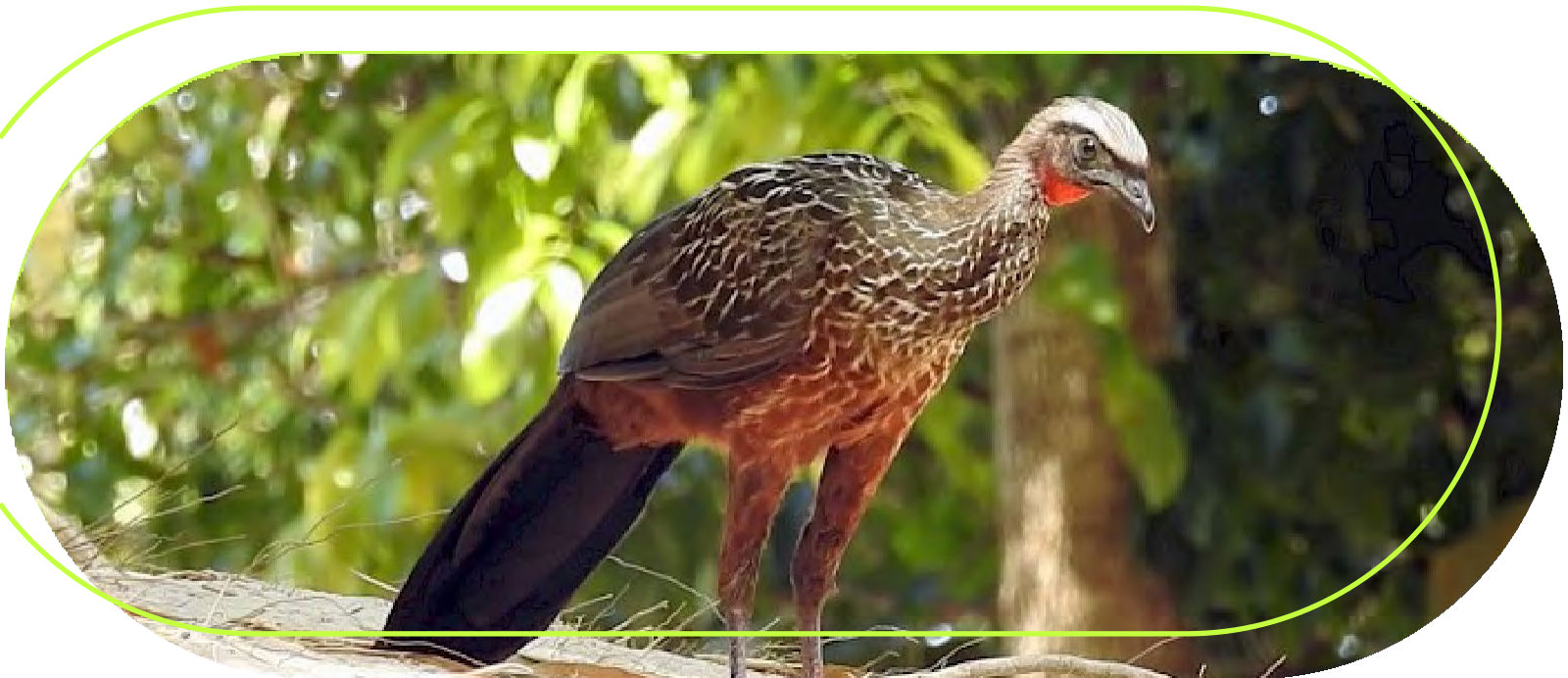
“The studies carried out in Queimado are part of the licensing. In relation to birds, for example, endemic and endangered species have been recorded and banded, such as the Gray Helmet, the Minas Gerais and the Chestnut-bellied Guan”, says biologist Gabriel Arvelino de Paula, PhD in Ecology and Conservation from UFMS (Federal University of Mato Grosso do Sul). Banding the bird consists of making an individual mark on its leg, with the

placement of a small numbered metal “ring”. This allows monitoring of the animal and its movements, being a common practice in monitoring programs involving birds. During all these years of studies up to the present day, several important fauna species have been recorded at this plant. Find out below a little about what is done at UHE Queimado.

TAKING CARE OF FAUNA AT THE UHE QUEIMADO

1. FAUNA INCREASE

Its objective is to try to attract animals to degraded areas, with few plants or soil without vegetation. To this end, structures are placed that enrich the environment (piles of wood, artificial perches joined or not by cables and even planting



of native fruit seedlings) so that fauna can have more mobility and be attracted to visit and/or stay in these regions.

Bringing these animals back is important for several reasons, such as the dispersal of seeds through feces, which allows forest restoration to occur naturally, among other results. This subprogram monitors birds, amphibians, reptiles and non-flying mammals. The nuclei formed with the increments show that small local interferences can be “ecological triggers” to promote connectivity and integration between natural areas that serve as shelter for animals.

Within this study, 45 species of mammals have already been identified. Some of them are the agouti, the ocelot, the coati, the tree rat, the little fox and the maned wolf. Of reptiles and amphibians, 64 species were listed and around 300 species of birds.

At least 72 species of birds depend on forest environments (such as the João Porca, the Rusty and the Choquinha Lisa) and ten have some threat of extinction (examples: Limpa-folha-do-brejo, Arara-Canindé and Jacu - chestnut-bellied).

2. SWIFT MONITORING

These birds live in waterfalls and build nests on the walls. They spend the night on the wall.

or behind the waterfall's veil. They can also be found in areas of caves or waterfalls, resting on vertical surfaces. In general, swifts are small, have a short beak, long and narrow sickle-shaped wings, and the tail is mostly short. They spend much of their time flying and feeding on insects in the air.

In Cachoeira de Queimado, which is close to the plant's spillway, there is a population of swifts, around 200 to 400 individuals, including several records of nests and



“This information has been used to develop environmental education actions and encourage the conservation of riparian forests and other riverine habitats used by species.”

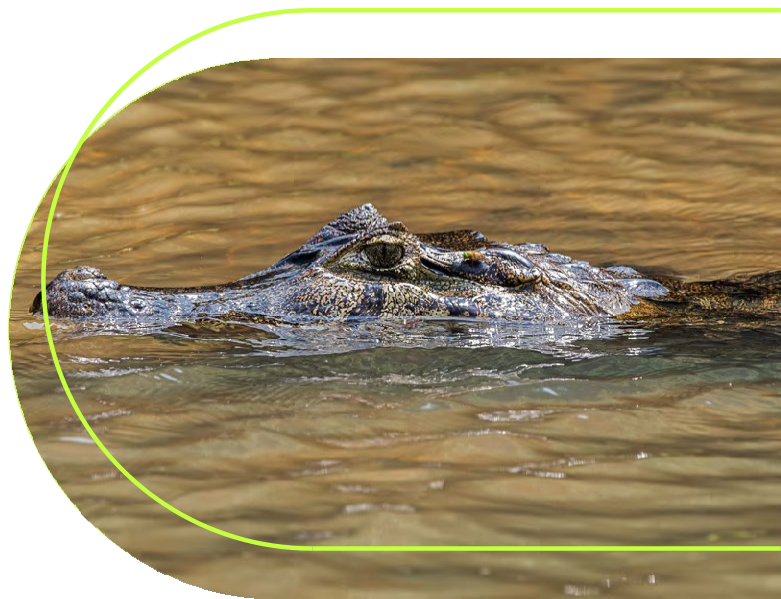
chicks. In the monitored waterfalls (Queimado, Buritizinho and Salto do Itiquira) the species *Cypseloides senex* (taperuçu-velho), *Cypseloides fumigatus* (taperuçu-preto), *Streptoprocne zonaris* (taperuçu-branca) have already been found. and *Streptoprocne biscutata* (taperuçu-de-coleira-falha).

Cemig carries out these studies with the aim of understanding the behavior and abundance of swifts in the region, as well as contributing to scientific knowledge of the biology and reproduction of these birds.

Alligators, for example, do not like highly disturbed environments, without vegetation and with human presence. Chelonians are better distributed using environments that are conserved and those that are not. By monitoring these animals, Cemig realizes that they continue to live in the region, even with the installation of the plant. This information has been used to develop environmental education actions and encourage the conservation of riparian forests and other riverine habitats used by species.

3. MONITORING OF CROCODYLIANS AND CHELONIANS

Crocodylians are alligators and chelonians that are represented by tortoises, tortoises and turtles. The focus of this study is to find out why these animals live in the region, assess whether the installation of the Queimado HPP has changed the populations and whether they can find places where they can survive.



4. LONGICAUDIS OTTER MONITORING

This mammal, popularly known as the otter, is a species considered “vulnerable” in the categories of threat to extinction in the state of Minas Gerais. Otters are semiaquatic carnivores; They preferentially feed on fish and crustaceans. They normally live solitary, but can be observed in small groups made up of females and their young.

Otters are monitored to have a better understanding of the impacts of the reservoir in relation to this animal.

Cemig has already recorded 445 traces of otters (feces, footprints, burrows) around the Queimado HPP, with greater occurrence in environments with preserved native riparian forest.

Another objective of the subprogram is to raise knowledge about the species and, in this way, raise awareness and mobilize fishermen and landowners in the region about the importance of these animals and the role of the community in the conservation/restoration of the riparian forests that they serve as shelter for otters.

5. LANDSCAPE ECOLOGY

Cemig seeks to evaluate how the fauna has behaved through changes in the landscape surrounding the plant. Around the reservoir, there are many farms, plantation and animal production areas, as well as fragments of vegetation, forming mosaics of land uses. What Cemig seeks to understand is how animals manage to survive in the region, if they interact well with the changing landscape.



The subprogram evaluates the interaction of the environment with each group of fauna (mammals, including bats, birds, reptiles and amphibians). This is important to assist in the planning and elaboration of conservation and sustainable development policies, reconciling economic activities with the subsistence of environments where animals shelter and feed.

It is possible to notice, for example, that there are animal species that are demanding in relation to the environment, that need more preserved regions, as they are more sensitive to environmental changes. But there are also those that are more generalist and capable of adapting better to environments that have had their landscape modified.

EARN MORE ABOUT THE SPECIES

Every year, materials are produced that show the results of studies of otters, crocodilians and chelonians, and swifts carried out by UHE Queimado. They are disseminated to the community surrounding the reservoir in Environmental Education actions, as well as in booklets containing information about the species. Booklets and booklets are available at: <https://uhequeimado.com.br/web/monitoramento-de-fauna-nas-areas-em-recuperacao/>.

CHAT WITH A BIOLOGIST

Gabriel Arvelino de Paula

For four years, biologist and ecologist Gabriel Arvelino de Paula worked together with Cemig to monitor the Queimado plant. Gabriel has a master's degree in Applied Ecology from UFLA (Federal University of Lavras) and a PhD in Ecology and Conservation from UFMS (Federal University of Mato Grosso do Sul). Check out some interesting facts he tells us.

! IMPORTANCE OF CEMIG'S WORK IN RELATION TO FAUNA

The work is important for understanding the threats, not only caused by the plant, but also by the advance of agriculture into natural areas.

SWIFTS ARE "LIVING FOSSILS"

Although they are not yet considered threatened, these species, in the long term, tend to decline due to several factors, some of which are still unknown. This group of birds is made up of a subfamily Cypseloidinae, exclusive to the Americas and can be considered living fossils."

At the Queimado, Itiquira and Buritizinho waterfalls, it was possible to monitor the variation of swift species and their reproduction. Up to four species that use the same waterfall were identified. This is the greatest diversity of this group ever found in the world. Cubs at different ages were also recorded and previously unrecorded behaviors were described, such as bathing in the waterfall twice a day. This shows the animal's strong interaction with the waters.

RELEVANCE OF THE RECOVERY OF DEGRADED AREAS

In the study of landscape ecology, it was possible to determine that the fauna is divided into two groups: forest species and field species. The forests occur mainly upstream and downstream of the reservoir, while the grasslands are on the central banks. Before the plant, there was a connection between these ends through the riparian forest, which is submerged in the reservoir. Thus, the recovery of degraded areas and the creation of ecological corridors between fragments are important for the maintenance of fauna at a regional level.

"This is the greatest diversity of this group ever found in the world. Puppies at different ages were also recorded and behaviors not yet recorded were described."

MONITORING OF BIRDS AND BATS IN WIND PLANTS

Birds and bats, which represent part of the flying fauna, began to be monitored at the Volta do Rio Wind Power Plant, in Acaraú, in the state of Ceará. On the Parajuru-Beberibe transmission line (connected to the Praias de Parajuru Wind Power Plant), also in Ceará, bird monitoring is being carried out. The idea is to assess the possible impacts of these projects on flying fauna.

At the Volta do Rio Wind Power Plant, monitoring is investigating the composition of bird and bat communities and also whether there are deaths associated with the operation of the wind turbines.

In practice, there is a risk that the blades of wind generators, which rotate with the wind and are the basis for this type of energy generation, could hit birds and bats in flight. The effect of rotation can also cause some type of disturbance to these animals.

Through the studies, it will be possible to assess the need to install an aerial signaling system at the wind farm, to avoid collisions. If this alternative proves to be relevant, the company will seek to establish guidelines for a project on the signaling system.

WIND GENERATORS

They can also be called a wind turbine or wind generation system. It is an electrical generator integrated into the axis of a weather vane. It converts wind energy into electrical energy. Among the impacts they can cause is collisions with birds and bats.

TRANSMISSION LINES (LTS)

In wind farms, transmission lines allow the electrical energy generated by wind turbines to flow to an electrical energy substation.

CURIOSITY

In the case of Praias de Parajuru, the environmental conservation strategy is focused on transmission lines (LT). The Avifauna Monitoring Plan aims to identify the occurrence and dynamics of the bird community along the Parajuru-Beberibe LT.

The fear is that many birds that fly quickly may not see the transmission lines and crash into the cables or cause electrocution.

With monitoring, Cemig intends to analyze the relevance and need for developing measures that help to avoid causing harm to birds.

FLORA

PLANS AND ACTIONS ARE IMPLEMENTED TO COMPENSATE AND RECOVER VEGETATION

Cemig is the largest integrated company in the electrical energy sector in Brazil, with hydroelectric plants, wind farms and photovoltaic plants. In addition, there are almost 570 thousand kilometers of distribution and transmission lines and networks. To make all this potential work, creating the collective benefit of generating and bringing energy to urban centers and remote regions of rural areas, it is inevitable that there will be an impact on vegetation.

Whether it is to build plants or install energy transmission and distribution lines, there are significant changes to the environment such as deforestation and changes in areas of restricted use, such as Permanent Preservation Areas (APP), Lei Reserves, lakes and Conservation Units.

Several actions are implemented by the company to try to compensate for this damage caused by the-

degradation of native vegetation. Among them, the creation of conservation units, the recovery of degraded areas with planting seedlings and soil care, the control of erosion and the vegetation restoration of deforested areas.

During the construction of a hydroelectric plant, for example, it is necessary to remove a large amount of earth from a location in order to build the dam structure. Later, Cemig will work in this degraded area, from where the land was removed, to try to recover it, planting and restoring the vegetation.

One of the Degraded Area Recovery Programs (PRAD) was implemented at HPP Emborcação, in the Triângulo Mineiro. The doctor in Ecology, Yasmine Antonini, who is also a professor at UFOP (Federal University of Ouro Preto), participated in this initiative.



She says that the general objective of this project was to implement experiments using nucleation techniques to accelerate ecological succession and promote the recovery of the impacted area. Overall, the results were very promising. “We found some techniques to be more efficient, others less so,” she commented.

REFORESTATION

Another way of seeking to mitigate the environmental damage caused by projects is forestry compensation. When implementing power distribution and transmission lines, it is necessary to remove vegetation from some land, in a linear manner.

Subsequently, Cemig calculates the hectares that needed to be deforested along the lines where the systems are located. Plant restoration takes place in another location, for example, in an APA (Environmental Protection Area), expanding the preserved part or creating a new one.

EROSIVE FOCUS

In all projects, when intervening on land, there will always be a risk of creating erosion in several locations. With the loss of vegetation cover, land becomes more susceptible to landslides and needs care. In several regions, Cemig restores areas where erosion hotspots have been recorded.

An important Cemig initiative that took place in 2020 was the Project “Development of soil bioengineering techniques for surface drainage and control of linear erosion in transmission and distribution lines”. On that occasion, five large erosions were recovered along the São Gotardo 2 – Três Marias transmission line..

RESERVATIONS

Environmental compensation also occurs through RPPNs (Private Natural Heritage Reserves). These reserves are created in areas acquired by Cemig and become an eternal environmental heritage, monitored by the company.



In them, environmental education actions are promoted involving communities and partnerships with universities to carry out scientific research on flora and fauna.

APP – YOU KNOW WHAT IT IS

It is a Permanent Preservation Area; According to the current Forest Code (Law No. 12,651/12, Art. 3), it is understood as:

“[...] protected area, covered or not by native vegetation, with the environmental function of preserving water resources, the landscape, geological stability and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil and ensure the well-being of human populations; [...]”.

PRODUCTION OF NATIVE SEEDLING AT CEMIG

Cemig maintains the seedling nursery at the Itutinga Environmental Station, which is located between the Itutinga and Camargos hydroelectric plants, in the municipality of Itutinga, in Minas Gerais. The nursery works with native species identified and divided into two groups: Pioneers (PI), which grow quickly and produce fruits that are attractive to fauna; and Climax (CL), light demanding, which are those species of intermediate growth that appear in the last stage of forest succession.

RPPN – UNDERSTAND MORE...

The Private Natural Heritage Reserve is a conservation unit (UC) under private ownership.

It is recorded in perpetuity on the property registration.

Its objective is to conserve biological diversity.

WHY IS IT IMPORTANT?

It contributes to the expansion of protected areas in the country.

It is easily created when compared to other categories of conservation units.

Enables the participation of the private sector in the national conservation effort..

Collaborates to protect the biodiversity of Brazilian biomes.

WHO CAN CREATE RPPN?

Individuals or legal entities, owners of rural or urban properties, with potential for nature conservation.

CAN A COMPANY CREATE AN RPPN?

Yes, the company can create RPPN in a property it owns.

It is a way of incorporating environmental culture, so widespread in today's society, into the corporate environment.

WHAT ACTIVITIES ARE ALLOWED WITHIN THE RPPN?

Scientific research and visitation activities for tourist, recreational and educational purposes, as provided for in the management plan.

Source: Chico Mendes Institute for Biodiversity Conservation (ICMBio)/Federal Government.

“Enables the participation of the private sector in the national conservation effort.”

The production of seedlings takes place through the sowing or cutting process, with the seeds and cuttings being collected in the region surrounding the Environmental Station. After the seeds germinate or the cuttings sprout in greenhouses, they are transferred to tubes and are cultivated until they reach average sizes between 30 cm and 40 cm, depending on the species.

The minimum monthly production (from January to November of each year) is approximately 2,500 seedlings/month of species native to the Cerrado and Atlantic Forest, totaling 22,000 seedlings/year if an average annual loss of 10% is considered.

These seedlings are used for revegetation in planting riparian forests, recovery of degraded areas and to protect springs near Cemig plants.

IN POWER GENERATION

RPPN GALHEIRO IS A FOREST LEGACY FOR THE TRIÂNGULO MINEIRO

To compensate for the impacts on the natural environment caused by the construction of the Nova Ponte Hydroelectric Plant, in the Triângulo Mineiro, the Galheiro RPPN (Private Natural Heritage Reserve) was created in 1995. In this region, the native vegetation is composed of a mosaic of environmental physiognomies,

Discover, in detail, a small portion of the actions that have been developed by Cemig in recent years, in which the seedlings produced are being applied.



such as the Forested Savanna, the Wooded Savanna, the Gallery Forests, among others. It is an area of great biological importance, which holds a plant heritage for the Triângulo Mineiro region and for Brazil.

Currently, this reserve has a specific management plan for RPPNs, published in 2015 by ICM-Bio (Instituto Chico Mendes de Conservação da Biodiversidade) and updated by Cemig in 2022.

Flora survey studies in the Galheiro Private Natural Heritage Reserve have demonstrated a great richness of species in the Cerrado biome and a continuous variation in floristic composition throughout its extension, a very relevant characteristic for the preservation of the region's fauna. In this RPPN, there are more than 1,200 species and 148 families of plants.

Cemig, always focused on exercising socio-environmental responsibility, develops several activities at RPPN Galheiro related to environmental education and encouraging scientific research. Educational signage, with visual impact plates for visitors, selective collection and maintenance of accommodation to receive students and researchers are some of them.

JEQUITINHONHA VALLEY AND WEALTH IN THE FARTURA RESERVE

In the municipality of Capelinha, in the Jequitinhonha Valley, in Minas Gerais, Cemig maintains the RPPN (Private Natural Heritage Reserve) Fartura. The Sustainable Use Conservation Unit was created in 2009 by Ordinance No. 189 of the State Institute of Forests of Minas Gerais (IEF),



consolidating the perpetual allocation of the property as a reserve.

The creation of this unit is linked to the environmental licensing of the Irapé Hydroelectric Plant (Usina Presidente Juscelino Kubitschek), located on the Jequitinhonha River. Located in the Atlantic Forest biome, the RPPN is in a region called ecotone (environmental transition), which is in contact with the Cerrado biome.

According to a survey carried out by the Federal University of Vales do Jequitinhonha and Mucuri, in 2016, the region has 278 species, belonging to 144 genera and 55 botanical families. Among the recorded species, 17 have not yet been identified.

In this RPPN, Cemig also carries out many actions within the Environmental Education Program to raise awareness about the care and conservation of the natural and cultural resources of the conservation unit and its surroundings.

MORE THAN A THOUSAND SPECIES OF FLORA IDENTIFIED IN THE CORONEL DOMICIANO USINA RESERVE

The RPPN (Private Natural Heritage Reserve) Usina Coronel Domiciano is located in the Atlantic Forest biome and is of great importance for the conservation of animal and plant species in Brazil. Created in 2000, through an ordinance

from the IEF (State Forest Institute), this Cemig Sustainable Use Conservation Unit has a management plan.

Regarding flora, at least 1,045 species belonging to 139 families were identified in this RPPN. The reserve is located in the municipalities of Muriaé and Rosário da Limeira, in the Zona da Mata of Minas Gerais. It is crossed by the Fumaça River, on which the PCH (Small Hydroelectric Plant) Coronel Domitiano began operating in 1911.

At RPPN, Cemig develops several activities related to fire protection, environmental education, visitation, informative signage, all developed with a focus on preserving the unit in partnership with the local community.



CURIOSITY

DISCOVER A LITTLE OF THE FLORA FOUND AT THE RPPN USINA CORONEL DOMICIANO

Grapiá (*Apuleia leiocarpa*): is
 → widely used in the timber industry and is therefore threatened with extinction in Brazil.

Ipê-amarelo (*Handroanthus chrysotrichus*): has medical and landscaping importance, as well as being attractive to bees and protected by law in Minas Gerais.

Braúna (*Melanoxylon brauna*):
 → threatened with extinction at national level, has dark wood, whose use is common in musical instruments.

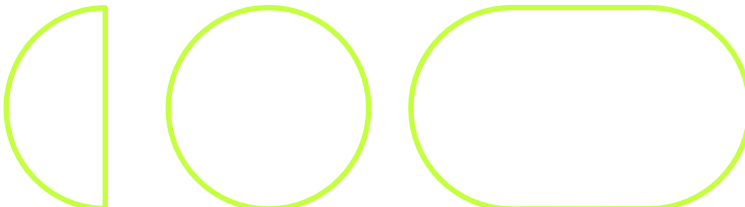
Canela-funcho (*Ocotea odorifera*):
 → used in folk medicine to treat rheumatoid arthritis, skin disorders, gout, and insect bites.

Amarílis (*Hippeastrum punicum*): is a source of potent
 → alkaloids that have analgesic, expectorant, antiviral and anti-inflammatory effects, in addition to being an ornamental plant.



IN EMBORCAÇÃO, PROJECT STUDY STRATEGIES TO ACCELERATE ECOLOGICAL SUCCESSION IN DEGRADED AREAS

For four years, a research project was developed at HPP Emborcação, in the Triângulo Mineiro, which aimed to propose and test recovery techniques for degraded areas, using new technologies and aiming to install ecological succession islands. The strategy is to attract colonizing fauna species



to an area that was degraded at the time of the plant's construction.

The work included the participation of the following entities: UFOP (Federal University of Ouro Preto), UFMG (Federal University of Minas Gerais), UFU (Federal University of Uberlândia), UNB (University of Brasília), Gorceix Foundation and Cemig GT (Cemig Geração e Transmissão S/A).

12 subprojects were developed, related to nucleation techniques such as perches and soil and gall transposition, with studies involving birds, mammals and invertebrates. The study was completed in August 2022, and the strategies considered effective will be continued to recover this degraded area of HPP Emborcação.

As products of this major study, the book Strategies to accelerate ecological succession in degraded areas around the Emborcação HPP: ecological services in favor of environmental restoration and the Technical Manual for Environmental Restoration applied to loan areas were produced. for the construction of dams, with emphasis on the Emborcação HPP.

In Cemig's assessment, the two products bring technical content that will also help in the recovery of other degraded areas of the company, through the use of innovative methodologies. Furthermore,



These techniques can be implemented by other companies in the electricity sector, which contributes to the dissemination of scientific and practical knowledge..

IN IRAPÉ, PLANTING OF 80 THOUSAND NATIVE SEEDLINGS CERRADO AND COMMUNITY INVOLVEMENT IN VARIOUS ACTIONS

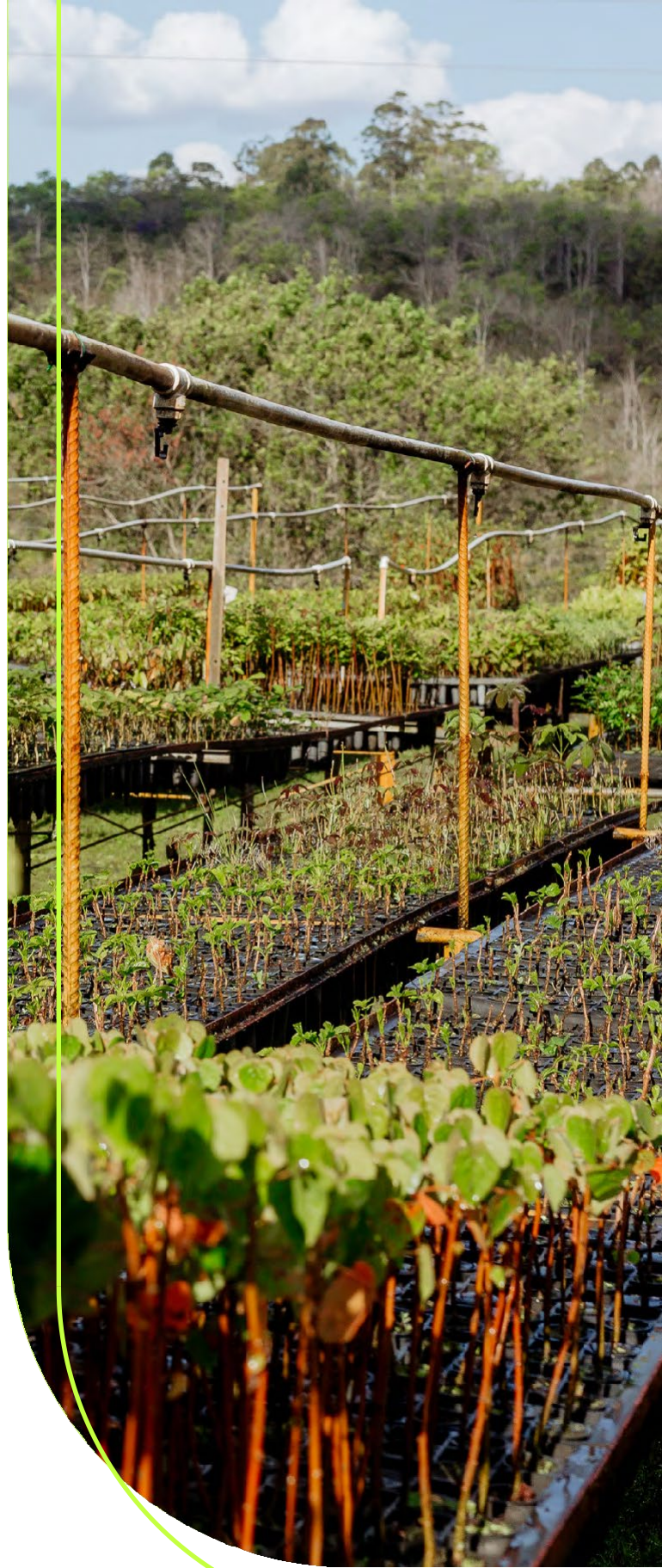
HPP Irapé is located in the northeast of Minas Gerais. It has one of the highest dams in the world, at 208 meters, and is among the most modern plants installed in Brazil.

Ten areas surrounding the Irapé plant are subject to the PRAD (Degraded Areas Recovery Program); these were altered locations at the time of the plant's construction. They began to be recovered at the end of the plant's implementation and are still the target of new interventions to ensure the success of plant restoration.

Cemig planted 80 thousand native Cerrado seedlings in 2018 and 2019 in these areas alone. As Irapé is located in a region with irregular rainfall, long periods of drought make it difficult to establish vegetation, facilitating the emergence of new erosion hotspots during the rainy season. Therefore, there is a need for constant monitoring and interventions in these areas that have undergone recovery.

In addition to the activities already carried out, new proposals were defined involving communication with surrounding residents so that everyone collaborates in maintaining the fences that prevent livestock access to the areas. Maintenance is also being carried out on firebreaks to prevent fires, analysis and technical assessment of soils where there has been low recovery success and optimization of drainage systems, among other measures.

To enhance the recovery of these degraded areas, Cemig has promoted new plantings of species



some will cover areas with exposed soil. This reduces the potential for erosion to emerge. Others will attract animals that, when consuming the fruits, disperse the seeds and also deposit feces that serve as natural fertilizer. As a result, new plants germinate naturally and the soil fauna (edaphic) also promotes the cycling of the earth's nutrients and the establishment of important ecological interactions for the restoration of the environment.

CONTROL AND RECOVERY OF EROSION POSITIONS IN HPP QUEIMADO

UHE Queimado, located in Rio Preto, has been working to manage the erosive sources existing on the banks of the reservoir since its implementation

KNOW MORE...

The problem of erosion is almost always the result of some type of environmental change, which can generate further degradation as it develops. One of the serious problems is the silting of rivers and loss of agricultural area.

Incorrect agricultural practices and indiscriminate deforestation can be identified as the main responsible for the erosion processes.

In rural areas, several factors interact to determine the intensity of the erosion process: rainfall, soil characteristics, size and slope of the slope, types of soil use and management, practices to reduce erosion.

In these cases, reforestation and changes in cultivation systems could significantly alleviate the problem.



Crédito: Projeto Pau-Casearia do Ujapaco

of the plant and currently has an environmental program that monitors these erosions caused by the dynamics of the operation.

The objective is to catalogue, monitor and, in some cases, prevent the progression of erosion. Their recovery is essential to reestablish the balance of the environment and reduce soil loss, which ends up interfering with the quality of the reservoir's water. Every year, the program identifies and maps the erosion features of the areas bordering the UHE Queimado reservoir, which is located on the border between Minas Gerais, Goiás and part of the Federal District.

Cemig seeks to characterize the nature of the processes, especially the situations that arise from the operation of the plant, through fluctuations in the water level and waves. Informative materials are prepared about the actions carried out in the program to be used in environmental education campaigns and activities integrated with the local community.

Currently, more than 30 erosion features are monitored along the reservoir margin, 21 of which were initially classified as high risk, and Cemig has been working and succeeding in changing this classification through recovery actions.

Among the measures is isolation through fences, which prevents the passage

sagem of people and animals. The sowing and planting of species native to the Cerrado are also carried out, reducing exposed soil and increasing water infiltration rates, which reduces the fragility of the land. With this program, Cemig has managed to control and stabilize some erosive features, positively affecting the banks of the lake.

REFORESTATION OF THE BANKS OF THE ROSAL HPP RESERVOIR

The Rosal Hydroelectric Power Plant (UHE) is located on the Itabapoana River. The reservoir covers around 170 hectares and covers the rural areas of the municipalities of Guaçuí, in Espírito Santo, and Bom Jesus do Itabapoana, in Rio de Janeiro. Access to HPP Rosal, from the city of Guaçuí, is via a paved highway. Installation works began in 1996 and were completed in 1999.

Around the reservoirs, the vegetation makes up the riparian forest, a plant formation that occurs along the watercourses, which is extremely important for protecting these aquatic environments.

These riparian forests prevent erosion, filter nutrients and pesticides, absorb solar radiation and provide shelter and food for the local aquatic and terrestrial fauna. The Rosal HPP reservoir is located in the biome

Atlantic Forest, and the riparian forest corresponds to the APP area (Permanent Preservation Area).

At UHE Rosal, procedures to mitigate impacts on vegetation, when forming the reservoir and recomposing the new APP, are employed through the Reservoir Banks Reforestation Program.

Currently, the program is in its final phase, as seedlings have already been planted in all 43.02 hectares that comprise the reservoir's APP. Cemig is now carrying out maintenance work on this recovery, which includes mowing the grasses and crowning the seedlings to prevent competition between plants, maintaining the firebreak around the APP to reduce the risk of fires, ant and termite control and top dressing.

ON TRANSMISSION POWER

FOREST RECOVERY OF CÓRREGO DOS PINTOS AND MINA DA LOCA

In the Triângulo Mineiro region, the Triângulo Regional Transmission System, from Cemig GT, operates, consisting of five substations and five transmission lines. As a compensatory measure for the intervention in a permanent preservation area



(APP) for the construction of this system, Cemig GT had to develop and execute a forest recovery project in a river basin, preferably of local importance for supplying public.

The riparian forest areas of the Córrego dos Pintos and Mina da Loca springs, which are located in the Borá stream sub-basin, were then chosen. This source directly contributes to the water supply of the population of the city of Sacramento, in Minas Gerais.

In the region, the main factor of environmental degradation related to springs

centes is agricultural activity. In this way, the areas were fenced to isolate water resources, and more than 26 km of fence were built throughout the project. After the enclosure, approximately 8,000 seedlings of species native to the region were planted.

The forest recovery project is in the monitoring phase and it has already been possible to observe an increase in vegetation in riparian forests, as well as water surges in the recovery areas.

IN POWER DISTRIBUTION

COMPENSATIONS FOR SUPPRESSION OF NATIVE VEGETATION

Cemig Distribuição carries out, in Minas Gerais, two types of compensation for the suppression of native vegetation:

- Land Regularization: allocation, through donation to the Public Authorities, of an area located within a Public Domain Conservation Unit;
- Forest Recomposition: planting of native species similar to those of suppressed phytophysognomy in degraded areas.

FOREST RECOMPOSITION

PAU FURADO STATE PARK

One of the intervention compensation projects in the Atlantic Forest, in a medium stage of natural regeneration, is the PECF (Executive Forest Compensation Project) Pau Furado 1, located inside the Pau Furado State Park. It is located in the Triângulo Mineiro, a region characterized by the presence of species typical of the transition between Cerrado and Atlantic Forest. This is a project to recover an area of 16.5 hectares, through the planting of native species that already occur in the park region.



The specific point where forest compensation occurred is a sector of the park that presents a historical risk of fires, especially due to its proximity to a highway. The last fire recorded in this area was in 2020, and the vegetation is in the initial stage of regeneration. The execution of the project by Cemig also began in 2020, in November.

More than 18 thousand seedlings were planted in Pau Furado State Park. Among the native species are sucupira-branca, quaresmeira, ingá, aroeira, angico, copaíba and embaúba. Part of the Cemig project area borders a farm where cattle are present. Therefore, to ensure the best development of the planted vegetation, protecting and preventing the entry of animals and strangers, maintenance was carried out on the existing fence at the site, with the replacement of damaged stakes and broken wires, among other measures.

Reforestation in the Conservation Unit is being carried out as environmental -

compensation for the construction of electricity distribution lines that pass through the municipalities of Patos de Minas and Varão de Minas.

With all the seedlings already planted, Cemig maintains care with the plantings through maintenance of fences, firebreaks, mowing of grasses, control of ants and termites, and top dressing.

PARACATU STATE PARK

Using the same method of recovering areas through the planting of native species, the PTRF (Technical Project for the Reconstitution of Flora) Paracatu allocated an area of 40.55 hectares for environmental compensation for intervention in APP and suppression of protected species of flora, located in the Paracatu State Park, which is in the municipality of Paracatu, in the northwest of Minas Gerais.

The compensatory measure occurred due to the implementation of electrical energy distribution lines in municipalities in different regions of the state

“...40.55 hectares for environmental compensation for intervention in APP and suppression of protected species of flora, located in Paracatu State Park...”

from Minas Gerais, such as Paracatu, Grão Mogol, Jequitibá, Jaboticatubas, Vespasiano, Santa Luzia, Ouro Preto, Francisco Sá, Monte Azul and Espinosa.

Through the planting of more than 45 thousand seedlings of native species, an increase in the connection between the fragments present around the area is expected. Also included in the project objectives are geological stability, conservation of biodiversity, the flow of fauna and flora, soil protection, in addition to maintaining and expanding the beauty of the landscape in the region. With this, Cemig hopes to contribute to stimulating sustainable development and ensuring the well-being of human populations.

In the area where the project was implemented, the predominant vegetation cover was formed by brachiaria and andropogon grass. Tree species found in the Cerrado biome were also observed in isolation, which will be incorporated into the new forest formation under development.

After planting species such as cagaita, barbatimão, cedar, araticum-do-cerrado, fruit-do-conde, jacarandá, different ipês and pequi, the seedlings have been receiving cultural treatment to ensure their development and growth. ment (mowing, crowning, fertilization).

LAND REGULARIZATION

MATA DO CEDRO II ECOLOGICAL STATION

The Mata do Cedro Ecological Station, located in the south of Minas Gerais, is an important Brazilian area for the protection and preservation of the Atlantic Forest biome. It is located in the municipality of Carmópolis de Minas, and is rich in biodiversity of flora and fauna, with a large number of springs and streams that are essential for the region. It has a diversity of tree species, especially due to the depth of the soil and its water retention capacity.



The need for Cemig's environmental compensation through land regularization is justified by the interventions that have taken place and are planned for the implementation of seven distribution lines. Some of them include the municipalities of Nova Lima, Santa Luzia, Vespasiano, Patos de Minas, Ouro Preto, Esmeraldas and Sete Lagoas. Intervention and compensation in native vegetation of the Atlantic Forest biome is regulated by Federal Law No. 11,428/2006 and Federal Decree No. 6,660/2008; in Minas Gerais, by IEF Ordinance No. 30/2015, State Decree No. 47,749/2019 and SEMAD/IEF Joint Resolution No. 3,102/2021.

To comply with current legislation, through the PECF (Executive Forest Compensation Project) Mata do Cedro II, Cemig selected three areas of a property called Fazenda Água Preta. They total just over 80 hectares, for land regularization through donation to the public authorities, within the Integral Protection Conservation Unit called Ecological Station (ESEC) Mata do Cedro. The area is located in the São Francisco River basin, in the Pará River sub-basin, and is influenced by agricultural activities in its surroundings.

This area has already been donated by Cemig to the State Forestry Institute – IEF, and will contribute to the conservation of an important remnant of the Atlantic Forest. The forest on site is

in a medium and advanced stage of natural regeneration, an uncommon condition for portions of the biome today. Furthermore, studies show that this forest is home to a great wealth of fauna, especially the lesser anteater (*Tamandua tetradactyla*), guigó (*Callicebus nigrifrons*), capuchin monkey (*Sapajus* sp.), coati (*Nasua nasua*), neotropical otter (*Lontra longicaudis*), puma (*Puma concolor*) and giant anteater (*Myrmecophaga tridactyla*).

SERRA DO PAPAGAIO STATE PARK

The PECF (Executive Forest Compensation Project) Serra do Papagaio I was proposed for compensation due to intervention in the Atlantic Forest in a medium stage of natural regeneration for the construction of five electric power distribution lines in the south and southeast of Minas Gerais passing through cities such as Boa Esperança, São Lourenço, Jacutinga, among others.

Aiming at land regularization, Cemig is donating an area called Fazenda Pedra

do Chapéu to the public authorities. There are 49 hectares located within the Integral Protection Conservation Unit of the Serra do Papagaio State Park. This park is located in Serra da Mantiqueira and houses important remnants of the Atlantic Forest, still with a high degree of conservation. It has mixed formations of fields, forests and areas of araucaria.

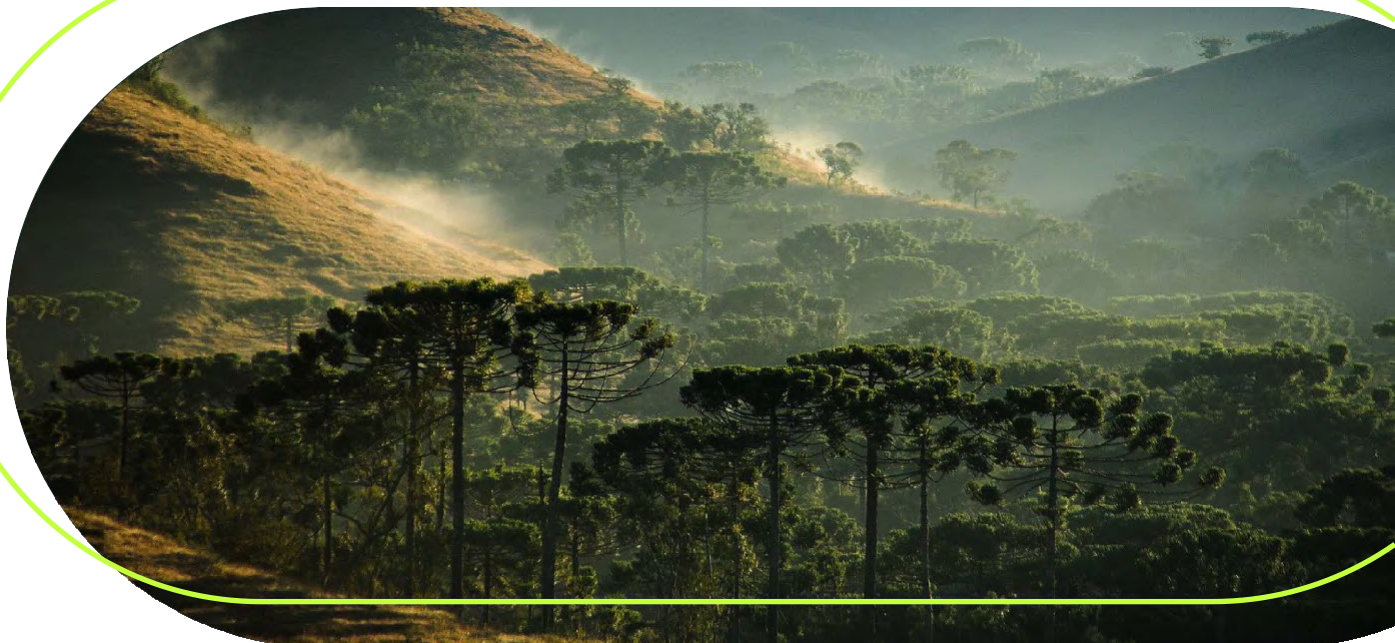
The flora of Serra do Papagaio is extremely rich. There are botanical collections that indicate the occurrence of more than 500 plant species in the park area in the municipality of Baependi alone. In the conservation unit, the sources of the main rivers forming the Rio Grande basin, responsible for supplying large urban centers in the south of Minas Gerais, are concentrated.



There is also an important geographic connection with the northern portion of the Itatiaia National Park. In this way, more effective protection of flora

and fauna is created by the continuous, legally preserved mountain range.

Serra do Papagaio State Park also constitutes an important reserve for several species of mammals, birds and amphibians. These animals live and reproduce thanks to the richness of environments and shelters in this region. Among the species, the southern muriqui, the maned wolf, the purple-breasted parrot and the puma stand out.

Around this unit, there is a predominance of occupation by agricultural activities, pastures and forestry. However, APPs are generally preserved and form important ecological corridors. The area that Cemig allocated for compensation is made up of native vegetation in a medium to advanced stage of regeneration, which contributes to the expansion of these corridors and environments conducive to the conservation of the region's rich fauna and flora.





**SOCIO-EDUCATIONAL ACTIVITIES
GIVE PEOPLE A VOICE
THE COVERAGE AREA OF THE
PROJECTS**

Responsible socio-environmental action is one of the most important values that Cemig seeks to put into practice in its actions. The company recognizes that its business generates direct and indirect impacts on various communities and believes that the success of its ventures and the quality of its products depend on relationships with different categories of interested parties.

In its management of risks and opportunities and when exercising corporate governance, Cemig is attentive to the demands of the population surrounding hydroelectric projects, whether around reservoirs, transmission lines or areas of energy distribution.

Therefore, in the company's internal policies and guidelines, people who live, work in the areas covered by the plants or work in public authorities, have a voice to express themselves and communicate demands and proposals.

In practice, this socio-environmental action, also called socio-educational, encompasses social activities that have an environmental bias and an educational bias. In general, there are several programs, projects and actions that deal with the entrepreneur's relationship with the community.

The rapprochement between the company and the population opens up space for knowledge of local demands and support in solving them, such as the need for care in areas with unpreserved springs. Residents find Cemig an open channel to support them in various situations linked to environmental issues, such as training, supplementary education for children and adolescents, care for rural producers with the soil, among many other possibilities.

The Science and Biology teacher, Lourdimila Pereira dos Santos Silva, has already attended some Cemig lectures

“Cemig's Communication Policy with the Community determines that communication and engagement with interested parties are the main route of corporate social responsibility.”

on the environment, as well as the planting of native seedlings and a theater performance linked to the theme. A resident of the Palmital de Minas district, in Cabeceira Grande, she considers these actions very important, especially with children. "Children reproduce at home what they learn at school," she says. The municipality of Cabeceira Grande is located around the Queimado Hydroelectric Power Plant (UHE).

During socio-environmental program actions, Cemig also provides the community with relevant information about legislation, the need to preserve the environment, care for water, flora and fauna.

The company presents plans and other actions developed for the recovery and conservation of the reservoirs surroundings and explains the entire process for generating energy, as well as the impacts caused and the measures taken to reduce or compensate for them. Cemig is aware of its role in reducing impacts caused to the environment and the essential need to involve the population to support the various actions.

In this way, the company reiterates that the strategic positioning in relation to local communities in the areas in which it operates includes social, environmental and economic



aspects to be considered in all of the company's ventures. Cemig's Communication Policy with the Community determines that communication and engagement with interested parties are the main route of corporate social responsibility.



ENVIRONMENTAL EDUCATION, COMMUNICATION AND RELATIONSHIP WITH THE COMMUNITY AT HPP QUEIMADO

The Queimado HPP, which is located in Rio Preto, between two municipalities in Minas Gerais (Unaí and Cabeceira Grande), two municipalities in Goiás (Cristalina and Formosa) and the Federal District, is an example of the complexity and effort involved in implementing comprehensive and large-scale socio-educational activities.

In just three years, from 2019 to 2021, more than 50 different actions were carried out in communities, involving more than 1,000 people.

At this plant, two important programs are managed (environmental education and social communication) and an integrated relationship plan with the surrounding community. Each of them has dozens of activities that take place annually.

Below, find out a little about these three socio-educational programs developed at UHE Queimado:

1 - ENVIRONMENTAL EDUCATION PROGRAM

Environmental education is an important instrument for the implementation of any undertaking that, in some way, affects the environment and the population's quality of life.

This determination is provided for in the National Environmental Education Policy (Law 9,795/99) and in Decree 4,281/02 that regulates it.

At UHE Queimado, one of the purposes of promoting environmental education is to prepare the local community to be environmental caretakers in relation to the changes generated by the inclusion of the hydroelectric plant in the regional scenario. The actions that are developed in the region involve theoretical content and practices aimed at raising awareness among the community.

In this way, the program is divided into projects that cover different audiences and contents to develop attitudes that seek individual and collective participation in the management of sustainable use and conservation of environmental resources.

SCHOOL ENVIRONMENTAL EDUCATION PROJECT: Aimed at EDUCATIONAL INSTITUTIONS, COVERING STUDENTS AND TEACHERS IN LECTURES AND EDUCATIONAL ACTIONS.

- In 2019, 857 visitors learned about the operation of UHE Queimado and its environmental activities;
- 60 yellow ipê and purple ipê seedlings were planted in Unaí (MG) with students and teachers, and another 100 seedlings donated to the city hall in 2021;
- Considering the years 2019 to 2021, more than 1,470 students and teachers participated in activities involving lectures, plays, visits to parks and the plant, dynamics, planting seedlings and development of sustainable projects.



SOCIO-ENVIRONMENTAL DEVELOPMENT AND CITIZENSHIP

PROJECT: SERVES CIVIL ENGAGED IN SUSTAINABLE PROJECTS AND ALLIED TO CONSERVATION.

- In 2021, 1,500 seedlings of native Cerrado species were donated and/or planted;
- On average, 400 booklets/folders with environmental themes produced by the plant are distributed every year;
- Considering the years 2019 to 2021, the lectures, visits to the plant, planting of seedlings, training and itinerant plant had 260 participants.



RURAL PRODUCER SUPPORT PROJECT: INVOLVES RURAL PRODUCERS IN IMPROVING LAND USE PRACTICES AND CONSERVING NATURAL RESOURCES.

- In 2020, 600 seedlings were donated by UHE Queimado and planted by rural producers who are members of the Bom Sucesso Community Association, in Cabeceira Grande (MG);
- At least six training sessions are held with rural producers every year on various topics such as preservation of springs, fire prevention, land use, sustainable agricultural practices, importance of water, erosion processes;
- Considering the years 2019 to 2021, open-air market activities with viola circles, training, visits to the plant, execution of sustainable projects and planting of seedlings involved 93 rural producers in the region.



ENVIRONMENTAL EDUCATION PROGRAM FOR WORKERS: SHOWS PLANT WORKERS THE IMPORTANCE OF THEIR ROLE AS A DISSEMINATOR OF GOOD INDIVIDUAL AND COLLECTIVE ENVIRONMENTAL PRACTICES.

- The 1st Ecological Walk at UHE Queimado was held in Unaí/MG in 2019, with 25 workers from all sectors of the hydroelectric plant and some of their families;
- Three online and two in-person trainings were carried out in 2022 with the themes: environmental licensing, granting, vegetation suppression, forest fires and spring conservation;
- An average of 22 employees from the plant participated in PEAT activities from 2019 to 2021, involving lectures, workshops, waste reduction campaigns and campaigns to value the environment.

Among the instruments used for these activities are environmental booklets, folders and inserts produced by UHE Queimado. Some present, for example, the management of solid waste, the otters present in the region, erosion and soil care, the conservation of springs, the swifts that build their nests in the waterfalls and sustainable agricultural practices. Find out more about these instruments by visiting the UHE Queimado website (<https://uhequeimado.com.br/web/meio-ambiente2/>)

2 – INTEGRATED RELATIONSHIP PLAN WITH ASSETS COMMUNITIES SURROUNDING THE HYDROELECTRIC PLANT (PIRCEH)

The Integrated Relationship Plan with Communities Surrounding Hydroelectric Power Plants (PIRCEH) at UHE Queimado aims to encourage co-responsibility and the importance of empowering communities in environmental issues. It also seeks to better publicize the plant's role among the population and expand interaction between the parties.

Within the Integrated Plan, different actions and the creation of social entities are envisaged. Get to know some of them:



INTEGRATED RELATIONSHIP COMMITTEE WITH COMMUNITIES SURROUNDING THE QUEIMADO HPP (CIRCEHQ)

It is the main systematizing means for strengthening the plant's relationship with communities, developing means of control, monitoring, evaluation of socio-environmental, communication and relationship actions.

The Committee was created in 2017, composed of representatives from the plant and its objective is to evaluate all requests from the community, including, for example, donation of seedlings, support with lectures, sponsorships, training, etc. Between 2019 and 2021, 22 demands were received from local residents.

COMMUNITY ADVISORY COUNCIL

Seeks the involvement of community entities and/or institutions from municipalities in the plant's direct

influence area to form Community Councils. Within the councils, projects and ideas that promote the improvement of environmental aspects of municipalities are discussed, such as the issue of garbage, care of springs and environmental awareness.

Two councils are already operating: the Municipal Community Council of Palmital de Minas and Cabeceira Grande, which has six participants on average, and the Unaí Community Advisory Council, with seven members.

In the opinion of retired Rubens de Oliveira Silva, resident of Palmital de Minas and member of the Community Advisory Council, socio-educational actions are extremely important for this region, where the plant is located. "The actions are still beginning because of the pandemic. For me, the main importance is the lake," he commented.



COMMUNITY TRAINING PROGRAM FOR PROJECTS SOCIO-ENVIRONMENTAL

The objective of this program is to train the community and local leaders, encouraging leadership in the design and implementation of sustainable socio-environmental projects capable of promoting change..

At least 29 people have already received training in the years 2019 to 2021, including students from different classes at Factu (Faculty of Sciences and Technologies of Unaí), Unimontes (State University of Montes Claros) and UFVJM (University Federal dos Vales do Jequitinhonha and Mucuri) both universities with campuses in Unaí, members of the Recicla Unaí Association (AREUNA), public administration collaborators, among others.

INCENTIVE PROGRAM FOR THE PRODUCTION OF SUSTAINABLE PROJECTS

It encourages institutions and community leaders in the region to produce socio-environmental projects that are sustainable and capable of managing changes for local and regional development, according to the knowledge acquired in the Training Program offered by the plant.

As an example, we cite the project “Environmental Education at Rio Preto Waterfalls” prepared by Unimontes students,

which promoted the removal of trash and planting of seedlings around the Rio Preto, which passes through the city of Unaí. The project had support from several institutions; eight dumpsters of rubbish and construction debris were removed from around the waterfalls, three bins donated by the plant were installed, as well as warning signs for bathers.

Two other projects designed by local residents were supported by the plant, called “My Square, My Life” and “Afforestation and Environmental Education Project”. The first of these, with the support of Unaí city hall, promoted the revitalization of an important square in the municipality, with improvements in gardening, the insertion of recycling bins, renovations of benches and the installation of gym equipment. The second project, which

“...eight dumpsters of garbage and construction debris were removed around the waterfalls, three garbage bins donated by the plant were installed, as well as warning signs for bathers”.



could not be carried out due to the pandemic, it included educational activities with students from Unimontes, Campus Unaí, as well as the installation of bins to collect recyclable materials.

ENVIRONMENTAL AGENTS TRAINING PROGRAM

The training of environmental agents around the Queimado HPP reservoir helps residents to identify and monitor the environmental impacts that exist in the place where they live and to act to correct the problems.

Carried out annually through training of interested parties, this Program clarifies important aspects about erosion, soil and water pollution, hazardous and non-hazardous waste, illegal fishing and hunting, among others, and informs the bodies involved in complaints and risk control. At least 10 residents around the reservoir were trained between 2019 and 2021, considering the difficulties imposed by the pandemic.

3 - SOCIAL COMMUNICATION PROGRAM

This initiative's main objective is to create a process of communication and interaction between UHE Queimado and the communities surrounding the project. For this purpose, the plant has channels:

Suggestion boxes

→ These boxes are installed in three strategic locations in the surrounding municipalities and are widely accessible to the communities involved. Through them, it is possible to receive questions, doubts, complaints and suggestions from the population.

0800 line and institutional email

→ The demands of the community directly affected by the project can be reported by calling 0800 881 0006 or by email at uhe.queimado@consorciocemigceb.com.br.

UHE Queimado website

- It is an important tool for publicizing the plant's actions and expanding contact with the directly affected community. At www.uhequeimado.com.br, it is possible to obtain general information about the hydroelectric plant, as well as access to texts and photos of the environmental programs and actions developed by the enterprise.
- A specific space is dedicated to news, giving the community feedback on the support given in many socio-environmental activities developed over the years.

Furthermore, the plant produces and distributes graphic materials to expand communication with communities located around the reservoir:

Informativo da UHE Queimado

- Produced every six months, it provides relevant information on the plant's environmental actions, curiosities and publicizes the work carried out in partnership with the population. All information is available on the UHE Queimado website for *download* (<https://uhequeimado.com.br/web/comunicacao-social/>).

Fôlder institucional UHE Queimado

- The folder contains information about the plant, the company's



environmental programs and communication channels. It is available on the UHE Queimado website for download (<https://uhequeimado.com.br/web/comunicacao-social/>).

Even with the pandemic, in 2021, 400 copies of the UHE Queimado Newsletter were made available, digitally or physically, with 58 contacts received through official channels (e-mail, form, 0800 line), and 730 graphic materials (folders and booklets) were distributed.

- PROJECTS

Two projects are planned in the Queimado UHE Social Communication Program. One of them is Institutional Articulation, which strengthens contact with representatives of community entities and/or public institutions, such as councils, unions and associations linked to the areas of environment and education, as well as institutional partners. - tutional, public and private.

The other project is Security and Alert, which seeks to expand communication with interested parties regarding the levels of the Rio Preto downstream of UHE Queimado, and the plant's possible contribution to alleviating major floods on the river.

POPULATION PARTICIPATES IN CONSTRUCTION FROM PACUERA (ENVIRONMENTAL PLAN FOR CONSERVATION AND USE OF THE ARTIFICIAL RESERVOIR SURROUNDINGS) AT THE EMBORÇAÇÃO PLANT

At the end of the 1970s, in the Triângulo Mineiro region, where the municipality of Araguari is located, the Emborcação HPP was implemented, which generates 1,192 megawatts

of power, installed through its four generating units.

Over the years, the large lake formed at this plant developed its economic, tourist, environmental and leisure potential for the population.

As stipulated by legislation, Cemig created the Pacuera with the objective of regulating the conservation, recovery, use and occupation of the reservoir and its surroundings, meeting the needs of the hydroelectric project and the community.

Pacuera seeks to reconcile land uses (economic activities, residences, degraded areas) in the surrounding area with the reservoir's operating standards and with the recovery and conservation of permanent preservation areas (APPs).



In Emborcação, this plan covers parcels of land in the 11 municipalities in the area covered by the reservoir, located on the Paranaíba River, on the border between the states of Minas Gerais and Goiás.

The main beneficiaries of this plan are municipal public administrators, land owners and people who live in the region.

In the months of April and May 2022, Cemig promoted seven events, divided between community workshops and public consultations to seek the population's participation in the suggestions brought by the Plan.

In total, more than 300 people participated in the events. In September 2022, after gathering all the questions raised by interested parties, Ibama (Brazilian Institute of the Environment and Renewable Natural Resources) approved the Pacuera de Emborcação document.

With Pacuera approved, the implementation of the Participatory Management Program for the surroundings of the reservoir will soon be carried out. This program aims to promote

greater involvement of communities in local socio-environmental programs and encourage their social organization, acting in the correct management of the zoning proposed in Pacuera. Find out more at: www.cemig.com.br/pacuera.

PARTICIPATORY MANAGEMENT INVOLVES RESIDENTS OF THE PARAÚNA REGION

The almost century-old CGH (Hydroelectric Generating Plant) Paraúna began construction in 1923 and began operating in 1927, on the Paraúna River, a tributary of the Rio das Velhas, in Minas Gerais.

CGH is located in the municipalities of Gouveia and Santana de Pirapama. As in most artificial reservoirs, Pacuera de Paraúna proposed the implementation of the Participatory Management Program.

The purpose of this program is to guarantee the consultative participation of public authorities, organized civil society, other water users and the enterprise itself in the management of the surroundings of the CGH Paraúna reservoir.

“This program aims to promote greater involvement of communities in local socio-environmental programs and encourage their social organization...”



Since 2021, when the Participatory Management Committee was formed, communication, training and involvement actions for surrounding communities have been ongoing; These activities can also be applied in an integrated manner with other programs already carried out at the plant.

In this sense, the program encourages the co-participation of all agents involved in preserving the surroundings of the reservoir, with action in line with the planning and zoning proposals described in Pacuera, the promotion of debate on issues related to water resources and the articulation the performance of the intervening entities, among others.

CGH PARAÚNA

FIND OUT A LITTLE MORE ABOUT THIS HYDROELECTRIC POWER

- Built on the Paraúna River
- Location: between the municipalities of Gouveia and Santana do Pirapama, MG
- Beginning of construction: 1923
- Start of operation: 1927
- Dam height: 11 meters
- Installed power: 4.28 megawatts
- Generating units: 3

CIVIL SOCIETY, PUBLIC AUTHORITY AND CEMIG TOGETHER FOR THE PRESERVATION OF THE SURROUNDINGS OF THE RESERVOIR FROM PCH POÇO FUNDO

The PCH (Small Hydroelectric Power Plant) Poço Fundo is built between the municipalities of Poço Fundo and Campestre, in the south of Minas Gerais, on the Rio Machado, a tributary of the Rio Verde.

In 2019, after approval of Pacuera, community mobilization began to implement the Participatory Management Program for this hydroelectric plant.

Soon after, upon invitation to interested parties, the Participatory Management Committee was formed. Participation is voluntary, and there was a participatory agreement on the terms of the internal regulations.

With the operation of the committee, Cemig seeks to develop the population's sensitivity in relation to the socio-environmental zoning of the reservoir's surroundings and make them aware of what precautions are necessary for the harmonious and beneficial coexistence of communities with the reservoir in question.

It is characterized by extremely serious work, with the involvement of the community in meetings, in which the zoning guidelines suggested in Pacuera are discussed, topics of interest for the development of activities and articulation of the activities of the entities are discussed. Stakeholders, with records of proposed actions in minutes. The executions and effectiveness of the actions are closely monitored by the Committee members.

The population has actively participated in these meetings, and it is important that the involvement of representatives from the municipalities of Campestre and Poço Fundo, the IEF (State Institute of Forests), the Hydrographic Basin Committee, among other partners, together with the energy company, always be



maintained and improved. Thus, it is possible to continue achieving the general objective of this committee, which is to encourage the participation of communities surrounding the reservoir in socio-environmental projects and encourage social organization.

FIRE PREVENTION

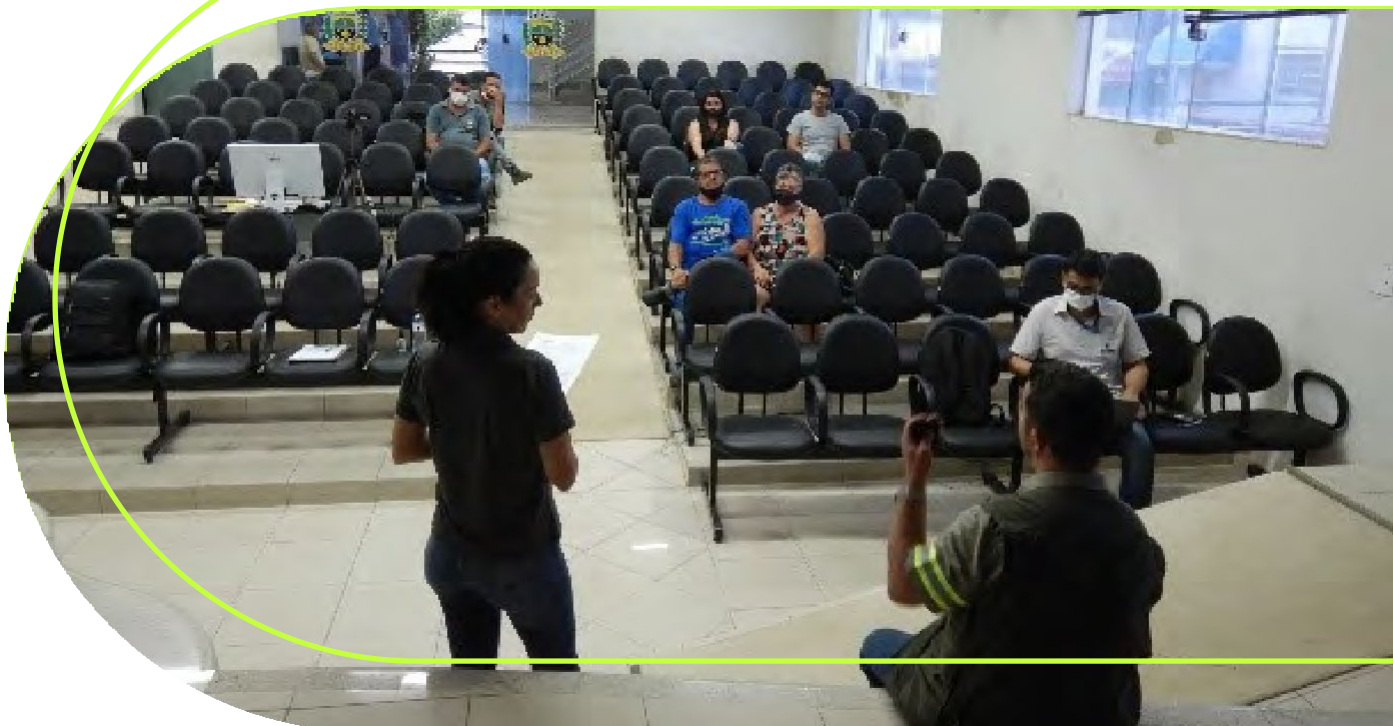
Among the activities defined in the Committee meetings, Cemig sent the “Manual for Preventing and Combating Forest Fires” to the Municipal Government of Poço Fundo, available on the Cemig website (<https://www.cemig.com.br/usina-do-conhecimento/cemig-lanca-manual-de-prevencao-e-combate-de-incendios-florestais/>). The material was sent to be made available on the local municipal management website. The Steering Committee also decided to send the physical version of the

manual to the Municipal Environmental Secretariats of the municipalities of Poço Fundo and Campestre.

PCH POÇO FUNDO

FIND OUT A LITTLE MORE ABOUT THIS SMALL HYDROELECTRIC

- Built on the Machado River
- Location: between the municipalities of Poço Fundo and Campestre, MG
- Start of construction: 1945
- Start of operations: 1949
- Dam height: 6 meters
- Installed power: 9.16 megawatts
- Generating units: 3



CEMIG