



# SCIENCE FOR



## SUSTAINABILITY:



BIODIVERSITY  
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MINISTRY OF  
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PÁTRIA AMADA  
**BRASIL**  
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## 8.2.2. TRAINING IN GASTRONOMY AND IT

Through existing ST&I structures in the Amazon region, training courses in topics/ areas considered strategic for the local population are offered.

- » **EXECUTING BODIES:** Natividade Prefecture (Tocantins).

The “Demonstration unit of social and sustainable technologies in a riverside community in the Amazon: access to water, sewage treatment, access to clean energy and digital inclusion” project is an example of the Social Innovation initiative. This project is implemented by IDSM, which created a project for the use of rainwater using solar energy, sewage treatment, and installation of toilets in schools and community houses.

### 8.1.3. Forest Management

The Mamirauá Institute maintains a series of initiatives that apply science, technology and innovation on the conservation and sustainable use of the Amazon's biodiversity.

- » **EXECUTING BODIES:** Mamirauá Sustainable Development Institute.
- » **PARTNERING ENTITIES:** The Mamirauá Institute has partnerships with several organizations and institutions, including: BNDES, Fishermen Colonies of Alvarães, Tefé and Maraã, CNPq, FINEP, Amazonas State Research Support Fund, Amazon Working Group, ICMBio, INPA, INPE, etc.

## 8.2. SCIENTIFIC EDUCATION

The Scientific Training initiative gathers projects aimed at science education for young people, students and teachers. These projects seek to spark the interest of young people in science and help train teachers.

### 8.2.1. SCIENCE AT SCHOOL PROGRAM

Projects aimed at students and teachers from public schools in the Amazon, such as the “Scientific Teacher Training” and “Traveling Amazon” projects.

- » **EXECUTING BODIES:** Federal University of Amazonas (UFAM) and State University of Amazonas (UEA).

## 8.1. SOCIAL TECHNOLOGY

The Social Technology initiative comprises projects that seek, using techniques or processes, for example, developed in interaction with the local population, to contribute to the sustainable development of the Amazon and to improve the quality of life of the communities that inhabit that territory.

Therefore, MCTI supports the Sustainable Social Technologies for the Amazon Program – 2030 Agenda. The general objective of the Program is to strengthen the articulation between Scientific and Technological Institutions associated with the Ministry (INPA, MPEG, IDSM) and between the member institutions of the Western Amazon NIT Network (AMOCI), headquartered at the National Institute for Research in the Amazon (INPA), and the Oriental Amazon NIT Arrangement (REDENAMOR), headquartered at the Emílio Goeldi Museum of Pará (MPEG). Such institutions are reference in innovation management and in the development and application/reapplication of solutions guided by the concept of social technology in the Amazon Region.

### 8.1.1. BAILIQUE

Bailique is an archipelago of 12 islands, comprising approximately 51 communities. The Bailique project's main objective is to train young people in the region to contribute to social inclusion and sustainable development of the local economy.

- » **EXECUTING BODIES:** Federal University of Rio Grande (FURG).
- » **COLLABORATING ORGANIZATIONS:** GTA Network – Amazon Working Group; Association of Traditional Communities of Bailique.

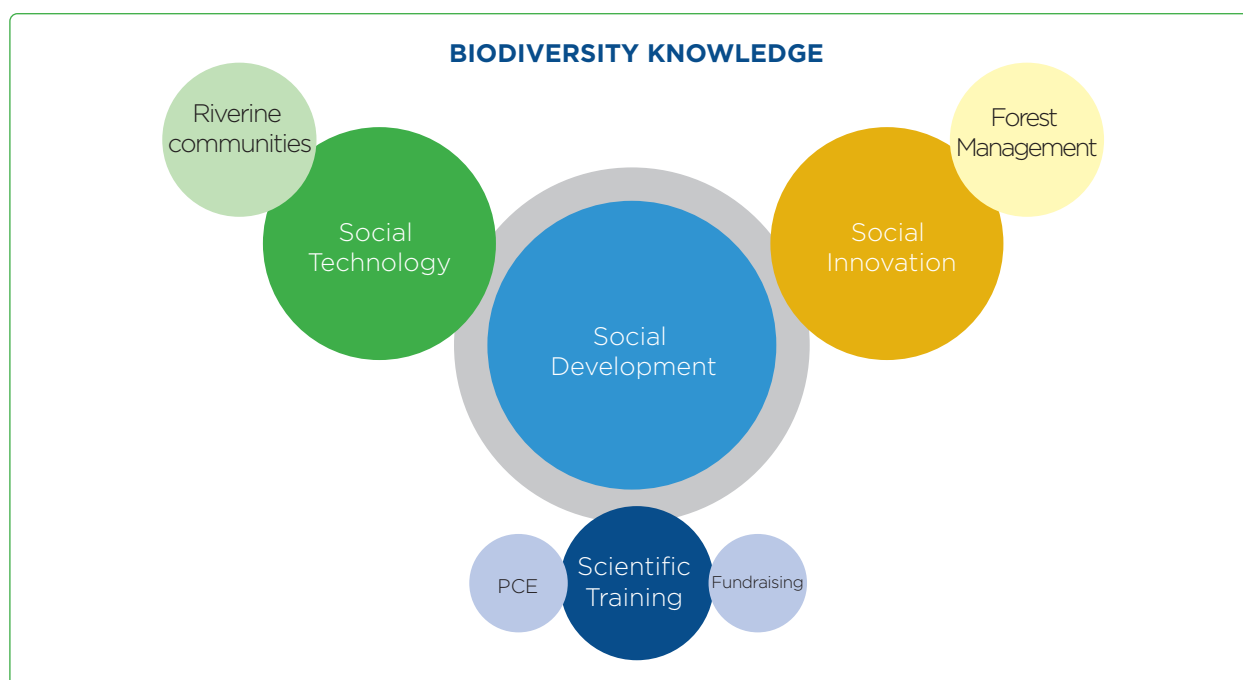
### 8.1.2. SOCIAL INNOVATION

The Social Innovation initiative consists of formulating projects aimed at implementing innovative, creative processes that contribute to the sustainable development of the Amazon.



## 8 . SOCIAL DEVELOPMENT

Social development consists of planning the sustainable development of the Amazon considering riverside populations, indigenous peoples and farmers in general. Therefore, the ST&I policies formulated by MCTI cover themes such as education, health, work, housing, among others.





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Environment (SEMA/AM); Federal University of Pará (UFPA); Fluminense Federal University (UFF); Brazilian Micro and Small Business Support Service (Sebrae); Forest and Agricultural Management and Certification Institute (IMAFLOA); and the Federation of Managers of Pirarucu in Mamirauá (FEMAPAM).



This experimental floating unit will be built to meet sanitary requirements and guarantee the health of the fish produced, verified by the State Inspection Service (SEI). In addition, it will bring more comfort and agility to those involved in the pre-processing of fish, with adequate facilities for this type of work. Another highlight will be its construction, done mostly with materials obtained in the region, reducing its production cost and facilitating the vessel's maintenance. It should be noted that the floating vessel will use photovoltaic energy, with water purification systems in the fish processing and tanks for storing the residues and effluents of its activity.



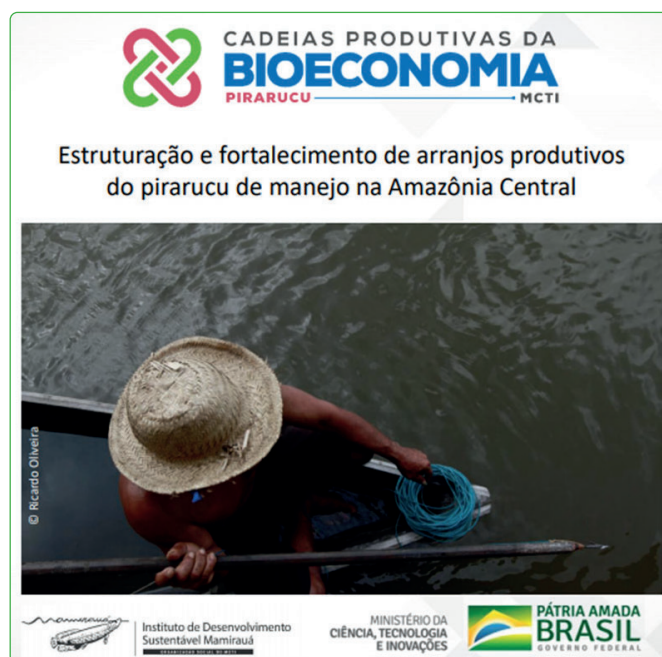
The launch of the vessel may guarantee the quality and health of the fish produced, adding value to the product and opening up new markets for pirarucu managers in the Central Amazon Region. It should be noted that a single unit will serve 12 communities and may increase the price of a kilo of clean fish from R\$ 6.00 to up to R\$ 12.00. Once this social technology is established and standardized, it can be scaled up and implemented in other regions of the Amazon, improving income and quality of life of the communities through the sustainable and rational use of local biodiversity, since the vessel can be easily adapted for processing other Amazonian water species, such as tambaqui fish and alligators.

- » **EXECUTING BODY:** Mamirauá Sustainable Development Institute (IDSM).
- » **COLLABORATING ORGANIZATIONS:** Ministry of Agriculture, Livestock and Supply (MAPA); Brazilian Agricultural Research Corporation (Embrapa) – Fisheries and Aquaculture Unit (Palmas/Tocantins); Chico Mendes Institute for Biodiversity Conservation (ICMBio); Amazonas State Secretariat for the

Other highlights are the preservation of these foods for longer periods, in smaller spaces and without refrigeration, easier transport, product standardization and the use of waste to generate bioenergy. Product sale is also considered, and there will be technical support for the elaboration of Business Plans.

- » **EXECUTING BODY:** Federal University of Santa Catarina (UFSC).
- » **COLLABORATING ORGANIZATIONS:** Secretariat of Economic Development, Science, Technology and Innovation of the State of Amazonas (SEDECTI/AM); Department of Environment and Sustainability of the State of Pará (SEMAS/PA); National Indian Foundation (FUNAI); Technical Assistance and Rural Extension Company of the State of Pará (Emater/PA); Amazonas State University (UEA); Federal University of Pará (UFPA); National Council for Scientific and Technological Development (CNPq); and Bailique Agroextratist Producers Cooperative (AmazonBai).

## 7.2. PIRARUCU PRODUCTION CHAIN



The **MCTI Bioeconomy Production Chains Program** will implement an experimental floating unit for the pre-processing of pirarucu in communities in the Central Amazon.

## 7.1. PRODUCTION CHAINS OF AÇAÍ AND CUPUAÇU

The **MCTI Bioeconomy Production Chains Program** will implement small-scale food processing units in Amazonian communities for validation and future scaling of technologies and protocols developed by universities and research institutes with the financial support of MCTI itself.



For the açaí and cupuaçu chains, four small food factories will be installed that will use renewable energy for food dehydration, generating pulp powder. The factories meet sanitary specifications for food production, allowing for quality assurance certifications. It should be noted that the drying method is innovative, faster and more energy efficient. In addition, it preserves the nutritional properties of foods, such as the high levels of antioxidants present in açaí, which makes it attractive for the more demanding markets that pay more. It adds value to the pulps of both açaí and cupuaçu, and other Amazonian fruits and, therefore, increased income and quality of life of the communities served. Another benefit will be community training in the use of equipment and production of dehydrated food, creating jobs.



## 7. BIOECONOMY PRODUCTION CHAINS

This program that is being implemented by SEPEF is dedicated to the use of Science and Technology for the development of technological solutions, products and services that allow the addition of value to production chains based on Brazilian biodiversity, promoting its sustainable and rational use for improving the quality of life and income of the population.







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The main strategic benefit of this research structure is the Brazilian contribution to reduce the uncertainties of models for forecasting weather and climate on the planet, since tropical forests represent a major bottleneck for global climate models.

- » **EXECUTING BODIES:** INPA, State University of Amazonas (UEA) and Max-Planck Institute.
- » **COLLABORATING ORGANIZATIONS:** Brazilian universities, American, German, French, Swiss and British universities.





**Figure 18:** The structure measures air samples that span thousands of square kilometers



**Figure 19:** View from the top of the ATTO tower, 325 meters high

## 6.2 AMAZON TALL TOWER OBSERVATORY (ATTO)

A joint scientific project between Brazil and Germany created to improve understanding of the complex interactions of the Amazon forest with the atmosphere and climate. It is the largest research tower in the world at 325 m high – equivalent to a 100-story building – capable of measuring air samples that span thousands of square kilometers. It is also the largest and best-equipped research tower in the world and one of the five largest research infrastructures in Brazil.

The objective of the research framework is to provide scientific results on the integrated understanding of the Amazon system and significantly reduce uncertainties about its impacts on global carbon and water cycles, atmospheric chemistry, and the climate change scenario.

The infrastructure is in São Sebastião do Uatumã (AM), about 150 km from Manaus (AM), and is maintained by the National Institute for Research in the Amazon (INPA), a research unit associated with MCTI. The facility also has two 80-meter tall towers, laboratories and a super-site for studying cloud physics.

The main benefit of **ATTO** is to help monitor and understand how the Amazon influences the global climate; provide continuous high-quality meteorological measurements needed to improve regional and global weather forecasting, which will allow the study of the evolution and impact of extreme weather events, as well as monitor the carbon balance of the Amazon forest and its resilience and vulnerability to extreme weather events.

The initiative has high international visibility, with a positive agenda for the Amazon as it should attract the national and international scientific research elite; fill gaps in scientific information (making it more accurate) on the effects of CO<sup>2</sup> concentrations; produce strategic information on the risk of collapse of ecosystems and ecosystem services; prepare the population (which is comprised of almost 30 million Brazilians) and institutions located in the Amazon, for adaptation measures to the impacts that climate change can bring to the Amazon region.



**Figure 17:** Laboratory in the forest. Structure for enrichment of CO<sup>2</sup> in the atmosphere

- » **EXECUTING BODIES:** INPA
- » **COLLABORATING ORGANIZATIONS:** Unicamp, USP, Embrapa, Alterra  
Wageningen University, University of Exeter, Technical University of Munich and  
University of Edinburgh

## 6. MAJOR STRUCTURES FOR RESEARCH ON CLIMATE CHANGE IN THE AMAZON

### 6.1 AMAZON FACE PROGRAM

An infrastructure for an experiment that aims to simulate the future atmosphere of the Amazon and evaluate all the processes that could be altered by the increase in atmospheric CO<sup>2</sup>. FACE is an outdoor CO<sup>2</sup> enrichment technology. It is the first infrastructure of its kind in a tropical country. The objective is to assess the effects of increased CO<sup>2</sup> on the resilience (adaptation capacity) of the Amazon rainforest, the biodiversity it houses and the ecosystem services it provides. The experiment, conducted by the National Institute for Research in the Amazon (INPA), a research unit associated with MCTI, is located 70 km north of Manaus (AM).

The process tests hypotheses to elucidate whether the increase in the atmospheric concentration of CO<sup>2</sup> will mitigate the effects of increased temperature and reduced rainfall projected for the region and, consequently, increase the resilience of the largest tropical forest in the world. Therefore, the experiment has a high strategic value for the country and for humanity, and will allow the creation of public policies and mitigation and adaptation actions that are closer to reality.





**Figure 16:** Technological action plans prioritize high impact technologies to reduce emissions in the country



continuation of scientific advances, contributing to the development of national and world science.

- » **EXECUTING BODIES:** CGCL/MCTI.
- » **COLLABORATING ORGANIZATIONS:** UNDP, GEF.

## 5.4 TECHNOLOGICAL ACTION PLANS

MCTI has created technological action plans that will leverage the development and diffusion of technologies with subsidies for project proposals for access to national and international financing of the 12 technologies prioritized to mitigate emissions in Brazil. These are low-carbon technologies, preferably with an increase in national content, and better access to financing in technologies to mitigate greenhouse gas emissions prioritized in the main sectors of the Brazilian economy. The plans are available on SIRENE, accompanied by a financing guide, which supports the preparation of project proposals for access to national and international financing for the 12 prioritized technologies.

### 5.3 NATIONAL INVENTORY OF ANTHROPIC GREENHOUSE GAS EMISSIONS AND REMOVALS

Initiative of national and international importance coordinated by MCTI that highlights, from all national efforts for the implementation of the Climate Convention, emissions by sources and removals by sinks of greenhouse gases (GHG), which includes periodic updates of the land use map and carbon map for the Amazon region. National inventories are designed to better quantify GHG emissions and removals. They are useful to support evidence-based decision-making through the availability of data from the National GHG Inventory. The tool has a transparency mechanism, and its results allow for subsidizing action plans to reduce greenhouse gases. In addition, its results establish the official Brazilian database.

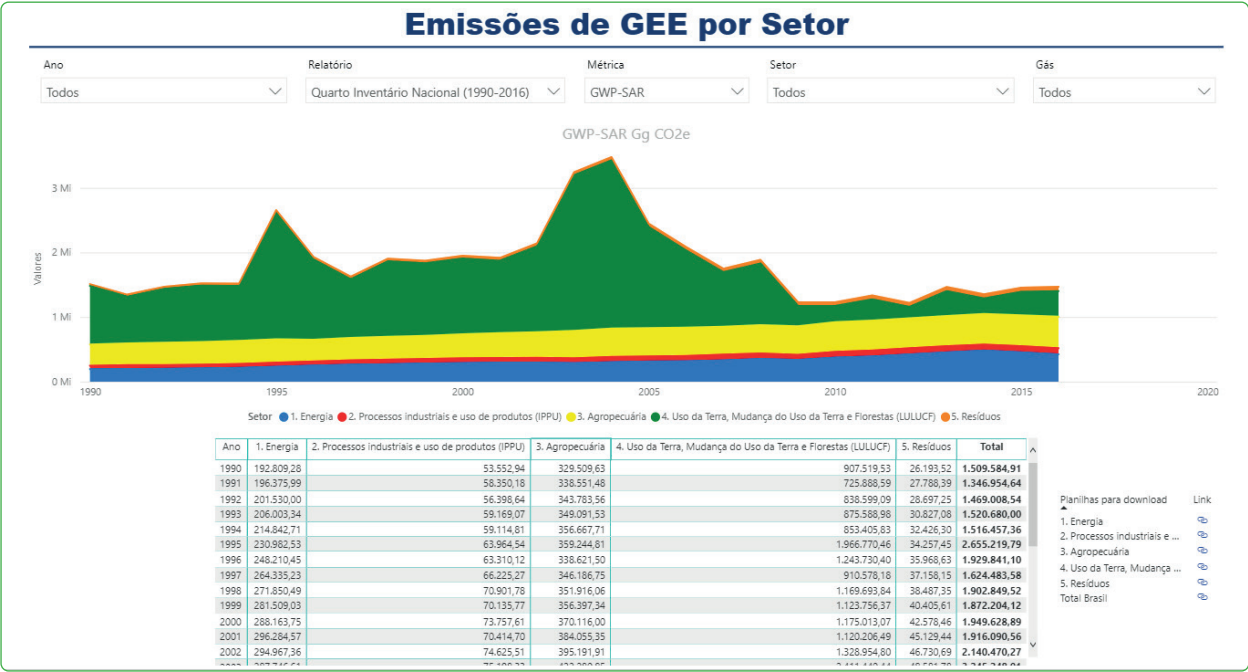
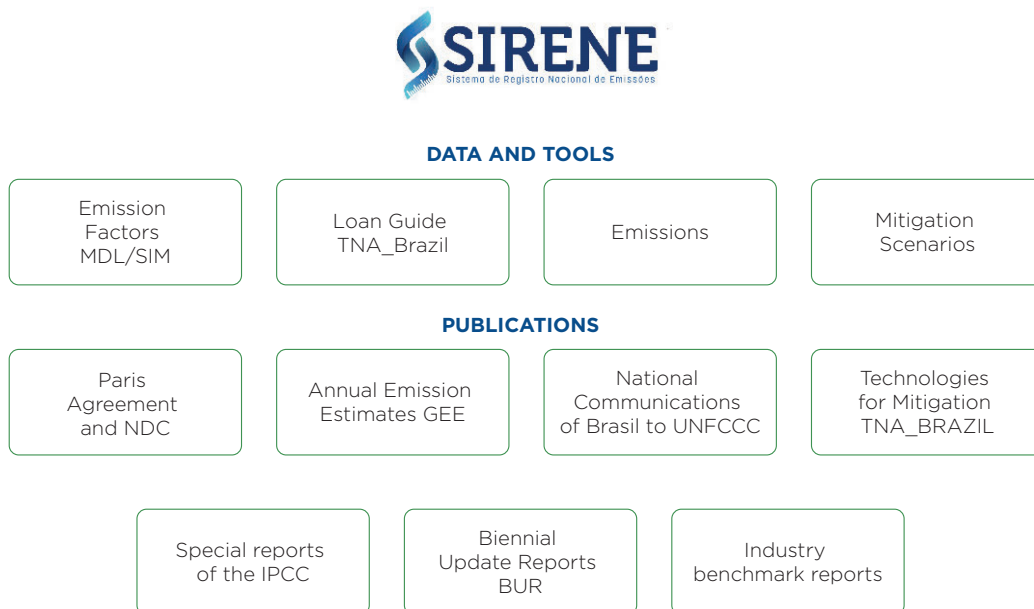


Figure 15: Emission results from 1990 to 2016 can be found on SIRENE

Brazil has advanced in the improvement and transparency of emission estimates in each edition of the National Inventory, seeking new scientific research and using parameters and emission and removal factors that reflect national conditions. This effort results in better accuracy of national emissions and encourages the

## 5.2 NATIONAL EMISSIONS REGISTRY SYSTEM (SIRENE) (gov.br/mcti/sirene)

**SIRENE** is the official climate change mitigation data and information system that provides information on measuring, reporting, and verifying greenhouse gas (GHG) emissions in Brazil, such as the National Inventory of GHG Emissions and Removals and GHG Emissions Annual Estimates. The purpose of this computer system is to provide security and transparency to the process of making inventories of greenhouse gas emissions, and to support decision-making in the context of climate policies, plans, programs, and projects. In addition, it provides relevant information on other initiatives coordinated by the MCTI, such as: technological action plans for prioritized technologies to mitigate emissions in Brazil; integrated analysis of the different mitigation options, considering the non-additivity of these options with their economic and social implications; the availability of emission factor data for corporate inventories, national electricity system and Clean Development Mechanism (CDM) projects.



**Figure 14:** Illustration of the information available on SIRENE

- » **EXECUTING BODIES:** CGCL/MCTI.
- » **COLLABORATING ORGANIZATIONS:** UNDP, GEF.



**Figure 13:** The digital platform offers information that support decision-making by public and private stakeholders

The tool provides an official reference environment of solid, robust, centralized and easily accessible information on the observed and projected impacts for the 5,568 Brazilian municipalities to inform and support strategic planning and decision-making on adaptation actions. The project began with a pilot phase and has been in operation since 2020, displaying information on the 1,262 thousand municipalities in ten states that comprise the Semi-arid region. The project involves MCTI, the National Institute for Space Research (INPE/MCTI) and the National Research Network (RNP/MCTI), in addition to COLLABORATING ORGANIZATIONS.

- » **EXECUTING BODIES:** CGCL/MCTI, RNP/MCTI and INPE/MCTI.
- » **COLLABORATING ORGANIZATIONS:** Ministry of the Economy, CDP, WRI, UNDP, UNEP, COPPE/UFRJ, GIZ, FIOCRUZ, WAYCARBON.



## 5. DATA CLIMA

A structure of technical and scientific information regarding the national effort to internalize the United Nations Framework Convention on Climate Change (UNFCCC or The Climate Convention) and its subsidiary instruments and the National Policy on Climate Change (PNMC). It has the objective of promoting the development of actions to mitigate the emission of greenhouse gases (GHG), the adoption of adaptation strategies and the reduction of vulnerabilities to the effects and impacts caused by climate change through the following initiatives: AdaptaBrasil MCTI , National Inventory of Anthropogenic GHG Emissions and Removals, National Emissions Registry System (SIRENE) and Technological Action Plans.

### 5.1 ADAPTABRASIL MCTI ([adaptabrazil.mcti.gov.br](http://adaptabrazil.mcti.gov.br))

The **AdaptaBrasil MCTI** digital platform presents information and analysis on the effects of climate change in Brazil. Its purpose is to provide public and private stakeholders with data that support decision-making on adaptation actions throughout the national territory. The platform provides 85 benchmarks associated with three strategic sectors: water, food, and energy; it also presents projections of impacts for 2030 and 2050 in climate scenarios, indicating the risk of climate impact in the region.



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- » **EXECUTING BODIES:** MCTI, INPE.
- » **COLLABORATING ORGANIZATIONS:** Cemaden, MMA, Ibama, ICMBio, MAPA, Embrapa, MDR, MME, MD, MRE, MJ.

### 4.3. FIP CERRADO MONITORING

The “**Development of Forest Fire Prevention Systems and Monitoring of Vegetation Cover in the Brazilian Cerrado (FIP)**” project, with its triple objective of strengthening Brazil’s institutional capacity for monitoring deforestation, providing information on forest fire risks and estimating the GHG emissions from deforestation and fires in the Cerrado is structured in three components: Component 1 – Deforestation monitoring; Component 2 - Information systems on fire risk and estimation of GHG emissions; Component 3 - Project management, monitoring and evaluation.

Two complementary monitoring systems to Prodes and Deter Cerrado created – CRS-UFMG fire mirroring and Cerrado DPAT LAPIG-UFG. Increment to 2 INPE systems – Fire risk and GHG emissions. New phytophysiognomy map for the Cerrado.

- » **EXECUTING BODIES:** MCTI.
- » **COLLABORATING ORGANIZATIONS:** UFG, UFMG, INPE, Finatec, IBRD.

and avoid new socioeconomic and environmental catastrophes caused by fires in the Pantanal, namely:

- » Challenge 1 – Knowing the causes that led to fires reaching catastrophic dimensions in the Pantanal and understanding the conditions that may lead to similar events in the future.
- » Challenge 2 – Develop an advanced fire risk forecasting and warning system in the Pantanal.
- » Challenge 3 – The definition of appropriate practices for the use of fire to manage vegetation in the Pantanal.

Three operational research sub-nets with over 30 researchers.

- » **EXECUTING BODIES:** MCTI, FINEP, UFMG.
- » **COLLABORATING ORGANIZATIONS:** UFMT, UFMS, Unemat, IFMS, Embrapa, INPE, Cemaden, USP, IBAMA, ICMBIO, MPEG, INPA, UFRGS, UnB, UFRJ.

## 4.2. BIOMES-BR

The “Biomes BR MCTI: monitoring and modeling changes and impacts on land use and land cover in all Brazilian biomes” project aims to produce and maintain time-indexed data sets on land use and land cover in Brazil, aimed at monitoring, inspection, generation of products and services necessary for the country’s sustainable development. It should subsidize operational activities, research and technological development, as well as the training of human resources to ensure, in addition to the production of data and information, the development of critical technologies, working in processing and making information readily available. It also proposes to expand and improve monitoring systems with technological development by adding new algorithms based on artificial intelligence and machine learning with scientific development, providing greater speed in processing and making data available to the community, while keeping high quality results and data transparency.



## 4. MONITORING

Brazil has operational environmental monitoring and modeling systems that are a reference for the world, integrating strategies and meeting the demands of the country. These systems allow the monitoring of suppression of native vegetation on a daily and annual basis; monitoring of fire outbreaks with sub-daily intervals; the estimation of greenhouse gas emissions; atmospheric modeling that show the transport and dispersion of pollutants due to changes in land use; monitoring of vulnerability conditions and impact risks from climate change.

### 4.1. PANTANAL RESEARCH NETWORK

The **Adaptation of Fire Use Practices and Maintenance of Socio-ecological Resilience Program (Pantanal Research Network)** will develop strategies and instruments to help prevent disasters in the Pantanal biome, due to forest fires, from happening in the future. The main general goals of the Pantanal Network are the synthesis of the conditions that create catastrophic fires and the prospects for new events in the region, the delivery of an advanced fire risk forecasting and warning system, and adequate fire practices for vegetation management. Faced with climate change scenarios in the Pantanal, the network is structured to meet 3 relevant challenges



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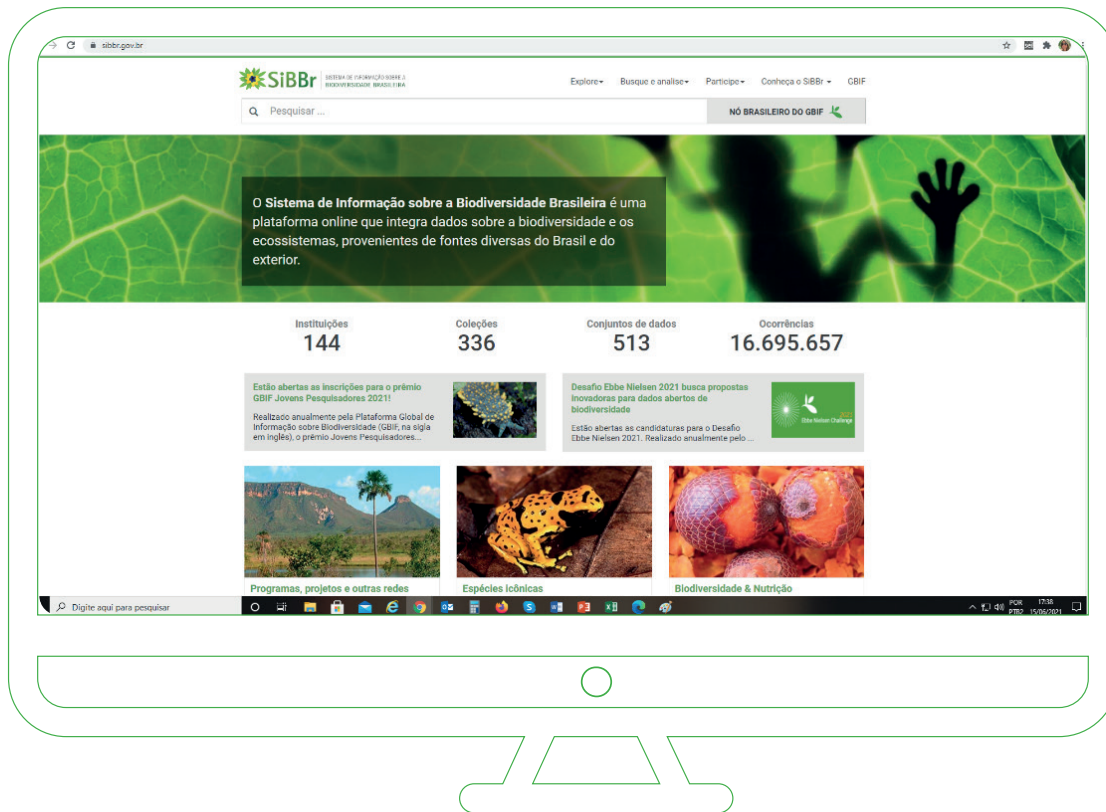
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**Figure 11:** SiBBR website - [www.sibbr.gov.br](http://www.sibbr.gov.br)

- » **EXECUTING BODIES:** RNP.
- » **COLLABORATING ORGANIZATIONS:** Science and technology institutes, Ministry of Environment/ICMBio, Global Biodiversity Information Facility (GBIF).

### 3.4. GBIF

The **Global Biodiversity Information Platform (GBIF)** is a global infrastructure that makes biodiversity data free and openly available. It features more than 1.65 billion biodiversity records from 1,644 institutions from different countries. In Brazil, the Information System on Brazilian Biodiversity (SiBBR – [www.sibbr.gov.br](http://www.sibbr.gov.br)), coordinated by MCTI, is the GBIF node responsible for managing the network of Brazilian publishing institutions, providing tools and training for sharing data and information about species. Brazil became a full member, with voting rights for defining priorities

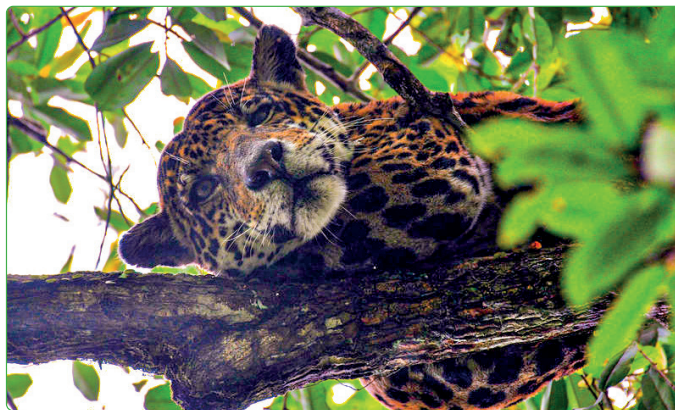


### 3.3. SiBBr

An initiative of the Ministry of Science, Technology and Innovations (MCTI), the **Information System on Brazilian Biodiversity (SiBBr)** aims to gather and provide access to data and information to support public policy, support conservation and sustainable use actions as well as promoting knowledge on biodiversity. By making a wide range of data on Brazilian species and enabling different crossovers with spatial studies available in an open way, SiBBr becomes an essential tool in academic research and in environmental management. SiBBr currently carries information on 160,000 species, with a total number of occurrence records of around 16.6 million. All the data can be freely accessed, which includes information on threatened species, native species used in medicine or cooking, their nutritional value, as well as information on biomes, protected areas in Brazil, Brazilian collections, research projects, and others. SiBBr is maintained and operated by the National Education and Research Network (RNP/MCTI), using the infrastructure based on the ALA Platform - Atlas of Living Australia, to improve the indexing, integration and visualization of data and information on Brazilian biodiversity. The ALA platform uses international standards that facilitate data sharing.

## 3.2. PROVIDENCE

The **Providence** technology was created in a scientific partnership between the Mamirauá Institute, Federal University of Amazonas, Polytechnic University of Catalonia - Spain, and the Commonwealth Scientific and Industrial Organization (CSIRO) - Australia, with financial support from the Gordon and Betty Moore Foundation. Providence brings an innovative way of carrying out environmental and biodiversity monitoring, as well as detecting and monitoring human activities. The technology integrates, for the first time, cutting-edge technologies - hardware and software - in the same equipment that allows uninterrupted monitoring of the environment, biodiversity and human activities, using a standardized protocol, with automatic identification of species by image and sound of human activities (the software allows for automatic identification of more species than other methods and technologies), remote data transmission (the ability to send data from anywhere on the planet), low energy consumption (energy gathering by solar panels with the ability to remain maintenance-free for longer periods), and collection of environmental data (e.g. rainfall, pressure, temperature, humidity, and others such as the presence of oil and mercury or other chemical components in water or air). The Providence technology also allows automated analysis of collected data and the availability of information generated on the same platform, allowing access to information on biodiversity indices, species distribution maps, activity and behavioral patterns, in addition to changing trends associated with environmental variables collected.



**Figure 10:** Illustration of real-time image capture.

- » **EXECUTING BODIES:** IDSM.
- » **COLLABORATING ORGANIZATIONS:** SCIRO (Australia), University of Catalunya (Spain) and the Gordon and Betty Moore Foundation.

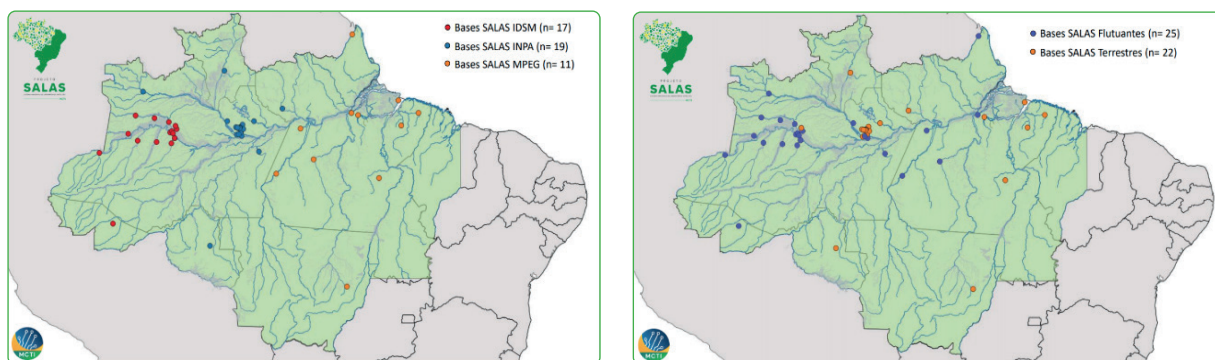


**Figure 8:** Illustration of the MCTI Amazon Satellite Floating Lab



**Figure 9:** Illustration of the MCTI Amazon Satellite Floating Lab – concept

expects to to expand knowledge on species of the flora, fauna and microorganisms aiming at their conservation and economic use. Therefore, it will enhance discovery of new materials and active ingredients and the production chains based on the biodiversity. Finally, it is expected that assigning a greater value to the standing forest and its biodiversity as an alternative for wealth generation may contribute to the reduction of illegal deforestation. Since these satellite laboratories will have equipment to support on-site monitoring and the fight against fires in the Amazon, which include combat gear and a water purification unit, it will also contribute to reducing fires. Thus it is expected that the project will also indirectly favor the maintenance of ecosystem services.



**Figure 7:** Map of the location of Laboratories (bases) belonging to the MCTI Amazon Satellite Laboratories System (SALAS MCTI). (A) Floating bases (blue dots) and Land (orange dots). (B) Bases associated to MCTI institutes: Mamirauá Sustainable Development Institute (IDSM) (red dots); National Institute for Research in the Amazon - INPA (green dots); Emílio Goeldi Museum of Pará (MPEG) (orange dots).

- » **EXECUTING BODIES:** IDSM, INPA, MPEG.
- » **COLLABORATING ORGANIZATIONS:** Regional science and technology institutes, state science & tech secretariats.

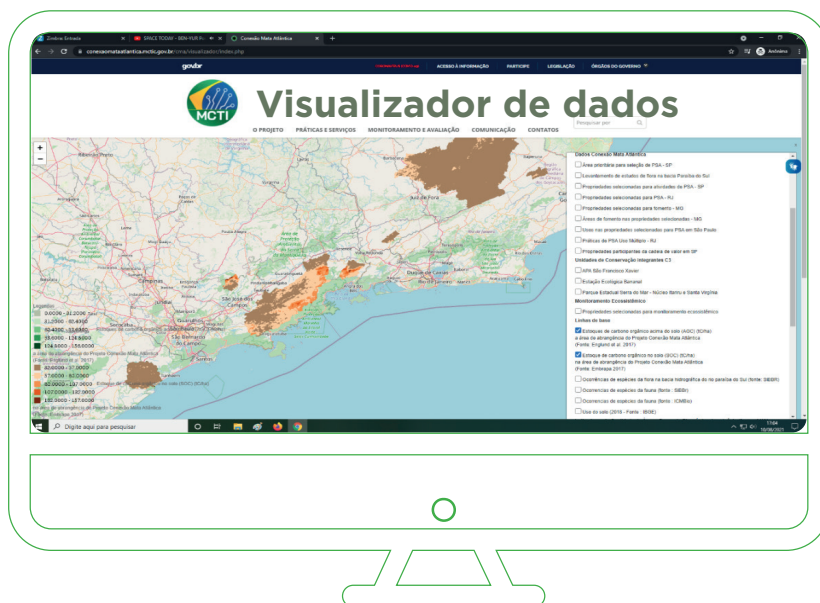


## 3. RESEARCH INFRASTRUCTURE

Modern infrastructure with adequate maintenance is essential for scientific and technological development. The achievement of excellence in scientific and technological research depends on modern and updated research infrastructure that allows the researchers the necessary means for high-level investigation in the respective fields of activity. The infrastructure is necessary not only for the development of new knowledge, but also for training human resources, for technical and scientific services and for the development of new processes, products and services.

### 3.1. SALAS

Instituted by Ordinance No. 4.046, of November 13th, 2020, **SALAS** has the objective of installing infrastructure to support scientific research in the Amazon. The Salas Project is structured in two phases. At first, three pilot projects are being established, in the states of Amazonas and Pará: i) Floating Lab – Mamirauá Sustainable Development Institute (IDSM); ii) Reactivation of the Amanã Sustainable Development Reserve Forest Lab (IDSM); iii) improving infrastructure in the Ferreira Penna Scientific Station (ECFPn) of Emílio Goeldi Museum of Pará (MPEG). Subsequently, the plan is to install satellite labs in the other states of the Amazon region. The Salas Project,



Approximately 16 thousand hectares under PSA contract involving the states of SP and RJ. Approximately 900 hectares under ecological restoration in the state of MG. More than 300 hectares of certified area.

**Figure 6:** The Atlantic Forest Connection Project website (<https://conexaomataatlantica.mctic.gov.br/cma/portal/>)

- » **EXECUTING BODIES:** MCTI, FAPESP and UEMG.
- » **COLLABORATING ORGANIZATIONS:** SP: (SIMA/CBRN, Forest Foundation), RJ: (INEA, SEAPPA) MG: (IEF, UEMG), IDB, Finatec.

## 2.2. SINBIOSE

The **Biodiversity and Ecosystem Services Synthesis Center (SinBiose)** has the mission of producing data syntheses and concepts of high international standards, with emphasis on projects related to current issues on biodiversity and ecosystem services, with socially relevant results. The Center must act as an intermediary between science and policymaking, helping in the development of scenarios, strategies, and solutions in the area. It must also contribute to the identification of knowledge gaps and emerging environmental issues. The focus of SinBiose is on the production of qualified information to subsidize decision-making. However, projects aimed at the development of new conceptual or methodological models at the frontier of knowledge are also considered.

Seven Project in execution with INPA, JBRJ, UFRS, UFSM, Oswaldo Cruz Foundation e the Oriental Amazon Center for Agroforestry Research.

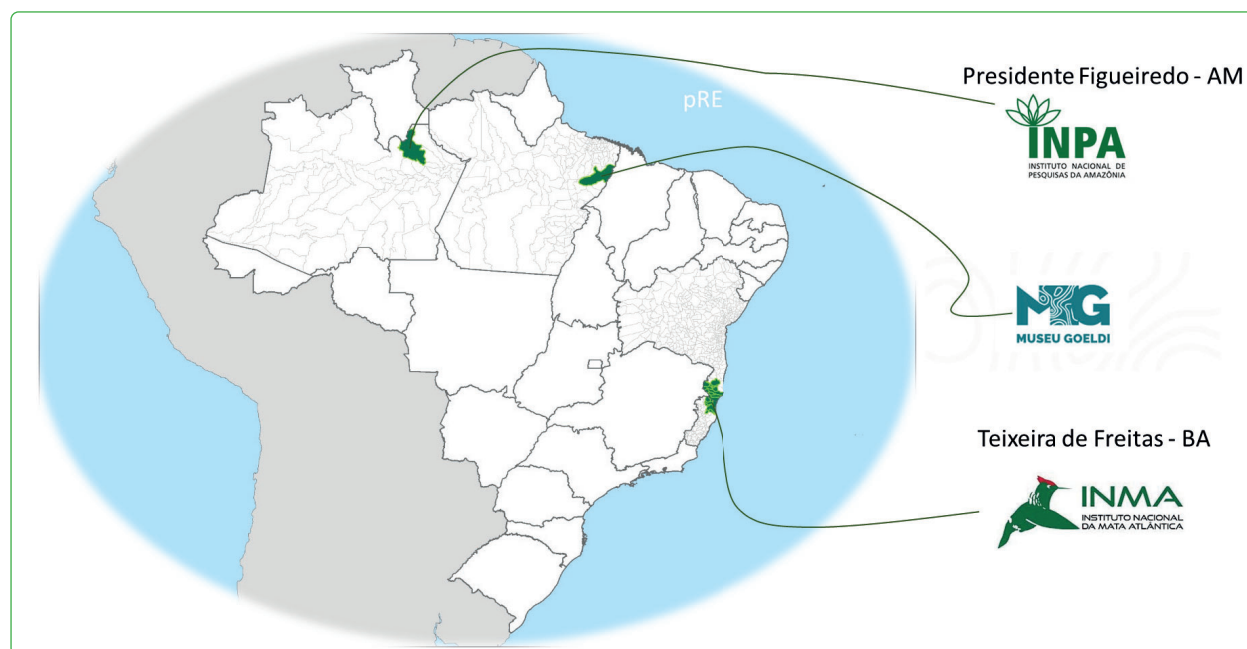
- » **EXECUTING BODIES:** CNPq.
- » **COLLABORATING ORGANIZATIONS:** CAPES, FAPESP e CONFAP.

## 2.3. ATLANTIC FOREST CONNECTION

The **GEF-Atlantic Forest Connection Project** is coordinated by the Ministry of Science, Technology and Innovations (MCTI), in partnership with the Secretariat of Infrastructure and Environment (SIMA) of São Paulo, the State Environmental Institute (INEA) of Rio de Janeiro and the State Forestry Institute (IEF) of Minas Gerais. The Project's objective is to recover and preserve ecosystem services associated with biodiversity and forest carbon capture, in priority zones of the Southeast Corridor of the Brazilian Atlantic Forest. The interventions take place in nine focal areas in the southeast corridor of the Atlantic Forest, in the states of São Paulo, Rio de Janeiro and Minas Gerais, through the implementation of tools to encourage the recovery and conservation of ecosystem services: i) Payment for Environmental Services, ii) Sustainable Value Chain, iii) Certification, iv) Soil and Water Conservation Practices and, v) Technological Leap in Rural Production.

methodologies for each type of degradation, monitoring and prioritization of areas with better cost-effect ratio.

The initiative encompasses a specialists' committee and three pilot projects: one in the Atlantic Forest and two in the Amazon, with the involvement of MCTI-attached institutes: The Atlantic Forest National Institute (INMA-ES); Emílio Goeldi Museum of Pará (MPEG-PA) and the National Institute for Research in the Amazon (INPA-AM). It is expected that the Regenera Brasil initiative might be extended in the future to the other Brazilian biomes, totaling 50 projects. The initiative aims at the conservation of Brazilian ecosystems by reducing biodiversity loss and expanding ecosystem services, while promoting agricultural business sustainability.



**Figure 5:** Current pilot projects in the Regenera Brasil initiative.

- » **EXECUTING BODIES:** INPA, MPEG, INMA, INPE.
- » **COLLABORATING ORGANIZATIONS:** Research centers in the Atlantic Forest, state environment and science and technology secretariats.



## 2. ECOSYSTEM SERVICES

Biodiversity provides ecosystem services that are essential for the maintenance of life on Earth and are often not perceived, like maintenance of air quality and climate, water availability and ecosystem stability. Current patterns of consumption, production and land occupancy are unsustainable and increasingly affect biodiversity and ecosystems. Over the last century, loss of biodiversity has become a critical problem, aggravated by the difficulty in measuring losses and the magnitude of the impact of these losses on processes and ecosystem services.

### 2.1. REGENERA

Large scale recovery of native Brazilian ecosystems aims at the conservation of biodiversity and ecosystem services, agriculture sustainability and the fulfillment of national and international commitments, such as Planaveg objectives e Brazilian goals set in the Bonn Challenge, which involve a huge scientific and technological challenge. In this context, SEFAE/MCTI instituted by means of Ordinance No. 3.206, from August 25th, 2020, the Regenera Brasil Initiative, with the goal of providing policymakers with the best science available to generate policies that promote the effective recovery of native Brazilian ecosystems, including the definition of recovery



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## 1.4. PROTAX

The advancement of knowledge on Brazilian biodiversity requires the adoption of a broad and innovative initiative that encourages both the expansion and improvement of taxonomists' training and their work conditions for research. To this end, the federal government instituted the **National Taxonomy Training Program (PROTAX)**. The program is an initiative in partnership with CNPq, CAPES and MCTI and provides a relevant contribution to national scientific and technological development in biology and associated subjects, improving taxonomical and biogeographical knowledge, as well as the taxonomical capacity in the country.

Over 100 projects supported to meet the challenge of covering the large Brazilian territorial expanse and megadiversity in regard to the number of taxonomists.

- » **EXECUTING BODIES:** CNPq.
- » **COLLABORATING ORGANIZATIONS:** State science foundations, CAPES.



### 1.3. BIOLOGICAL COLLECTIONS

Brazil has a large amount of biological collections belonging to public and private institutions with different purposes and origins, such as: universities, museums, and research centers. Beside institutional differences, there is also diversity related to taxonomical groups – Botany, Microbiology, Zoology – biomes and countries where the collection was sampled and where they are stored in Brazil. It all reflects on how these collections are handled by the staff in their respective institutions, by the government or the funding agency that maintains them. The great heterogeneity does not allow for comparisons, which makes generalizations mostly unfair in defining valuation parameters and consequently in the application of funding, which might be sometimes uneconomical in regard to the actual needs of the collections. Therefore, it is essential to understand the reality of biological collections in Brazil and understand their challenges, gaps, services and information provided to society. Even though the challenges are great due to the diversity of biological collections in Brazil, it's expected that with the publication and disseminations of guides with better practices recommendations, there will be an improvement in the management and availability of information and services for the whole society and the establishment of the basis for the creation of the Brazilian Biological Collection Network.



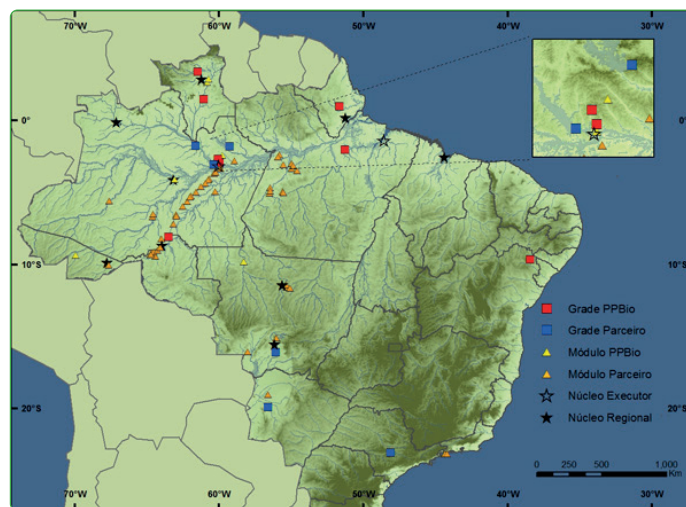
**Figure 4:** Biological collections image.

- » **EXECUTING BODIES:** MCTI and CNPq.
- » **COLLABORATING ORGANIZATIONS:** UFPR, research centers with biological collections, Brazilian scientific societies (Zoological, Botanical and others).



## 1.2. PPBIO

The **Brazilian Program for Biodiversity Research (PPBio)** was established in 2004 as a response to Brazilian commitments to the Biological Diversity Convention (Ordinance No. 268 from MCTI, Federal Register of June 18, 2004). PPBio is a strategic national program to enhance knowledge on the immense Brazilian biodiversity, filling in knowledge gaps, especially in hard-to-reach areas that have a deficit of scientific knowledge. For that, the project the following objectives: 1) apply efficiently tried-and-true biodiversity and ecosystem monitoring methodologies; 2) training and integrating locals and people responsible for the monitoring of biodiversity to maximize quality and availability of information for decision making on degradation of environmental services associated with biodiversity, aiming to minimize environmental degradation, encourage sustainable use of natural and anthropized environment resources, such as agroforestry and urban, as well as maximize economic benefit and local and regional well-being; 3) generate models and scenarios for the sustainable use of natural resources in Brazilian territory and for the different biomes; 4) modeling impacts from extreme climate events on biodiversity and ecosystem services, for example, from forest fires.



**Figure 3:** PPBio and its partners have more than 70 fences and modules spread through Brazil.

- » **EXECUTING BODIES:** MCTI and CNPq.
- » **COLLABORATING ORGANIZATIONS:** INPA, MPEG, UEFS, UFRJ, UERJ, UnB, UFRS, UFMG.

of the country. The program has the main objective of supporting long-term research on the working patterns of ecosystems e the impacts caused by anthropic disturbances and environmental changes, in permanent research sites spread throughout different Brazilian ecosystems. It also fosters information networks, supports domestic and international cooperation, encourages capacity building of human resources, and provides subsidies for the establishment of public policies in sustainable development. Today, the PELD network has 34 research sites spread through different ecosystems.



**Figure 2:** PELD sites and their locations in Brazilian biomes and coastal and marine environments.

- » **EXECUTING BODIES:** CNPq
- » **COLLABORATING ORGANIZATIONS** COLLABORATING ORGANIZATIONS:  
State science foundations, CAPES, Newton Fund (British Council).

# 1. GENERATION OF KNOWLEDGE

Given the complexity of the task of discovering, describing, characterizing, and making good use of products derived from the enormous Brazilian biological diversity, as well as understanding patterns of changes in structure and function of biodiversity and associated ecosystems and its impacts on society, there must be a collective scientific effort spanning several decades, with the establishment and maintenance of an agenda for research in biodiversity in Brazil. Human resources must also be trained in these subject areas and interdisciplinary multi-institutional research groups that work in networks must be encouraged. For that purpose, MCTI supports the expansion and consolidation of research networks that aim at meeting the demands of planning, development, conservation, and sustainable use of natural resources strategies.

## 1.1. PELD

The Long-Term Ecological Program (PELD) is a pioneering initiative, with a strategic approach by the Brazilian government since 1999 in articulating a network of long-term reference sites for research on the subject of Ecosystem Ecology. PELD fosters the generation of qualified knowledge on ecosystems and their biodiversity, stimulating the transfer of knowledge to society and aid sustainable development



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The figure below shows the main actions regarding the Science for Biodiversity and Ecosystems agenda.



**Figure 1:** MCTI's strategy for Science for Biodiversity and Ecosystems chart.

The boundaries are expanded through long-term investment in research groups that work in domestic and international cooperation. These initiatives also involve the popularization and dissemination of science to provide society with access to the best evidence-based information that contributes to quality-of-life improvement, wealth generation and the preservation of nature.

Brazil is the country with the greatest biological diversity in the world, home to around 20% of the planet's biodiversity. The greater the knowledge about Brazilian biodiversity, the better the use of its potential in agriculture, tourism, biotechnological exploration, in medicine, industry and on the definition of provided ecosystem services, such as water purification, nutrient cycling and the maintenance of the planet's climatic conditions. A new approach on the relationship between biodiversity and ecosystem services throughout the country's six different biomes is vital right now, when biodiversity may be the key to a better future, not only from a social well-being, but also from economic and climatic standpoints.

Knowing, cataloging, monitoring, and understanding the workings of Brazilian ecosystems, including its forests, grasslands, savannahs, and wetlands, all of which house great biodiversity, is only one part of the processes that require continuous and coordinated efforts. Another vital part is understanding the relations between different components of biodiversity in space and time and how it may be used and handled to restore damages caused by anthropic activities and, equally relevant, how it can be used in a sustainable way, for example, using species that have high potential to generate important products for society.

# SCIENCE FOR SUSTAINABILITY: BIODIVERSITY AND CLIMATE

**Sustainability is one of the greatest contemporary challenges of our society.**

Scientific knowledge is one of the main tools that humankind can use to ensure its survival and improve quality of life while reducing inequality. The best answers for many economic, social, and environmental issues are found through careful analysis by scientists engaged in finding solutions based in rigorous methodology validated by peers. Understanding the consequences of climate change for society, the relationship between man and nature, the limits of exploration of natural resources, and the relevance of preserving biodiversity are examples of the importance of science for the great national challenges. Dominion over scientific knowledge is an aspect of sovereignty and it allows the country to promote sustainable use of its natural riches and a more equitable distribution of its results.

Research on Biodiversity and Climate Change are priorities for MCTI, with specific programs, funding for science projects, regulatory framework and planning instruments. These themes encompass different areas of Science (Physics, Chemistry, Biology, Geosciences, among others) for pushing the boundaries of knowledge in current challenges, such as: environmental impact of climate change, better use and conservation of biodiversity, and improving quality of life in urban environments.

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# SUMMARY

1. GENERATION OF KNOWLEDGE	13
2. ECOSYSTEM SERVICES	19
3. RESEARCH INFRASTRUCTURE	23
4. MONITORING	31
5. DATA CLIMA	35
6. MAJOR STRUCTURES FOR RESEARCH ON CLIMATE CHANGE IN THE AMAZON	41
7. BIOECONOMY PRODUCTION CHAINS	47
8 . SOCIAL DEVELOPMENT	53



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## SCIENCE FOR SUSTAINABILITY, TECHNOLOGY FOR SOCIETY E INNOVATIONS FOR TAKING CARE OF THE PLANET AND THE AMAZON

It is with immense pleasure that I am writing for this Science For Sustainability magazine.

We have collected in this volume our main actions in development, though not all, for the preservation and sustainable use of the largest tropical forest in the world: the Amazon.

We are proudly showing the world that the Ministry of Science, Technology and Innovations develops projects, initiatives and planned strategic public policies for the flora and fauna, while also regarding the people who inhabit and live in the region, supported by our associated institutions in the Amazon.

MCTI contemplates all Brazilian biomes, investing in and fostering the continuous generation of pioneering scientific knowledge. In this administration, we have expanded our efforts to applications that may and should be implemented to address common issues in our society, which are collective and urgent if we wish to promote sustainable development now and in the future.

Our forest is rich in biodiversity, exuberance, bio assets. It is most important that if we focus our efforts to include common people in our social and political decisions, bringing our citizens closer in support of global issues that we face, so we can turn the forest into a source of prosperity and wealth, while also preserving its natural relevance for the planet and humanity. Our unity is our strongest tool, as we have witnessed in the world coming together in the pandemic to fight an invisible enemy that has challenged, but not defeated, our capacity to converge and overcome. It is possible, and I believe it.

In this brochure, you will find important initiatives that may result in new methods and ways of using our natural resources, generating wealth for the country and improving the quality of life of the population. This is my belief, and I count on you to make an effort to show the world that the Federal Government shares the same objectives as everyone: taking good care of the Amazon and its people.

We have consolidated public policies in place in the Amazon and broad participation from members of the civil society and, therefore, additional resources and support are always welcome.

Kind regards,



MARCOS CESAR PONTES



Supercomputador  
*Santos Dumant*

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