8. Scientific research centres, research cooperation programmes and NGO activities in the Amazon region

8.1. Brazilian state research centres in Amazonia

Brazil has some excellent research centres in Amazonia that have rendered outstanding services to the scientific exploration of the different Amazon regions for many decades with a wide range of topics. They have made intensive efforts to exchange ideas with national and international partner institutions, invited numerous foreign researchers as guest stays, and trained Brazilian researchers who have devoted themselves to the central topics of basic research and empirical field research. The scientific results have been published in national and international journals. These results have contributed to the fact that within a short period of time the knowledge about Amazonia has greatly improved. Decisive insights into the life of the regional amerindian population as well as the natural resources of Amazonia were gained.

New research results on Amazonian biodiversity, tropical ecosystems and their vulnerability, the importance of tropical forests as carbon storage, consequences of deforestation and land use change with increasing greenhouse gas emissions, and problems of climate change can be mentioned. Improved mapping by satellite imagery contributed to a better understanding of the regional differentiation of specific situations and also made it possible to better localise protected areas and Indigenous territories as well as economic and social conflicts of interest. Many scientific studies brought positive insights into agroforestry and sustainable development and thus gave perspectives for an environmental policy adapted to the natural and social conditions of the region. Brazilian universities and research centres outside the Amazon region have also intensified Amazon research in recent years.[366]

366 In this context, there are a number of academic activities, of which PROCAD (Programa de Cooperação Acadêmica em Defesa Nacional – National Programme for Academic Cooperation) will be mentioned here as an example. PROCAD is an initiative launched under the responsibility of CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Coordination for the Improvement of Higher Education Personnel) and is primarily intended to promote academic cooperation. PROCAD-Amazônia is explicitly targeted at the North of Brazil and the state of Maranhão in order to reduce interregional imbalances (Filocreão, Pizzio, and Theis 2022, 21 f.). The programme aims to strengthen postgraduate studies in the northern region and Maranhão state by supporting joint research projects that build academic networks and make it possible to use the human resources and infrastructures available at the different participating institutions. New research topics will be taken up to create the conditions for increased research in Brazilian Amazonia and to improve the quality of courses offered by higher education institutions (Insti-

Findings of research projects have been successfully incorporated into the environmental policy of Amazonian states. Unfortunately, the environmental policy of the Brazilian federal government frequently did not consider essential research results because they did not correspond to the political objectives of various governments.

At this point it is only possible to briefly introduce some of the most important research centres.

The **National Institute of Amazonian Research (INPA)** is an internationally highly regarded public research and educational institution, headquartered in Manaus. It was founded in 1952 and implemented in 1954, with the purpose of furthering scientific knowledge of the Brazilian Amazon region. Most of INPA's research focuses on tropical forest management, ecology, molecular ecology, zoology, botany, tropical agriculture and tropical pisciculture. INPA offers graduate masters and doctorate programmes in the mentioned scientific fields.

In its early years, INPA did pioneering work on surveys and inventories of fauna and flora. In 1969, the cooperation with the Max Planck Institute for Limnology in Plön (Germany) in the field of tropical ecology was the first of many other international agreements of bilateral cooperation.[367] INPA has been carrying out scientific studies of the physical environment and living conditions in the Amazon region to promote human well-being and social development in regional economy. The Institute also is a cooperation partner in the German-Brazilian ATTO (Amazon Tall Tower Observatory) programme.[368]

Today, the challenge is to sustainably expand the use of the Amazon's natural resources. INPA has the general coordination of research in the following focuses: Environmental dynamics; society, environment and health; technology and innovation; and biodiversity. With its outstanding research results, INPA is a world reference in tropical biology.[369]

Since 1971, INPA publishes the multidisciplinary scientific journal *Acta Amazônica* with research results in and about the Amazonian region in a broad range of disciplines.[370]

The **Museu Paraense Emilio Goeldi**[371] is a renowned research institution linked to the Ministry of Science. It conducts research on the Amazonian flora and operates in the areas of taxonomy and biosystematics, ethnobotany and economic botany, anatomy of wood and vegetative organs and in studies of biodiversity.

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tuto de Ensino Superior, IES) in this region (https://www.gov.br/capes/pt-br/acesso-a-informacao/acoes-e-programas/bolsas/programas-estrategicos/desenvolvimento-regional/procad-amazonia) (accessed September 10, 2023).

367 See chapter II.8.2.

368 Cf. chapter II.8.2.

369 https://www.developmentaid.org/organisations/view/246143/inpa (accessed 15.01.2023).

370 Agronomy and forestry, animal sciences and fisheries, biodiversity and conservation, biotechnology, chemistry and pharmacology, environmental sciences, food sciences, geosciences, health sciences, human and social sciences, and materials technology.

371 The Goeldi Museum was founded in Belém/Pará in 1866 and later named in honour of the Swiss naturalist Emil Goeldi, who reorganised the institution and was its director from 1894 to 1905. He was a zoologist and was commissioned to turn the Museum into an important research centre on the Amazon (https://www.museu-goeldi.br [accessed January 15, 2023]).

The studies in zoology have the objective of building an inventory of the Amazonian fauna, the analysis of its geographic distribution, behaviour, and relationship with the environment. The aim is to prepare plans for the conservation of the environment and management of fauna. Research is realised in all major groups of vertebrates (*avifauna*, *herpetofauna*, *ichthyofauna* and *mastofauna*) and several groups of invertebrates.

The Goeldi Museum has also the aim of increasing public awareness of science in the Amazon by means of its museums, botanical garden and zoological park.

The archaeology area develops research on human societies through material remains and landscapes modified by human populations that occupied the Amazon from the pre-colonial past to the present day. The institution is probably the largest repository of Amazonian collections in the world.[372]

Research in geosciences and ecology is developed on the evolution and functioning of ecosystems (including palaeontology, palynology, stratigraphy, and ecology) at different spatial and temporal scales, and on land use and sustainability with studies on land and soil use and their effects on biota as well as the conservation and use of Amazonian environments and species.

The Museu Paraense Emílio Goeldi offers graduate and postgraduate courses in biodiversity and in sociocultural diversity. In addition to these, there are masters' and doctorate' courses in zoology, sociology, anthropology, tropical botany and in environmental sciences.[373] Scientific publications, such as the *Boletim do Museu Paraense Emílio Goeldi* in Human and Natural Sciences, among others, are highly regarded.

The Museum maintains a scientific research station in the Amazonian rain forest (Estação Científica Ferreira Penna), inaugurated in 1993, with 330 km² in the Caxiuanã National Forest, (municipality of Melgaço, Pará).

The **Nucleus of High Amazonian Studies (NAEA)** is one of the academic units of the Federal University of Pará (UFPA) in Belém. It was created in 1973, with the aim of producing knowledge about the Pan-Amazon and forming professionals specialised in regional development planning. The Nucleus stands out for being the first in Amazonia to dedicate itself to the development of the Amazonian region based on paradigms of social and environmental sustainability in an interdisciplinary way (Castro and Campos 2015).[374] As a central theme, regional development began to incorporate interconnected themes, such as the study of the state, policies, and public management.

The NAEA has become a national and international reference, cooperating with research centres in many countries, in addition to being one of the most important producers of research results and scientific discourses on the region. Many foreign researchers worked in collaboration with NAEA. Its actions are concentrated in its numerous research groups of the most varied themes. The scientific productions come from the Graduate Programme in Sustainable Development of the Humid Tropics and the Graduate Programme in Public Management.

372 The Museu Goeldi offers more than 120 000 pieces in the archaeological collection, including ceramic artifacts, and more than 14 000 pieces in the ethnographic collection, including Indigenous cultures.

373 https://www.museu-goeldi.br (accessed January 15, 2023).

374 http://www.naea.ufpa.br/ (accessed January 17, 2023).

The *Revista Novos Cadernos NAEA* is an interdisciplinary journal, dedicated to the scientific publications on topics relevant to the areas of development, planning and the environment. There is a large number of book publications on Amazonian topics.

Research groups of different Amazonian universities have intensified their scientific programmes on Amazonian themes. Some contributed to research programmes with foreign countries and research centres, such as the Federal University of Mato Grosso in Cuiabá, founded in 1970, in the SHIFT programme and in the Carbiocial project with Germany,[375] to give just an example of the manifold activities.

8.2. German-Brazilian research programmes

After decades of personal collaboration between Brazilian and international scientists in individual research projects, larger projects of institutional collaboration had been established.[376] Of Brazil's bilateral research programmes at government level, only the German-Brazilian research cooperation in Amazonia may be mentioned here as an example. In addition to development cooperation at the political level (Fatheuer 2019), some of the most important German-Brazilian research programmes have been cofinanced by the German Ministry of Education and Research (BMBF) and the Ministry of Economic Cooperation (BMZ). Traditionally, German-Brazilian scientific cooperation has always been very active in many scientific disciplines.[377] In the Amazon region, the National Institute of Amazonian Research (INPA) in Manaus had established cooperation with the Max Planck Institute for Limnology in Plön (Germany) in 1969 in the field of tropical ecology,[378] whereby the experience of Harald Sioli – he did research and lived from 1938 to 1956 in Amazonia – played an important role on both sides.

In the 1990s, projects of the German-Brazilian scientific and technical cooperation within the framework of the SHIFT programme (1990–2002: Studies on Human Im-

375 See chapter II.8.2. In the SHIFT programme, a research group of the UFMT (Núcleo de Estudos Rurais e Urbanos, NERU) worked in close cooperation with the Centre of Latin American Studies (FLA) of the Institute of Geography, University of Tübingen (Research group of Gerd Kohlhepp).

376 Some projects fell victim to the political circumstances during the military dictatorship. An example is the initiative of Orlando Valverde, who, together with his colleagues from the Instituto Brasileiro de Geografia (IBG) of the IBGE and the Department of Geography of the University of Heidelberg, Germany (research group of Gottfried Pfeifer, Gerd Kohlhepp, Gisbert Glaser and Hanna Bremer), wanted to carry out a research project in Amazonia with a small research vessel in the early 1970s. Although an agreement had been concluded between the two institutions in 1971, and financing was secured on the German side, the project failed due to political, administrative, and financial problems of the Brazilian counterpart (cf. Kohlhepp 2017b, 15).

377 Scientific and technological relations have been a central element of cooperation and are highlighted by the German-Brazilian Strategic Partnership Action Plan. The Brazilian Ministries of Science and Education and the German BMBF identified in regular meetings the thematic priorities of their cooperation. Cf. https://www.bmbf.de/bmbf/en/international-affairs/worldwide-networking/the-americas-and-canada/brazil-research-partner-for-sustainability-and-innovation.html#searchFacets (accessed January 14, 2023).

378 The agreement signed in 1969 between the German Max Planck Society and the Brazilian National Research Council (CNPq) opened up new possibilities for bilateral cooperation in tropical ecology research in the Amazon region. As early as 1965, Harald Sioli and his Brazilian colleague Djalma Batista founded the journal *Amazoniana*, a renowned publication in which landscape-ecological and limnological research results have been published (cf. Sioli 1968; 2007).

pact on Tropical Forests and Floodplains in the Brazilian Tropics) provided an excellent opportunity to intensify research on the Amazonian issue creating opportunities for scientists in both countries for basic and applied research, as was already mentioned before.[379] The aim of the multidisciplinary programme, with the focus on life and earth sciences of Brazilian and German university institutes and research centres, was to analyse the impact of human activities on tropical ecosystems, especially in the rain forest regions of Central and Eastern Amazonia, the *várzea* areas, the floodplain of the Pantanal and the catchment area of the Upper Rio Paraguai in Mato Grosso. Different projects contributed to the development of sustainable land use systems in tropical regions.

Another bilateral research programme, the MADAM programme (1995-2005: Mangrove Dynamics and Management) focused on the study of sustainable management of mangrove forests and its resources in the Belém coastal region.

The CarBioCial project (Carbon sequestration, biodiversity and social structures in Southern Amazonia: models and implementation of carbon-optimised land management strategies, 2011–2016), in close cooperation with its Brazilian partner project Carbioma,[380] investigated viable carbon-optimised land management strategies maintaining ecosystem services under changing climate conditions in southern Amazonia. The project was funded by the German Ministry of Education and Research (BMBF), the Carbioma project by the Brazilian National Council for Scientific and Technological Development (CNPq).

The multi- and interdisciplinary Carbiocial project "aims at understanding the vital natural processes and socio-economic driving forces in the region and develops strategies to enhance and protect carbon stocks in the recently deforested agro landscapes of central/northern Mato Grosso and southern Pará" (Gerold *et al*. 2014, 4).[381] Analysing the fundamental factors soil, water, and climate in this "hotspot of global change," the agrarian structures and production models, social and political transformations, it is the goal to find the starting points for a necessary change of local and regional production patterns, considering the local livelihoods as well as the current national and global conditions (Gerold *et al*. 2014; Mello-Théry and Cunha, 2014; Schönenberg *et al*. 2017). The research supported the goals set by the Brazilian ABC programme[382] and international treaties such as REDD and the Kyoto protocol. Brazil is responsible for about 20 % of worldwide carbon emissions caused by tropical deforestation. Drivers of this process are the international agricultural markets, where there is high demand for soybean products, palm oil, and sugar cane for biofuels.

The land use frontier of southern Amazonia with its extremely dynamic processes of land use change was frequently struck by land conflicts. In parts of this region, most of the farmers had no regular land title. As deforestation was accelerating along

379 See chapter II.3.2.2.

380 Scientific programme coordinators were: Gerhard Gerold (University of Göttingen, Germany) and Eduardo Guimarães Couto (Federal University of Mato Grosso, Cuiabá).

381 www.carbiocial.de.

382 In 2010, the Brazilian Government designed the Low-Carbon Agriculture Plan (ABC Plan) to provide resources and incentives for farmers to adopt sustainable agricultural techniques. The objective is to reduce emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from agriculture. (https://www.climatepolicydatabase.org/) (accessed 13.01.2023); cf. chapter II.6.3.1.

the Cuiabá–Santarém highway, associated with major carbon losses and greenhouse gas releases, global interest in mitigating these emissions is high. The relevance of the affected ecosystems (rain forest, *cerradão* and *cerrado*) for carbon storage and GHG cycling is of global importance (Gerold and Hohnwald 2012).

Three regions were selected: Novo Progresso (southern Pará) with the most active deforestation; Sinop (northern Mato Grosso): centre of young soybean production; Cuiabá (central Mato Grosso): established agrarian cultivation (>20 years) and adapted mechanised cropping (e.g., no till).

The research project connected working groups from 17 universities and research centres in Brazil, Germany, and Austria, including the Brazilian agricultural research corporation Embrapa.

The joint main goals of the research cluster were (Gerold *et al*. 2014):

- to perform region-specific analyses in order to improve and apply interdisciplinary sets of models of land use impacts on carbon-stocks, water and GHG balances,
- to develop and optimise viable land management strategies that minimise carbon losses and GHG emission and maximise carbon sequestration,
- to assess the trade-offs between land management options and socio-economic impacts in terms of GHG reduction, profitability, and ecological sustainability,
- to elaborate regionally specified models which are essential and the key target of the project as model calculations of carbon and GHG fluxes from the respective ecosystems for different land use scenarios are still highly uncertain,
- to support the Brazilian partners to implement the optimised techniques in practice, considering the soybean value chain and overall carbon balance.

All research and implementation activities included direct involvement of the stakeholders, such as state environmental agencies, planning authorities and municipal administration, private organisations of farmers, and the agricultural research corporation Embrapa. Joint field experiments for improving carbon storage and ecosystem functions were performed in cooperation with an NGO founded by the farmers' organisation of Mato Grosso.

For the farmers of the region and for the state planning and environmental authorities, this applied research was of great importance as the farmers are increasingly suffering the effects of climate change with longer dry periods, a delayed rainy season, and greater variability in precipitation levels (Mello-Théry *et al*. 2020).

As the region's agriculture is very export-oriented and highly important for Brazilian export revenues, as well as globally relevant in economic and climate policy terms, the findings of this research can certainly offer positive results with far-reaching perspectives.

The ATTO project (Amazon Tall Tower Observatory) is an ongoing bilateral research project since 2009 in the Amazon rain forest to analyse the relationship between climate, atmospheric chemistry, and the rain forest, using highly sensitive instruments. Scientists from Brazil and Germany continuously record meteorological, chemical, and biological data, such as the concentration of greenhouses gases. Because the Amazon region is of such importance to the global climate, it is of vital importance to get a better understanding of these complex processes. The findings will enable to better

predict developments of the climate and more accurate climate predictions in the future.

The research site is located in a largely untouched nature reserve in the Amazon rain forest to the exclusion of direct anthropogenic impacts, about 150 km north of Manaus. The German Ministry of Education and Research (BMBF) had provided financial means for the construction of a 325 m high measuring steel tower (Tall Tower, inaugurated in 2015), built under difficult conditions, with smaller towers (80 m) and a base camp site with air-conditioned laboratory containers in the rain forest. Since 2011, measuring equipment for atmosphere, biosphere, and climate research (carbon dioxide, ozone, volatile organic compounds, nitrogen-containing trace gases, aerosols, meteorology, clouds, weather data and micrometeorology, among others) has been set up. Satellite connection for data transmission and device control exists since 2013.[383] Brazilian funding is realised by Financiadora de Estudos e Projetos (FINEP-MCTI). In addition, six other subprojects are funded by CNPq.

The main research objectives are:[384]

- collecting data on the influence of the vast, largely untouched rain forest on the climate,
- understanding sources and sinks of greenhouse gases such as CO_2, methane and N_2O,
- investigating the formation of aerosols which is important for cloud formation,
- investigating the transport processes of air masses and their alteration through the forest over a distance of several hundred kilometres.

The ATTO data can also serve as a basis for environmental regulations for the sustainable development of the Amazon region.

The German-Brazilian research project Chemistry of the Atmosphere: Field Experiment in Brazil (CAFE Brazil) started in December 2022 and is an extension to the ATTO project. An international research team led by the Max Planck Institute for Chemistry began collecting data on the chemical processes in Brazil's largely clean atmosphere above the Amazonian rain forest. 20 measurement flights with the High Altitude and Long Range (HALO) research aircraft from DLR, the German aeronautics and space research centre, are planned. The flights over the rain forest will follow set patterns to measure vertical and horizontal profiles. The plan also includes "helix" flights, in which HALO spirals up from low altitudes to an altitude of 15 kilometres.[385]

383 Main partners of this German-Brazilian joint project are: Max-Planck-Institute (MPI) for Chemistry, Mainz, Germany; Max-Planck-Institute for Biogeochemistry, Jena, Germany; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil; Universidade do Estado de Amazonas (UEA), Manaus, Brazil. Information about this project was provided by https://www.mpg.de; www.bgc-jena.mpg.de; www.mpic.de; www.bmbf.de; www.inpa.gov.br; www.attoproject.org (accessed January 14, 2023).

384 www.attoproject.org (accessed January 14, 2023).

385 Information about this project was provided by https://www.mpic.de; www.dlr.de (accessed January 14, 2023). Cooperation partners in CAFE-Brazil: Germany: Max-Planck-Institute (MPI) for Chemistry; Frankfurt University; Brazil: Universidade de São Paulo (USP) and Instituto Nacional de Pesquisas Espaciais (INPE). HALO: German aeronautics and space research centre (DLR).

The Amazonian rain forest is of global ecological importance, producing oxygen, stabilising the global climate, and influencing the water and carbon cycles. Dozens of parameters are measured, including aerosols, volatile organic compounds, sulphur and nitrogen oxides, carbon monoxide, methane, ozone, free radicals, and water. In addition to the measurements using the aircraft, data are collected with the help of balloons and drones from the ground at the ATTO research station. Studies conducted at the ATTO station will complement the HALO data. In addition to climate observations at different heights in the atmosphere, ATTO will enable research into the rain forest biosphere. This is a unique opportunity to link measurements in and directly above the rain forest.

Research objectives are to find out how atmospheric oxidation processes take place in the troposphere above the Amazonian rain forest and how they influence the formation and growth of aerosol particles, which are of central importance for the formation of clouds and precipitation. New insights into the interactions between the biosphere and the atmosphere are expected to better explain the fundamental role of the rain forest in the terrestrial system.[386]

8.3. National and international NGOs' research activities in the Amazon region

8.3.1. National NGOs with research activities in Amazonia

In Brazilian Amazonia, a number of regional non-profit and impartial NGOs have played an important role since the 1990s as key actors in the socio-environmental movements together with environmental activists and grassroots organisations in critical monitoring of state regional policy, with special efforts to prevent and control deforestation (Barbosa 2015). This applies in particular to organisations that did not only provide the public discussion with press reports about failed state activities, but which increasingly had scientifically trained staff members, who clearly analysed socio-environmental problems from the point of view of bio-, geo- and social sciences and were therefore able to make specific proposals for solutions to state agencies.

Although these solutions were initially rarely taken up,[387] they have been increasingly considered in project-related implementation in recent years. In some cases, NGOs have also been consulted in the formulation of environmental requirements, especially since public authorities often did not have suitably qualified experts in their ranks.

386 https://www.mpic.de; www.dlr.de (see footnote 384).

387 Some early foundations of NGOs, especially during the military dictatorship, had great difficulty in publishing their analyses when they criticised state decisions and projects. This was the case, for example, for the NGO CNDDA (National Campaign of Defence and Development of Amazonia), founded in 1967 by the renowned geographer Orlando Valverde and some colleagues, with the critical journal *A Amazônia Brasileira em Foco*. Members were renowned scientists as Aziz Nacib Ab'Sáber, Darcy Ribeiro, Warwick E. Kerr, Harald Sioli, Philip M. Fearnside and Irene Garrido Filha (General Secretary), among others. The journal was supported by contributions from members and donations from national and foreign environmentalists and sponsors, as well as congresses of CNDDA (cf. Kohlhepp 2017a, footnote 41).See also chapter I.6.2. for other examples.

National environmentalists and NGOs have made an important contribution to the implementation of environmental issues in the new Constitution of 1988.[388] NGOs have also contributed to the realisation of public policies through participatory processes and incorporation of local communities in environmental management. They often carry out their activities in a conflictual and sometimes hostile "social climate" and have to assert themselves against numerous opponents and strong resistance. NGOs can also act as intermediaries between governments, rural communities and the private sector to implement socio-environmental development programmes and strengthen good governance processes. They have analysed environmental impact assessments of infrastructure projects, such as dams, to support local organisations and communities affected by them (Jordão 2022, 97 f.).[389]

On the other hand, NGOs advocate for the government to change and implement its policies to protect land rights. They induce social pressure through information disclosure in the media and serve as intermediaries between transnational environmental NGOs and communities in campaigns to pressure decision-makers.

The involvement of NGOs in the preparation of expert reports in an advisory capacity for government agencies or also for private donors can of course also lead to the danger of donors exerting too much influence on the independence of NGOs. This is especially challenging, as smaller NGOs often find it difficult to secure their existence on the disputed project market.

All NGOs are of course dependent on donations which are either provided by official authorities, by environmentally or philanthropically oriented foundations, but mostly by private inland and international donors (industrial companies, banks, journals, NGOs, individual donors) either as permanent donations or as one-time transfers. There is an increasing competition on the environmental project market for these donations – there are hundreds of funding organisations with different cultures of action – so that special efforts are required in public appearance, media access and especially on the internet for appropriate self-presentation and explanation of the desired objectives. Success in fundraising depends on public recognition, credibility, reliable management systems (external auditing, accountability, transparency, compliance), profound expertise and reputation related to their professionalism, technical capacity, and permanence in the territory. Open dialogue with all stakeholders, especially at the local level, continuity of leadership and the collaborative presentation of results are especially important (Jordão 2022, 168 f., Table 2-2; 259, Table 3-1).

A big challenge for NGOs is the establishment of a network with partners which can support certain campaigns but of course can also arouse fears about the limited autonomy and competitive thinking. Since international NGOs are usually larger, very well-organised, and globally well-known institutions with a much higher budget, national NGOs also need to cooperate with experienced international partners, which is not always welcome in Brazil.

According to a recent survey, there are 73 environmental NGOs working in Amazônia Legal (Jordão 2022, 168, Table 2-1). In the following, only a few national NGOs can be mentioned that have distinguished themselves through their work and publications around Amazonia.

388 See chapters I.6.1, 6.2.

389 See examples in chapters II.5.2 and II.6.1, 6.2 of this volume.

ISA (Instituto SocioAmbiental/Socio-Environmental Institute) was established in 1994 to work on integrated solutions to social and environmental problems of Indigenous, *quilombola* and extractivist communities. ISA aims to protect their territories, strengthen their culture and traditional knowledge, raise their political profile, and develop sustainable economies. ISA has pioneered the concept of integrating environmental protection and sustainable development and the important cooperation with Indigenous groups in various Amazonian regions.[390] The Institute seeks to strengthen the role of partner communities by promoting forest restoration actions in the basins of the Rio Negro in Amazonas and Roraima and the Rio Xingu in Mato Grosso and Pará.

ISA's work has achieved significant impact by influencing public policies.

> ISA has introduced integrated programmes from satellite mapping and monitoring against land invasions, to sustainable income-generation, to extending formal citizenship. These initiatives have become models for Indigenous socio-environmental development in Brazil and around Latin America.[391]

ISA serves as a national reference for the production, analysis and quality of data on Indigenous peoples in Brazil. Furthermore, in terms of monitoring of protected areas, the organisation produces a wide variety of information which influences public policy decisions and government actions concerning "the defence of collective rights and the protection and conservation of Brazil's environmental heritage."[392] Monitoring programmes are based on Indigenous territories and federal and state conservation units, as well as other public lands. The monitoring follows the processes of demarcation of protected areas and the threats of deforestation, infrastructure impacts, fires, mining, and *grilagem*, providing information to the public debate.

Imazon (Amazon Institute of People and the Environment) is a Brazilian research institution, founded in 1990 in Belém, with studies on conservation and sustainable development in Amazonia. Imazon proposes solutions to problems with the use and conservation of natural resources in the Amazon region. Numerous technical papers have been published in international scientific journals and a large number of books and brochures have been released to support decision-making in the public sector and to communicate expertise to the general public. Since 2008, Imazon has been releasing a monthly "Deforestation Bulletin" with data on deforestation and degradation in the Brazilian Amazonia.[393]

Ipam (Amazon Environmental Research Institute) is a scientific NGO that has worked for the sustainable development of the Amazon since 1995. Its purpose is to consolidate the Amazonian tropical development model by 2035, by producing knowledge, implementing local initiatives, and directing public policies in a way that influences economic development, social equality, and environmental preservation. The aim is to promote science and innovation for an environmentally sound, economically prosperous, and socially just Amazonia, testing the application and viability of public

390 http://www.socioambiental.org/pt-br (accessed January 20, 2023). See chapter II.7.2.

391 Self-declaration of ISA, http://www.socioambiental.org/pt-br (accessed 20.01.2023)..

392 Idem.

393 Self-declaration of Imazon, https://imazon.org.br/en/ (accessed January 20, 2023). .

policies. Extensive data on biophysical factors (topography, soil types, and hydrology) and factors of human influence (critical infrastructure, major protected areas) have been collected to make maps on areas of high and low suitability for agriculture and large mammal habitat. Ipam has an extensive international cooperation and a large network of funding agencies and partners.[394]

The **Instituto Centro de Vida** (ICV),[395] founded in Mato Grosso in 1991, is a non-profit civil society organization of public interest. ICV is an NGO that works to build shared sustainability solutions that reconcile agricultural and forestry production with the conservation and restoration of natural ecosystems and their services (ICV 2022). Its actions reach state, national and international levels in terms of transparency, environmental governance, and public policies, as well as the municipal level through practical experiences. Partnerships exist with various sectors, such as governments, organisations, networks, collectives, companies, and media.

Fase (Federation of Organisations for Social and Educational Assistance), founded in 1961, is a non-profit, non-governmental organisation dedicated to popular education and the defence of human rights, with national operations and regional units in the Amazon region in Mato Grosso and Pará.[396] It operates in the municipalities of the metropolitan region of Belém, Baixo Tocantins and Baixo Amazonas, aiming at regional development and alternatives such as agro-extractivism and cooperativism. It defends the socio-environmental sustainability of territories and supports women's groups encouraging economic and political autonomy.

A number of NGOs also work together with foreign institutions and colleagues in the field of research. This applies – as one example among others – to the NGO Instituto Araguaia and the Frankfurt Zoological Society. There is a cooperation to protect the biodiversity of the Araguaia River Basin and its ecological processes in the Cantão State Park in the state of Tocantins, a "hot spot" for the conservation of biodiversity in the border area of the *cerrado* and the tropical rain forest.

The source and amount of funding will ultimately limit and influence the range of activities of Brazilian NGOs, seeking cooperation with more well-funded international NGOs as far as possible.

8.3.2. The role of international NGOs

International NGOs have contributed to slow down deforestation and reverse environmental degradation in Brazilian Amazonia. Brazilian and international NGOs participated in planning the National Programme for the Protection of the Environment (PNMA).[397] Pressure from international conservation NGOs has mediated government policies (Barbosa 2015).[398]

394 Self-declaration of Ipam, https://ipam.org.br; https://www.devex.com (accessed January 20, 2023). . With 76 partners, Ipam has the most extensive network of partners (cf. Jordão 2022, 355).

395 Self-declaration of ICV, https://www.icv.org.br (accessed January 28, 2023). .

396 Self-declaration of Fase, https://fase.org.br/pt/onde-atuamos/fase-amazonia/ (accessed January 28, 2023). .

397 See chapter II.1.5.

398 Valuable basic information in Mongabay Series: Amazon infrastructure, Amazon conservation. Mongabay is a US-based non-profit conservation and environmental science news platform. Its ex-

In conservative and nationalist circles within Brazilian society, but also among the various governments after the military dictatorship, the socio-ecological activities of international NGOs were and are viewed with a certain degree of suspicion. Not surprisingly, their activities criticising the government's agenda are often interpreted as direct or indirect interference by foreign organisations in Brazil's internal affairs. This is especially the case when pressure of large transnational NGOs has influenced the environmental and climate policy decisions in Brazil with strong effects, such as changes in legal requirements. International NGOs are sometimes in an ambiguous position because their parent countries, the industrialised nations, have incorporated Amazonia into the international commodity chains which to a large extent have caused problems of increasing deforestation.

But their financial resources and cooperation with national NGOs are of great importance for both sides to be able to implement well-prepared and really necessary projects with the appropriate perseverance. International NGOs that want to work in Amazonia need – except permission to work in the country – mainly Brazilian partners and collaborators with a specific local, regional and cultural knowledge as well as political contacts at all levels in the country.

At this point, it is only possible to mention a few transnational NGOs with Brazilian branches that played an essential role in the discussion about an environmentally friendly and more sustainable regional policy in Amazonia and contributed to important decisions.

Greenpeace

Greenpeace is a transnational non-profit organisation which is committed to environmental nature and climate protection as well as peace and, according to its own statements, "fights with direct non-violent actions for the protection of the natural livelihoods of man and nature and justice for all living beings."[399]

Greenpeace has been working in Brazil for 30 years denouncing and confronting governments, companies and projects that encourage the destruction of the Amazon region and threaten the global climate. Greenpeace Brazil investigates the impact of global supply chains in Amazonia, emphasises the problems involved and tries to influence federal, state, and local governments to bring about change by innovative methods of proceeding. The work in Amazonia has included the Amazon soybean moratorium that bans felling native forests for the purpose of establishing soybean plantations to meet EU requirements of responsible soybean production. This agreement happened also due to a large-scale Greenpeace campaign (Nepstad *et al*. 2014; Nepstad and Shimada 2018).[400]

Since 2006, many companies have agreed to stop buying soybeans from Brazilian farmers that destroy the Amazon rain forest. Soybean-financing institutions have also adhered to the compliance of the zero-deforestation policy as a requirement for loans. Greenpeace and other international NGOs continue to pressure national and re-

pertise is respected among science journalism and researchers due to the critical analysis of environmentally relevant state decisions in Amazonia and their effects. https://rainforests.mongabay.com/amazon/ (accessed January 28, 2023).

399 https://www.greenpeace.org/international (accessed January 23, 2023).

400 Cf. chapter II.4.3.

gional institutions into adapting to higher environmental standards to continue being competitive in international markets. Politicisation of commodity chains has brought awareness and positive results for the conservation of the region (Barbosa 2015). This has significantly reduced deforestation for soybean fields in Brazilian Amazonia. Greenpeace investigated the international market's role in cattle-driven deforestation in Amazonia and in protecting critical forest areas from problematic infrastructure expansion. A Greenpeace report gained visibility internationally and propelled the Brazilian government to exert stricter controls on cattle farming and leather operations in Amazônia Legal (Greenpeace 1997; 2009a). The Greenpeace International Amazon campaign includes the adjacent biome *cerrado* which is under serious threat from the same drivers that are devastating the Amazonian rain forests.

Greenpeace commissioned leading researchers from various fields to provide critical and independent analyses of the Tapajos project's "Environmental Impact Study" and "Environmental Impact Report" (EIA/RIMA). The scientists concluded that the EIA/RIMA submitted to IBAMA should be rejected by the licensing agency, because it does not fulfil its purpose of analysing the environmental viability of the project.

Reports prepared by the international NGO Greenpeace have encouraged changes in policies and financing requirements that propelled stricter controls on activities causing deforestation in the Brazilian Amazônia Legal.

WWF (World Wide Fund for Nature)

The WWF, founded in 1961, is one of the largest international nature and environmental organisations. It has worked in Brazil since 1971, but officially opened its office there in 1996. WWF runs dozens of projects in Brazil in partnership with regional NGOs, universities and government agencies. It develops activities in support of research, environmental legislation, public policy, environmental education and communication. In particular, many conservation projects are aimed at stimulating sustainable economic alternatives that both involve and benefit local communities.

> WWF-Brazil is part of the WWF network and currently is working in more than 90 projects in the Amazon, *cerrado*, Atlantic Forest, Pantanal, and marine ecosystems on the Brazilian coast. The aim is to protect and restore biodiversity, strengthen family farming and local production, as well as generate studies on the impact of deforestation and fires. WWF has a strong presence in the climate and energy debate, defending and creating solutions for a future of climate security.[401]

In 2002, Brazil had established the Amazon Region Protected Areas (ARPA) programme, implemented in partnership with federal, state, and municipal governments and the support of the World Bank, the German Government Cooperation Bank (KfW) and WWF Brazil. The programme was the world's largest initiative for the conservation of tropical forests, protecting 60 million hectares (Kohlhepp 2007a).[402]

In 2014, WWF helped launch ARPA for Life (ARPA-phase III), "an initiative securing long-term funding for the programme through an innovative conservation finance approach known as Project Finance for Permanence" (Foster 2022, n. p.). These pro-

401 Self-declaration of WWF, https://wwf.org/international (accessed January 23,2023).

402 See chapter II.5.1; https://www.kfw-entwicklungsbank.de (accessed January 23, 2023).

jects secure necessary policy changes and funding of multiple stakeholders to ensure that large-scale systems of conservation areas are well managed, sustainably financed, and benefit the communities that depend on them. Two decades after its first creation, ARPA continues to play an essential role in the conservation of the rain forest, preserving biodiversity, reducing deforestation and supporting local livelihoods (Foster 2022).

"It is one of WWF's great successes: the world's largest tropical forest conservation area programme has been secured in the long term."[403] Deforestation has been greatly reduced in the Amazonian rain forest, an important carbon reservoir, what is essential for mitigating climate change. Between 2008 and 2020, the protected areas supported by ARPA reduced deforestation by approximately 260 000 km², corresponding to an estimated 104 million tons of avoided CO_2 emissions. ARPA's effectiveness with a reinforced balance of protection and sustainable use can be partly attributed to the programme's management and governance.[404] ARPA has become an icon of conservation efforts in the Amazon biome due to impressive results (Barbosa 2015). The programme currently supports 114 federal and state protected areas distributed throughout the nine states of Amazônia Legal.

A large number of other international NGOs work in the Brazilian Amazonia:[405]

Friends of the Earth is a civil society organisation dedicated to protecting the environment and promoting development with sustainability and social justice. The entity *Amigos da Terra/Brasil* is a member of the International Federation Friends of the Earth, the largest network of grassroots environmental groups. It develops programmes, campaigns and projects that combine resistance, mobilisation, and transformation actions. *Amigos da Terra (Amazônia Brasileira)* defend the compatibility of production with goals of zero deforestation for the two main agricultural commodities, soybeans, and cattle, by 2030.[406]

International Rivers works with threatened communities, Indigenous peoples, social movements, and NGOs to fight destructive dams planned for the Amazon, while supporting alternative strategies to meet legitimate energy needs and promoting the permanent protection of the region's rivers, communities, and livelihoods.[407]

Amazon Watch fights the destruction of the Amazon, supports Indigenous rights and finds climate justice solutions.

The **Amazon Conservation Team** works hand-in-hand with Indigenous leaders to ensure the long-term welfare of the Amazon rain forest.

The **Amazon Conservation Association** has trained hundreds of conservationists who work to support the restoration of the Amazonian rain forest and sustainable Indigenous-led economies.

403 https://wwf.org/international; https://www.wwf.de; https://www.worldwildlife.org (accessed January 23, 2023).

404 "half of the areas ARPA supports are 'integral protection areas,' which strictly limit resource use. The other half are 'sustainable use areas,' which seek to balance conservation with the sustainable use of natural resources by local populations" (Foster 2022, n. p.).

405 The following statements are self-determined statements of the NGOs.

406 http://www.amigosdaterrabrasil.org.br/ (accessed January 27, 2023).

407 https://www.internationalrivers.org/ (accessed January 27, 2023).

Survival International recognises that there is no protecting Amazonia without Indigenous communities leading the way and works to amplify the voices of Indigenous leaders.

The **International Working Group for Indigenous Affairs** focuses on protecting Indigenous cultures, which always includes an environment-first approach.

The **Rainforest Action Network** preserves forests, protects the climate and upholds human rights by challenging corporate power and systemic injustice through frontline partnerships and strategic campaigns.

The **Rainforest Trust** has saved more than 23 million acres of the Amazonian rain forest since 1988 by funding projects that restore and protect ecosystems.

The NGOs mentioned here are only some of the active organisations.

International NGO interactions with economic interest groups included the wood (mahogany), food (soybean and beef), leather, and power (hydroelectric dams) industries. But there are critical opinions as well: "It would not be difficult to find examples of big NGOs proposing sustainable development projects in the Amazon that lack a nuanced understanding of traditional peoples' culture and livelihoods and their environmental impacts" (Barbosa 2015, n. p.).

Without underestimating the achievements of national and international NGOs, however, it must be emphasised that the real guardians of the rain forest are the Indigenous peoples or traditional peasant communities native to Amazonian territories. In recent years, they have organised a considerable number of their own NGOs.[408]

408 Cf. chapter II.7.2.