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Author(s)	Tsuchiya, Akio
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# Development and Conservation Attempts in Amazonia during the Past 50 Years

TSUCHIYA Akio<sup>1,2)</sup>

<sup>1)</sup> School of Integrated Arts and Sciences, Hiroshima University

<sup>2)</sup> Graduate School of Integrated Sciences for Life, Hiroshima University

## 過去50年のアマゾンの開発と保全の試み

土谷 彰男<sup>1,2)</sup>

<sup>1)</sup> 広島大学総合科学部

<sup>2)</sup> 広島大学大学院統合生命科学研究科

### Abstract

Development projects within Brazilian Amazon, such as resource exploitation and civilian settlements, were bulled through by military governments from the 1960s to the 1980s, but since that time, due to domestic hyper-inflation and the anti-logging campaigns of foreign countries, the federal government shifted to environmental conservation. A main turning point was the Pilot Program for Protection of the Tropical Forests of Brazil (PPG7) which was implemented with the financial aid of developed countries. From the second half of the 1990s, however, not only conservation projects in Amazonia but also developmental projects in Cerrado have been supported by stable domestic economies and widespread neoliberalism. The development drive has centered upon infrastructure constructions which promote exporting meat and soybeans. At a local level, the Secretariat of State for Rural Production consists of sections for both development and conservation – family farmer assistance and environmental protection – and the state government for environmental protection segregates the full protection units and the sustainable use units through Ecological-Economic Zoning. Meanwhile, environmental NGOs in various communities have experimented with agroforestry. The relay harvesting of non-wood products helps to increase the biomass and species richness. It is hoped that the local governments will continue to cooperate with agroforestry NGOs in order to raise the behaviors of small farmers.

### 1. A multilateral approach to the Amazon

Except for the rubber boom period from 1887 to 1917, it was the second half of the

20<sup>th</sup> century when large-scale developments flourished in Brazilian Amazonia (Costa, 1989). The military governments strongly executed the developments, and brought about huge forest

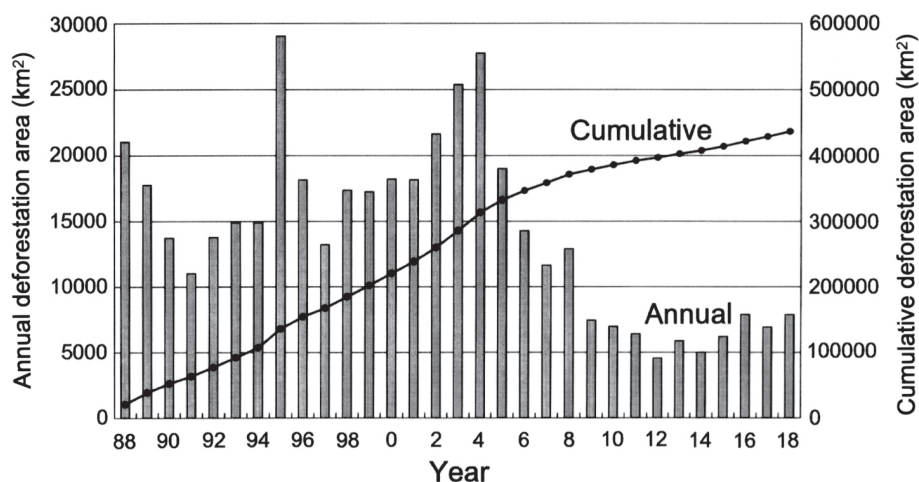


Figure 1. Annual and cumulative deforestation areas in Legal Amazon from 1988 to 2018. Annual data is not obtained from 1970 to 1987, but the cumulative area amounts to 355,000 km<sup>2</sup>. Data: <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes> and “Prodes Analógicos” linked to the site.

disappearance – about 355,000 km<sup>2</sup> during 18 years from 1970 to 1987 – and a further 430,000 km<sup>2</sup> of forests disappeared during the subsequent 30 years (Figure 1). It has been simulated that the percentage of deforestation will reach 40% in the middle of this century (Carvalho *et al.*, 2001, Laurance *et al.*, 2001, Soares-Filho *et al.*, 2004, 2006). Brazilian government officials have believed “the Frontier Theory” that the fortunes sleeping in the five million km<sup>2</sup> of Amazonia should be utilized for improving the standards of living of Brazilians. The objective of the present study is chronologically overviewing the rapid developments, and commenting both on the efforts made toward environmental conservation since the 1990s, and on the dilemma between conservation and development.

For the most part, the alterations made to Amazonian rainforests have been discussed from ecological and earth environmental viewpoints (Nepstad *et al.*, 1999, Davidson *et al.*, 2012). Road constructions and settlements have been executed to support the lumber, meat, and mine industries, but the developments were forced to change to conservation due to the hyper-inflation in the late 1980s and because of criticism from foreign countries against the devastating deforestations.

Consequently, from the first half of the 1990s international organizations launched a variety of conservation projects. In the meantime, the development front has just moved to the Cerrado where meat and soybeans are produced on a massive scale, and the infrastructure constructions have been steadily conducted in order to export the agricultural products (Carvalho *et al.*, 2002). Also, agroforestry has gradually germinated at the level of environmental NGOs. All of these phenomena should be considered, including political, economic, and social aspects during the past 50 years (Alves *et al.*, 2008).

## 2. Changes in policies concerning Amazonia

### (1) Development activities in Amazonia

The first president to seriously be proactive toward inland developments was Getúlio Dornelles Vargas. He founded the Superintendency of Economic Recovery Plan for the Amazon (SPEVEA) in 1953 in order to make use of largely untouched lands. Then, President Juscelino Kubitschek de Oliveira moved the capital to Brasília, 1,000 km into the interior from Rio de Janeiro, in the Target Plan of 1960. Thereafter, the construction of interstate highways started between southern

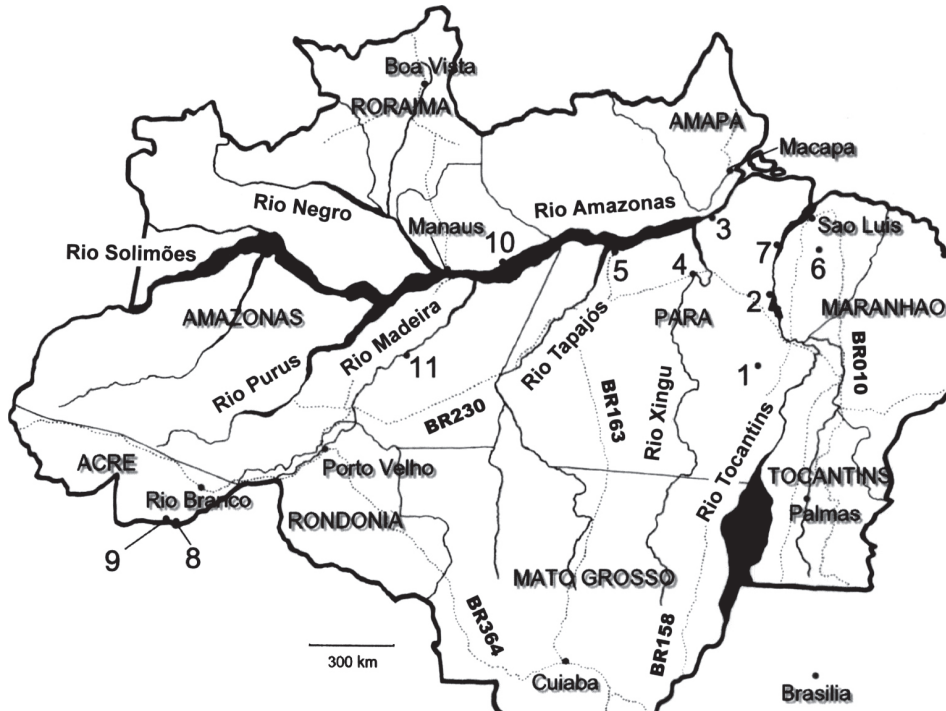


Figure 2. The Legal Amazon (created by the author). Name of STATES, Capitals, main rivers, and interstate roads. Local cities which appear in this paper are 1: Carajás, 2: Tucuui, 3: Gurupá, 4: Altamira, 5: Santarém, 6: Tomé-Açu, 7: Cametá, 8: Eptaciolândia, 9: Brasiléia, 10: Silves, 11: Manicoré.

Brazil and Amazonia. The new highways included BR010 from Brasília to Belém at the mouth of the Amazon River, and BR364 from Cuiabá to Porto Velho in western Amazonia (Figure 2).

Then, a military coup occurred in 1964, and a long dark age continued until 1985, but infrastructure developments in Amazonia advanced during the period. In 1966, President Humberto de Alencar Castelo Branco initiated the Amazon Operation, aiming for stronger border defenses of northern territories. He reorganized the SPEVEA into the Superintendency for Development of Amazon (SUDAM), and set up the area called Legal Amazon, and founded the Bank of Amazonia. The following year, he specified Manaus to be a duty-free city, establishing the Superintendency of Free Trade Zone of Manaus (SUFRAMA). Through these reforms, he intended to concentrate people, goods, and money into Manaus (Castello Branco, 1991). In 1968, President Artur da Costa e Silva set up tax incentives for agriculture and

livestock farming to support settlements and cattle grazing in Amazonia.

The 1970s was a decade for implementing them. President Emílio Garrastazu Médici started the Program of National Integration-I (1970-1974), and the construction of the Trans-Amazonian Highway (BR230) started. In the Program of Redistributive Land Reform (1970), the National Institute of Colonization and Agrarian Reform (INCRA) started settlement of 400,000 people from Northeast Brazil to Eastern Amazonia under the slogan “A land without people for people without land”. Small towns were established such as *Agrovilla*, *Agrópolis*, and *Rurópolis*, and agricultural production began to flourish. However, the federal government’s project, which had aimed to settle a million people into Amazonia, changed into a large-scale development. President Ernesto Beckmann Geisel executed the Program of Growth Pole Development of Agriculture-Stock Farming and Agriculture-Mining in

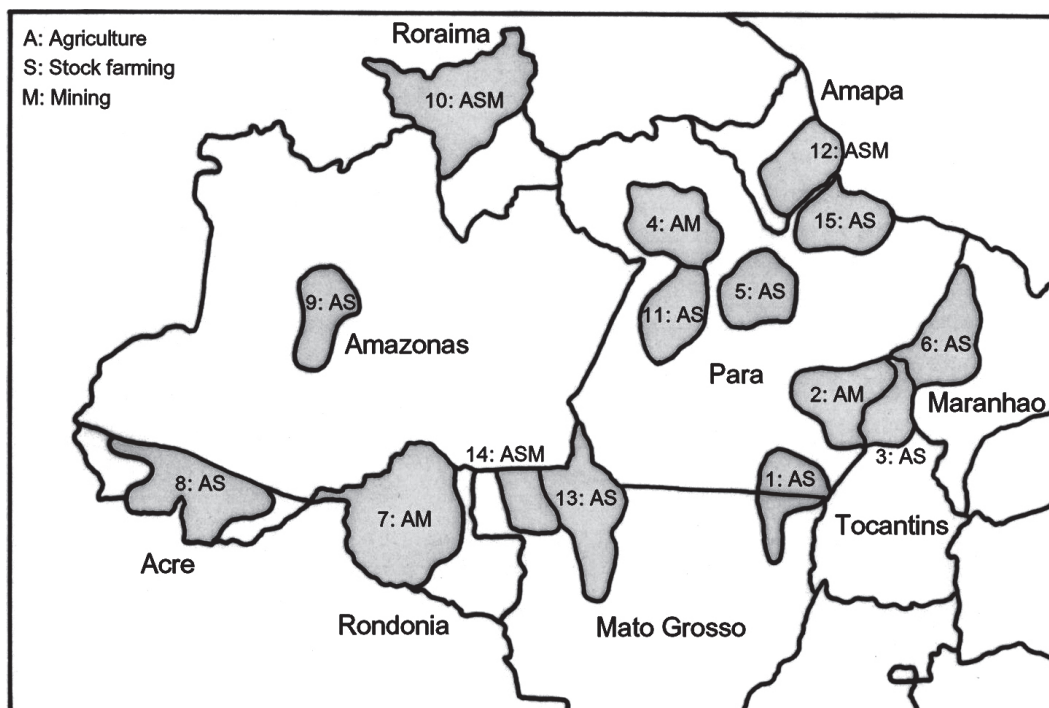


Figure 3. Fifteen development poles in the “Polamazônia”, where 1: Xingu-Araguaia, 2: Carajás, 3: Araguaia-Tocantins, 4: Trombetas, 5: Altamira, 6: Pré-Amazônia Maranhense, 7: Rondônia, 8: Acre, 9: Juruá-Solimões, 10: Roraima, 11: Tapajós, 12: Amapá, 13: Juruena, 14: Aripuanã, 15: Marajó (referred to Conselho de Desenvolvimento Econômico (1974)).

Amazonia (Polamazônia) to carry out growth pole developments in 15 places throughout Amazonia from 1975 to 1980 (Figure 3).

In the 1980s, the scale of developments expanded. President João Baptista de Oliveira Figueiredo started the Great Carajás Project in which strip mining for iron mines was carried out in Carajás in eastern Pará (as for the location, see No. 1 of Figure 2). Itaquí Port in São Luis was expanded for exporting iron ore. The Carajás Railway was constructed between the two cities, and the Tucuruí Hydroelectric Power Station (No. 2 of Fig. 2) was constructed. A number of steelmakers, the World Bank, and the Japan International Cooperation Agency financially supported the project. In western Amazonia, agricultural entrepreneurs were settled around Mato Grosso and Rondônia States through the Program of Integrated Development of Northwestern Brazil (Polonoroeste, 1981-1985) (Bartoli, 2010). After the military government collapsed in 1985,

President José Sarney de Araújo Costa set up the Northern Border Project for the purposes of national defense, the management of indigenous people, preventing smuggling, and supporting gold miners (*garimpeiro*) in the northern territories, which has an area of 1.4 million km<sup>2</sup>. Also, his government aimed to construct 80 hydroelectric dams and pipelines of natural gas in anticipation of future demands in Amazonia.

## (2) Conservation activities in Amazonia

The huge deforestation of Amazonian rainforests came to be seen as a problem by developed countries in the second half of the 1980s, in which logging and pasture expansions, mining, and dam developments were criticized (Fearnside, 1991). Price inflation terribly rose, and Brazil failed in the IMF-led framework, because of the second oil shock in 1979 and because of the foreign debt crisis in Mexico in 1982. In 1987, the Sarney Administration announced a moratorium on interest payments of

foreign debts. The government-led and foreign-dependent development models collapsed, and the development of Amazonia was forced to shift to conservation policies in the form of succumbing to the demands of developed countries. It was the same year when the World Commission on Environment and Development (the Brundtland Commission) submitted a report (Our Common Future) to the United Nations, where the sustainable development was shared among the UN member countries (World Commission on Environment and Development, 1987).

The Sarney Administration put the environmental provisions (Article 225) into the new constitution, promulgated in 1988, and set up the National Council of Environment (CONAMA). The government presented the Our Nature Program which intended to change chaotic development policies into orderly ones. That is, 40% of the Legal Amazon area would come under control of the federal government, log exports would be prohibited, and tax incentives for agriculture and stock farmers would be aborted. The National Institute for Space Research (INPE) started to publish the annual deforestation area through the Project of Deforestation Monitoring in Legal Amazon (PRODES). The next year, to control forest fires (*queimada*), the National System of Prevention of Forest Fires (PREVFOGO) was announced. Also, the National System of Protection of Amazonia (SIPAM) was established in order to utilize satellite information for public security, public health, land use, transport, communication, education, and environmental conservation. As for the environmental conservation policies, regional centers in Belém, Manaus, and Porto Velho made drainage basin maps and a data bank of species richness, while monitoring felling, firing, water quality, concentrations of warming gases, and changes in vegetation areas. Further, the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) was established in 1989, the

Ministry of Environment (MMA) was established in 1992, and the National Council of Legal Amazon (CONAMAZ) and the Secretary of Coordination of Amazonia (SCA) were born in 1993. These institutes started the Project of Ecological-Economic Zoning (ZEE) of Legal Amazon for the purpose of dividing geographical areas into those which should be conserved and those which could be developed. On the international scene, at the G7 Summit in Houston in 1990, West Germany proposed the idea of the Pilot Program for Protection of the Tropical Forests of Brazil (PPG7). The program was put into action in 1992, and continued from 1994 to 2009 mainly through the World Bank and donor countries (Antoni, 2010). Also, the United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro in 1992 in which the Rio Declaration, Agenda 21, the Framework Convention on Climate Change, the Convention on Biological Diversity, and the Declaration on Forest Principle were concluded.

### (3) Amazonia and Cerrado

Conservation policies dulled the pace of development in Amazonia, but the pace accelerated in Cerrado where the agribusinesses of meat and soybean production prospered (Walker *et al.*, 2009). Stock farming is predominant in the deforestation arc from southwestern to northeastern Amazonia, called cerrado (Figure 4). Soybean fields are also concentrated in cerrado. The agribusiness was influenced by Neoliberalism which became powerful in Brazil in the 1990s. It was a departure from the previous models of national integration of Amazonia, and on earning huge amounts of money via multinational companies dealing with stock farming and plantation agriculture. Therefore, the government strongly supported road construction for transporting meats and crops from Cerrado to the Western and Asian countries via Amazonia.

President Fernando Henrique Cardoso, who

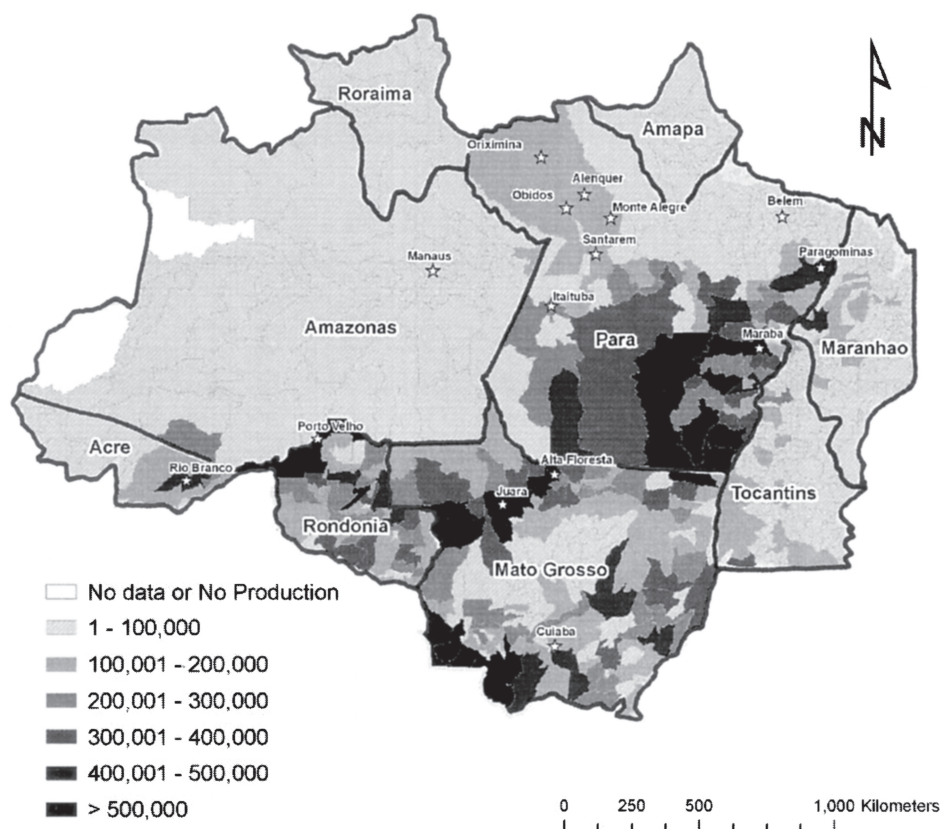


Figure 4. Number of cattle by municipality in the Legal Amazon in 2005 (Walker *et al.*, 2009).

succeeded in calming down the hyper-inflation in “the Real Plan”, incorporated the Integrated National Policy of Legal Amazon (PNIPA) into a multi-year plan (“Brazil in Action”, 1996-1999). He also promulgated the Environmental Crimes Act in 1998, in which penalties were applied to criminals who were involved in deforestation, illegal burnings, and contracting for land sales without permits. Further, the Program for Prevention and Control of Forest Fires in Legal Amazon (PROARCO) was announced in 1998 (Justino & Andrade, 2000). When the Forest Code was amended in 2000, the duty of forest conservation was raised to 80% of land area of settlers, but instead, the agricultural land tax was exempted, and that of afforested areas was reduced.

The second phase of the Cardoso Administration announced “Brazil Advances” as a multi-year plan (2000-2003) in which the National Axes of Integration and Development (EINDs) was included. In the program, the land

of Brazil was divided into nine axes, including three axes in the Legal Amazon. The government planned to construct not only interstate highways but also waterways, railroads, and hydroelectric power stations in order to carry primary products to domestic markets and up to international markets. The Initiative for Integration of Regional Infrastructure in South America (IIRSA), which was announced in 2000, had 12 developmental axes, and three axes were common with those of EINDs (Tavares, 2016). As a conservation policy, the Surveillance System of the Amazon (SIVAM), the largest environmental monitoring system, began operating in 2002. It has a radar exploitation system which penetrates forest canopies even during night and rainy days. The collected data have been used for zonings, patrolling indigenous people, and monitoring forest fires, crimes, and aircrafts. The Integrated System of Alerting Deforestation in Cerrado (SIAD-Cerrado, 2002) has also been a system to expose illegal logging

using satellite information.

Luiz Inácio Lula da Silva, who was inaugurated as President of Brazil in 2003, basically followed the policies for Amazonia of the previous president, and in rapid succession, announced development and conservation policies. The Program of Sustainable Amazon (PAS, 2003) was his basic policy for Amazonia. Sustainable production, environmental management and regional order, social inclusion and citizenship, and supporting an industrial base for development were the main pillars of the program. Both the Action Plan for Prevention and Control of Deforestation in Legal Amazon (PPCDAM), and Real Time Deforestation Detection System (DETER), which were announced in 2004, were monitoring side projects. The INPE explored occurrence points of forest fires using Advanced Very High Resolution Radiometers, and immediately reported the information to government agencies (Laurance,

2003).

Lula's developmental policies were incorporated in a multi-year plan ("Plan for All of the People in Brazil, Participation and Inclusion", 2004-2007), including the construction of hydroelectric dams at Belo Monte in the Xingu River, and Jirau and Santo Antônio in the Madeira River (Figure 5). Inhabitants have opposed the constructions because the electric generating capacity largely decreases in dry season due to shallow water depth in topographically flat Amazonia, a huge amount of methane arises from wide submerged forests. The export of soybeans and iron ores dramatically increased due to resource diplomacy between India/China and Brazil. The GDP growth surpassed 6%, and foreign debt contrarily decreased. In 2005, Brazil got out of the IMF financial assistance, and became a creditor country in 2007.

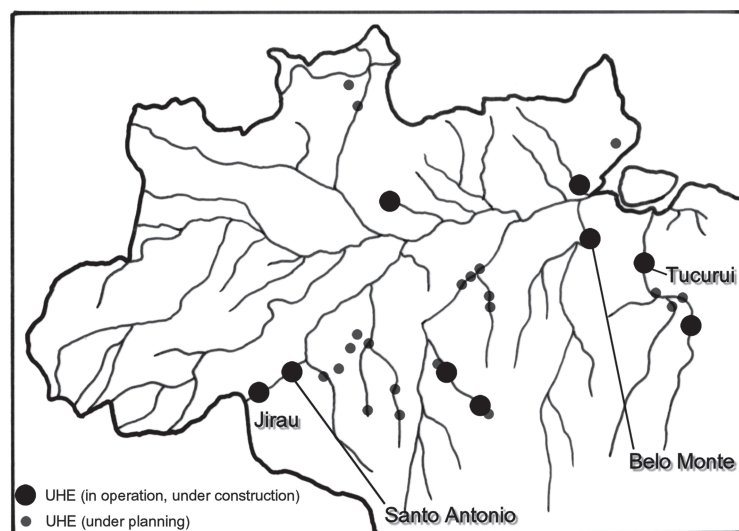


Figure 5. Location of hydroelectric power plants which are now in operation (●)/under construction (●).  
Data: <http://dams-info.org/pt>.

The federal government presented the Soybean Moratorium (2006) in order to prohibit new cultivation of soybeans in the Legal Amazon, and attempting to block the spreading north of soybean fields. Also, the Public Forest Management Act (2006) aimed to entrust forest management to

private sectors by leasing public lands for 40 years as a public-private co-management. In 2008, the government announced the National Policy on Climate Change (PNMC). This was a control measure of CO<sub>2</sub> emissions from deforestation in Amazonia and Cerrado just before the 15<sup>th</sup>



Conference of Parties of the United Nations Framework Convention on Climate Change in Copenhagen. The policy aimed to reduce annual CO<sub>2</sub> emissions by 36.1-38.9% until 2020 in the scenario of “Business As Usual”, and to reduce emissions to 16 hundred million tons in the high governance scenario. Brazil came to be recognized as one of BRICS countries in the 2000s, and the government tried to show its environmental protection efforts on the international stage. In 2009, a Presidential Decree was announced concerning the zoning of sugar cane, which intended to reduce Amazonian sugar cane cultivation for producing bioethanol. Further, in the same year, the government announced the Action Plan for Prevention and Control of Deforestation and Forest Fires in Cerrado (PPCerrado). It was decided that not only the MMA and state governments but also companies and environmental NGOs would participate in the project.

The second phase of the Lula Administration presented the Plan of Sustainable Amazon (PAS) as a multi-year plan (2008-2011). It leaned toward infrastructure construction, including extension of the North Railway and North-South Railway. The Program of Growth Acceleration (PAC, 2009-2011) promoted the construction of hydroelectric power stations. Also, the government presented the Ecological-Economic Macro-zoning in Legal Amazon (MacroZEE) in 2010. This zoning system was composed of three pillars: the network territories for connecting development poles which had already been opened, the frontier territories for expanding agroforestry and stock farming, and the zoning territories for progressing zonings in Amazonian rainforests and Pantanal in Mato Grosso. Importantly, the system was executed with PAS as “two wheels of a car”. However, only the zoning territories were for environmental conservation. Thus, the system was criticized because it is not different from the EINDs of the Cardoso Administration. After the

presidency changed to Dilma Vana Rousseff, the Forest Code was revised (New Forest Code) in 2011, in which “the 80% rule” was maintained, but the obligation to reforest illegally-fallen areas was exempted, which was a retreat from the previous one. Later, the European currency crisis and declines in demand for iron ore in China as well as bribery scandals involving the Rousseff and the subsequent Michel Temer Administrations made the Brazilian GDP decrease rapidly, and the environmental politics in Amazonia also have been partially suspended. Jair Messias Bolsonaro, who was inaugurated as President in 2019, is an ultraconservative politician with a military career. He has already permitted mining and hydroelectric power developments in indio-protected areas, making up an area of 17% of the Legal Amazon. It is feared that he might lean toward further developmental activities similar to those of the military era from the 1960s to the 1980s.

### **3. Details of the conservation system**

#### **(1) Executing agencies**

Conservation projects have been presented by the federal government, international organizations and environmental NGOs. The MMA has been responsible for the conservation projects of the federal government. In the PPG7, the MMA committed to all the five themes: public-private co-managements, sustainable use of natural resources, monitoring of large-scale felling and burning, sustainable land development, and support for science and technologies. The MDA has supported settlers through agricultural financing, and has executed the Proambiente, a rewarding system to inhabitants for their environmental protection services. The World Bank has made the largest contribution among international organizations. In the PPG7, it acted as a coordinating body among donor countries, the Brazilian government and NGOs, and promoted a variety of projects in the

PPG7. The World Bank independently executed the Amazon Region Protected Areas Program (ARPA) in which the ZEE was expanded to 12% of the whole Amazonia. The United Nations Development Program (UNDP) supported the PPG7, and the United States Agency for International Development (USAID) supported the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), the activities of The Nature Conservancy (TNC), the Worldwide Funds for Nature (WWF) and Conservation International (CI), as well as the PPG7, too (LBA, 1996). Instead, the WWF financially supported the ARPA of World Bank and the Corredores (conservation projects in two places

in Atlantic Forest and five places in Amazonia).

Most environmental NGOs were founded before/after the UNCED in 1992 (Table 1). Here are examples of leading environmental protection groups: Amazon Institute of People and the Environment (IMAZON) was established in Belém, Pará in 1990. It has focused on deforestation, land use changes, large-scale burnings, mining, lumber factories and highway construction, and has supported local communities. It participated in the ProManejo of PPG7. The Institute of Environmental Research of the Amazon (IPAM) is an organization established within the Federal University of Pará in 1995, and has carried out joint research with Woods

Table 1. Three types of environmental NGOs (created by the author). Upper: comprehensive, middle: agroforestry-shifted, lower: authentication-related organizations.

Organization	Founded	State
IMAZON: Amazon Institute of People and the Environment	1990	Para
IPAM: Institute of Environmental Research of the Amazon	1995	Para
FASE: Federation of Organs for Social and Educational Assistance	1961	Para
IESA: Institute of Socio-Environmental Studies in Amapa	1995	Amapa
GTA: Amazon Working Group	1992	Brasilia
FVA: Amazon Victory Foundation	1990	Amazonas
SOS Amazonia	1988	Acre
CTA: Center for Amazonian Workers	1988	Acre
ISA: Instituto Socioambiental	1994	Sao Paulo
CAMTA: Integrated Agricultural Cooperative of Tome-Acu	1949	Para
ECOPORE: Ecological Action Guapore	1988	Rondonia
RECA: Association of Small Farmers and Agrosilviculturists of the Economic, Intercropped, and Dense Reforestation Project	1989	Rondonia
PESACRE: Research and Extension Group of Agroforestry System in Acre	1990	Acre
POEMA: Program of Poverty and Environment in Amazonia	1991	Para
CEPEAM: Center of Environmental Projects and Studies of Amazonas	1993	Amazonas
APACC: Association of Assistance for Poverty Communities in Para	1994	Para
CAPEB: Agricultural-Extractive Cooperative of Rural Products in Eptaciolandia and Brasileia	1996	Acre
RIOTERRA: Cultural and Environmental Study Center of the Amazon Region	1999	Rondonia
AVIVE: Green Life Association of Amazonia	1999	Amazonas
ASFLORA: Friends of Amazonian Forest	2000	Para
HANDS: Health and Development Service	2001	Amazonas
IMAFLORA: Institute of Agricultural and Forest Management and Certification	1995	Sao Paulo
Instituto Cabruca	2007	Bahia
Friends of the Earth Brazilian Amazonia	1989	Sao Paulo

Hole Research Center of the U.S. It participated in the Proambiente. The Federation of Organs for Social and Educational Assistance (FASE) is an old NGO which has survived the oppressions of military regimes since 1961. In Gurupá (No. 3 of Fig. 2), a small town along southern coast of the Amazon River, the FASE carried out fieldwork regarding improvements in living standards and environment-friendly economic developments. The Institute of Socio-Environmental Studies in Amapá (IESA) is an NGO which was founded in Macapá, Amapá State in 1995. It has aimed for improvements in life standards of people living along rivers, and the conservation of nesting places of wild birds. It participated in the Proteger II. The Amazon Working Group (GTA), which was established in 1992, has headquarters in Brasília, and 16 branches in the Legal Amazon. As the representative of Brazilian NGOs (513 organizations), it participated in the Proteger as a regular member, and executed Proambiente as well. It supports permanent family housing, respect for social and environmental diversities, resolution of regional conflicts, abolition of biased coverage, education for sustainable development, solidarity with other states in Amazonia, and legislation which guarantees women's rights. The Amazon Victory Foundation (FVA), which was established in 1990, works on managing residents who live in national parks, supports the Ianomami Tribe, and creates Extractive Reserves in the catchment area of the Negro River. The SOS Amazonia, an NGO in Rio Branco, Acre State which was established in 1988, has participated in management projects concerning national parks and zoning works. The Center for Amazonian Workers (CTA) was founded by Chico Mendes, a rubber extractor, in Rio Branco in 1983. It works on forest conservation, education, and health care for local residents living near extractive reserves. The Instituto Socioambiental (ISA), which was established in São Paulo in 1994, is an NGO supporting indigenous people. Along

with Caiapó Tribe, it opposes the Belo Monte hydroelectric power station near Altamira (No. 4 of Fig. 2).

Some of the activities of these NGOs are supported by the budgets of the federal government and international organizations with environmental protection funds. For the government and organizations, the existence of NGOs is invaluable because the NGOs actively engage in activities in the interior. The administrative sectors and NGOs are in a give-and-take relationship.

## (2) PPG7

The PPG7 (1994-2009) was the first case in which developed countries, international organizations, and the Brazilian government collaborated for forest conservation in Amazonia and Atlantic Forest. The initial budget was 346 million US dollars, 50% of which was contributed by Germany. Also, the EU, England, the U.S., the Netherland, Japan, Italy, and France entered their names as donor countries. The participants worked on five themes: the practical attempts and demonstrations for environmental conservation and sustainable development, nature and resources conservation (zonings and designations of protected areas for indigenous people), reinforcements of administrative sectors, enhancements of research institutions, and enlightenment dissemination activities.

The donor countries took charge of discussion and evaluation of subprograms/projects, and the Brazilian government (MMA, IBAMA, MCT, FUNAI) and NGOs executed them (Figure 6). The Subprogram of Demonstration Projects (PD/A) was a project to showcase environmentally-friendly local industries. More than 190 places were selected in Amazonia. The Demonstration Projects of Indigenous People (PDPI) was a project to demonstrate the everyday life of indigenous people. The Project of Extractive Reserve (RESEX) was a project to protect extractive forestry, such

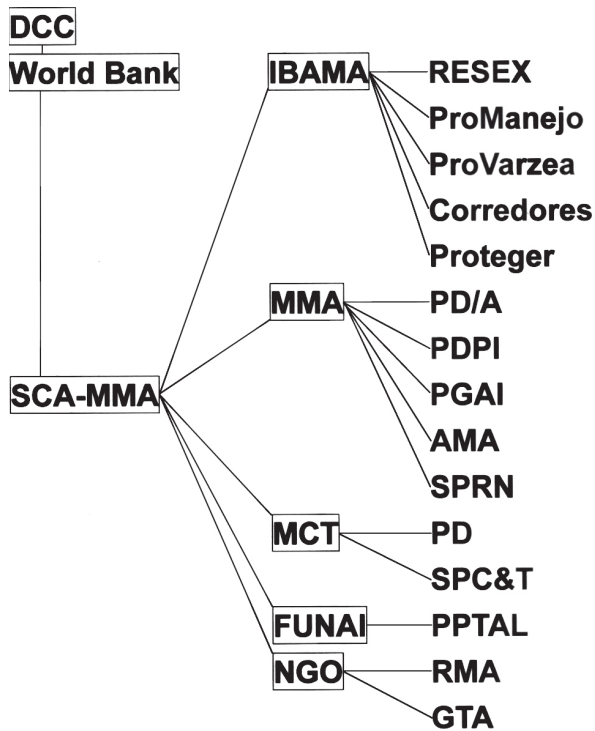


Figure 6. Structure of PPG7, which is made of Donor Countries Committee (DCC), World Bank, and Amazon Coordination Bureau (SCA) of MMA. Projects are operated by Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), Ministry of Environment (MMA), Ministry of Science and Technology (MCT), National Indian Foundation (FUNAI), and NGOs.

as seeds, fruits, latex, and resin; a total area of 21,600 km<sup>2</sup> was designated. In the Integrated Project for Protection of Land and Indigenous People in Amazonia (PPTAL), 149 districts (29 million hectares) were designated as the protected areas of indigenous people. The Subprogram of Science and Technology (SPC&T) aimed to support sciences and technologies dealing with the biological resources of Amazonia, and natural resource policies for sustainable utilization were executed in the Subprogram of Natural Resources Policy (SPRN). The Support Project for Forest Management in Amazonia (ProManejo) assisted the forest management of Amazonian rainforests, the Project of Natural Resources Management of Várzea (ProVárzea) assisted the natural resource management of flooded forests, and the Project

of Mobilization and Training for Prevention of Forest Fires in Amazonia (Proteger) advocated for forest fire prevention campaigns. The ecological corridors in two places in the Atlantic Forest and five places in Amazonia were conserved through the Ecological Corridors Project (Corredores). The Project to Strengthen the GTA Network (GTA) aimed to enforce the Amazon workers federation, and the Support Project for the NGO Network in Atlantic Forest (RMA) assisted the federation of environmental NGOs along the Atlantic coast. The Support Project for Monitoring and Evaluation (AMA) was a project to monitor and analyze all the projects of PPG7, and to find more effective supports.

In relation to these projects, the following problems were pointed out: the PPG7 had so many objectives, the target area was too wide, any police/administrative power was not possessed, the cooperation with existing programs of federal government was insufficient, it took a long time to execute anything due to the bureaucracy peculiar to Brazil, the administrative expenses were overwhelming, most projects were concentrated into a few NGOs, and only a small number of companies participated.

### (3) Individual projects

The ProVárzea started in 1994, which was assisted by the MMA/IBAMA. It aimed to raise the living standards of people living in inundated areas (*várzea*) from the middle to the lower course of the Amazon River. The concrete goals were the collection of knowledge and information of várzea, the monitoring of natural resources, sustainable developments, and the empowerment of women (Santos, 2005). For example, the IPAM instructed the breeding of *pirarucu*, and increased the product to 15 times as much as before (Vidal *et al.*, 2015). The INCRA started the Agricultural-Extractive Settlement Projects (PAEs) in 2006, which helped to settle 11,400 families into nine prefectures

near Santarém (No. 5 of Fig. 2). The Technical Assistance and Rural Extension Enterprise (EMATER) visited schools to lecture on the water/garbage issues of várzea. The ProVárzea shifted to a second phase (2003-2010). For example, the production of river shrimp, honey, non-wood products using latex and resin such as soap, candle, crème, aroma oil, and medicines were supported from the stages of production to sale (WWF-Brasil, 2013).

The ProManejo, which was initiated by the MMA/IBAMA in 1999, was a project of sustainable utilization of forests, consisting of three pillars of activity: support for forest management, the monitoring of sawing activities, and support for people around extractive reserves in Tapajós National Park near Santarém. Regarding forest management, it supported low environmental impact management projects in various places in Amazonia. In the monitoring of sawmills, the

IMAZON conducted interviews to get information about felling, transport, and lumber processing activities. It financially supported the community in the Tapajós Park. Also, it executed surveillance activities to prevent illegal felling in the park. Further, it assisted infrastructures for eco-tourism and environmental education for visitors to the park (Veríssimo, 2005).

The Proteger was also executed by the MMA/IBAMA. It started in 1998, as a part of PROARCO. The state governments, except for Amazonas, and NGOs such as the GTA took charge of practices (Sauer, 2005). To decrease the amount of indiscriminate burnings, both Proteger I and II enlightened the agroforestry through home visits and seminars at communities of family agricultural households. A textbook was published for lectures at a school. Deforestation area and satellite images indicating the places of burnings were disclosed to inhabitants (Figure 7).

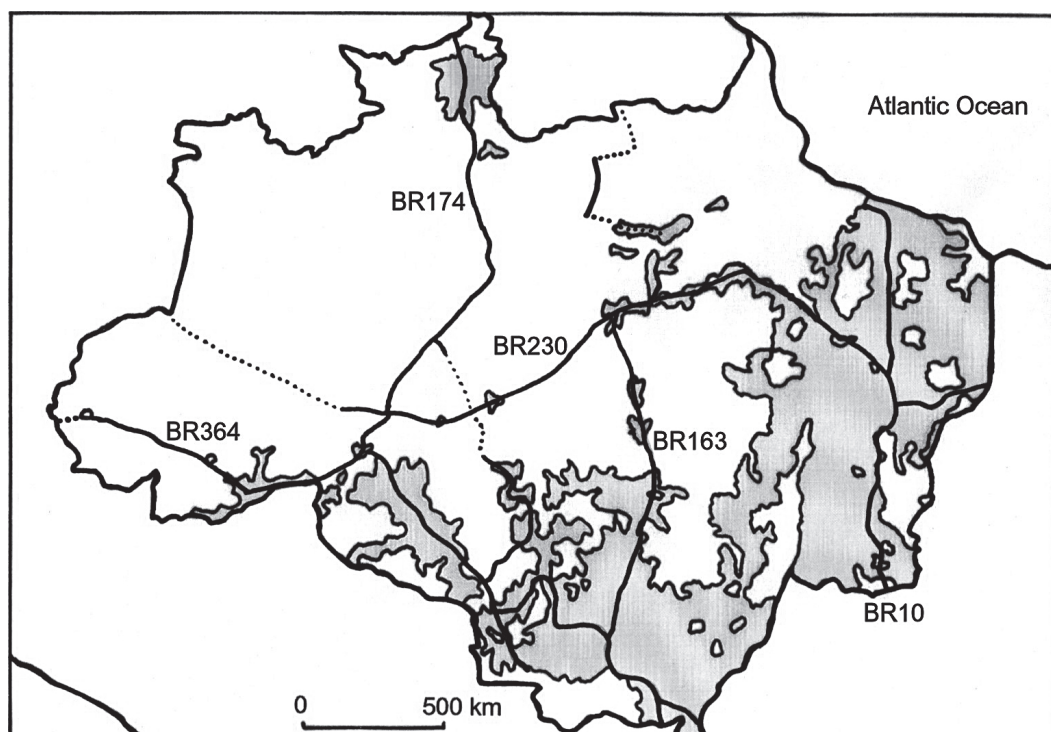


Figure 7. Distribution of deforestation area in 2017 (referred to <https://www.socioambiental.org/pt-br/noticias-socioambientais/amazonia-esquartejada>).

#### 4. Two-sided functions at the state level

##### (1) Assistance for small farmers

At the forefront of developmental and conservational works are the Secretariat of State for Rural Production (SEPROR) and the Institute of Agriculture and Ranching Development and Sustainable Forestry of Amazonas State (IDAM). More than 80% of all farmers in Brazil (43 million people) are engaged in family agriculture, and the amount of production accounts for 10% of the GDP. Therefore, the federal government has made efforts to strengthen family agriculture. The National Program for Family Agriculture Enhancement (Pronaf) is a system to financially support small farmers. There are differences in the upper limits of loans among petty, small-scale, middle-scale, and large-scale farms, and a variety of loan categories have been set up such as *Pronaf Mais Alimentos* (food production), *Pronaf Agroindústria* (agroindustry), *Pronaf Floresta* (forestry), *Pronaf Semiárido* (semi-arid regions), *Pronaf Mulher* (women), *Pronaf Jovem* (youngsters), *Pronaf Custeio e Comercialização de Agroindustriais* (sales and marketing in agroindustry), *Pronaf Cotas-partes* (allotted charges), *Pronaf Agroecologia* (ecological agriculture) (Mattei, 2005). The Constitutional Fund for the North Region (FNO) which was established in 1988 supplies loans via the Bank of Amazonia. The financial resource is the revenue of the federal government (up to 0.6%), and is loaned to agricultural and stock farmers and processors. The State Fund of Support for Micro and Small Business and Social Development (FMPES) is another system to support agriculture and stock farming and small businesses in which applicants get loans from the state bank, after procuring guarantors.

At the state level, the IDAM provides the Pronaf and technical assistance to farmers, that is, technical instructions and supplying services

regarding agricultural materials and machines. The IDAM has a branch in each prefecture (totaling 66 branches). Each branch consists of a few engineers and 4-5 technical experts in agriculture, fishery, forestry, and veterinary medicine. They instruct the cultivation of vegetables, flowers, livestock, and fish breeding, and supply materials such as seeds, seedlings, vaccines, and agricultural chemicals as well as machines. The instruction fees encompass 2% of the amount of loans from the Pronaf, FNO, and FMPES.

##### (2) Regional zoning

The conservation sectors of state governments are related to the CONAMAZ and IBAMA, and the Institute of Environmental Protection of Amazonas State (IPAAM) are positioned as branch offices of IBAMA. Most developmental activities are applied to IPAAM which issues licenses based on environmental protection. Land development of more than 100 hectares requires an Environmental Impact Assessment (EIA), each felling of more than 2,000 hectares needs a permit and an EIA, and forest management of less than 500 hectares also has to fall under the examination of both the IBAMA and IPAAM.

The ZEE is also designated by the IPAAM with the Project for Integrated Management of Environment (PGAI). For example, the MMA carried out fieldwork on the ecological, economical, and social characteristics of local areas, and held workshops in the National Project for Public and Private Integrated Actions on Biodiversity (PROBIO) in 1996, and the results were used for zoning works. Ministries other than the MMA also had different zoning systems, but they were standardized into 12 categories by the National System of Nature Conservation Units (SNUC) in 2000 (Bartoli, 2010). There are five categories as Full Protection Units (UPI): Ecological Stations, Biological Reserves, National Parks, Natural Monuments, and Wildlife Refuges.

Table 2. Percentage of conservation areas, indigenous people protected areas, public lands (military land), and private lands (farmland, pasture) of each state in Legal Amazon (referred to Bartoli, 2010).

State	Area (km <sup>2</sup> )	Conservation areas (%)	Indio protected areas (%)	Public lands (%)	Private lands (%)
Acre	154,000	18.4	11.9	39.6	30.9
Amazonas	1,568,000	16.9	21.6	53.7	7.8
Amapa	142,000	14.1	7.9	66.2	12.3
Para	1,253,000	9.1	19.3	43.9	24.1
Rondonia	238,000	34.4	17.3	24.4	24.0
Roraima	225,000	14.3	57.3	17.8	10.6
Mato Grosso	907,000	3.2	10.8	33.4	52.6
Tocantins	278,000	9.5	7.1	21.2	62.3
Total	4,765,000	14.9	16.8	37.7	30.6

There are seven categories as Sustainable Use Units (UUS): Environmental Protection Areas, Areas of Relevant Ecological Interest, National Forests, Extractive Reserves, Fauna Reserves, Sustainable Development Reserves, and Privately Owned Nature Reserves. The percentage of UPI is different among states in the Legal Amazon (Table 2). The percentage can be as small as 16.9% in the case of Amazonas State, where developments have been limited. In Tocantins and Mato Grosso where large-scale developments were widely conducted, the percentage of private lands is as high as 52.6% and 62.3%, while the percentage of conservation areas is less than 10%. In addition, the IPAAM incorporated the projects of PPG7 into the PGAI; for example, the RESEX, ProManejo, ProVárzea, Corredores, Proteger, and PPTAL were executed at the state level.

### 5. Sprouting of agroforestry

The agroforestry system (SAF's), which started in a private sector in Amazonia, is explained here. Japanese immigrants colonized Amazonia in 1928, but they failed in the cultivation of cacao due to a lack of knowledge concerning tropical agriculture. Then, their assets were confiscated at the beginning of the World War II. When the plantation of black pepper got on the right track,

however, the yield of only 500 families increased up to 5% of that of the world during the first half of the 1960s. However, because the pepper originally grows on shaded forest floors, the open-field post cultivation caused fusarium disease, and the yield dropped. From the 1990s, the Integrated Agricultural Cooperative of Tomé-Açu (CAMTA) (No. 6 of Fig. 2) came to center upon the harvesting of non-wood products such as fruit, palm, resin, latex, and seed oil extraction (Table 1). Such harvesting and cultivation were established in the Successional Agroforestry System, which is a relay cultivation from annual crops, perennial crops, low-rise fruit trees, palms and middle-layer trees, and finally to high-rise trees. The SAF's and the teaching activities were evaluated, and technological authentications have been given to CAMTA since about the year 2000.

The SAF's have arisen in other settlements, and have expanded to the whole of Amazonia. The Ecological Action Guaporé (ECOPORE) is an NGO which has executed fieldwork in Rondônia since 1988. It steadily works on the transplanting of seedlings for restoring devastated lands and for environmental education. The Association of Small Farmers and Agrosilviculturists of the Economic, Intercropped, and Dense Reforestation Project (RECA) was also founded in Rondônia in 1989. It is famous for reforestation which raises the forest

values of mixed stands when possessing the trees for a long time without large-scale burning. The Research and Extension Group of Agroforestry System in Acre (PESACRE) is an NGO which was established in Rio Branco in 1990. It coordinates and promotes SAF's techniques with the Federal University of Acre and the University of Florida in the U.S. The Program of Poverty and Environment in Amazonia (POEMA), which was born in the Federal University of Pará in 1991, has a distributor firm, and a German automobile company produces head rests using the fibers of palms cultivated by small farmers through the distributor. The Center of Environmental Projects and Studies of Amazonas (CEPEAM) is an NGO which was established in Manaus in 1993. Its enrichment afforestation, which is a linear seedling afforestation of valuable tree species, was highly evaluated, and the land which it helped to improve was designated as a natural heritage-private protected forest by IBAMA. The Association of Assistance for Poverty Communities in Pará (APACC) is an NGO which supports small-scale farmers and fishermen in Cametá (No. 7 of Fig. 2) at the mouth region of Tocantins River. It has taught local residents about poultry and pork mixed agroforestry, attempting to convert the previous slash-and burn agriculture of cassava (*mandioca*) to multi-item cultivation (Scalabrin, 2013). The Agricultural-Extractive Cooperative of Rural Products in Epitaciolândia (No. 8 of Fig. 2) and Brasileia (No. 9 of Fig. 2) (CAPEB) is an agricultural cooperative established in southern Acre in 1996. It has worked on the sales of forest/agricultural products, materials, and machines for SAF's, and gives technical advice to members. The Cultural and Environmental Study Center of the Amazon Region (RIOTERRA) is an NGO founded in Rondônia in 1999. It has dealt with a variety of projects such as the Amazon Backyards Project (seeding for sustainability), feasibility studies on the increase in biomass in the RESEX communities related to REDD+, fish

breeding, education for minority tribes, career training for women, and family register acquisition. The Green Life Association of Amazonia (AVIVE) is also a SAF's NGO in Silves (No. 10 of Fig. 2), Amazonas established in 1999. It is mainly made of women, and purposes to manage forests of rosewood and other valuable tree species, extract the essential oils, produce aroma oils and soaps, and sell the products. The Friends of Amazonian Forest (ASFLORA) is a Japanese NGO for afforestation and environmental education, which was founded in 2000. Since 1992 it has annually carried out the Eastern Amazon Tropical Forest Regeneration Experiment with the Japanese Center for International Studies in Ecology (JISE), which is characterized by a high-density planting of native tree species. The Health and Development Service (HANDS) is a Japanese health care NGO, which started activities in Manicoré (No. 11 of Fig. 2), Amazonas in 2001. In order to improve the dietary habits of eating only fish and farina, HANDS educated the SAF's with CAMTA until 2015. When a Japanese motorcycle company built a test course in an abandoned pasture in the northern Manaus in 2000, the state government requested to conserve the surrounding forests. Then, a few employees planted more than 25,000 seedlings of fruit and palm species in 400 hectares, and now supply the fruits to the company's cafeteria every day; this is an example in which a private sector regenerated a deteriorated pasture where livestock grazing had been carried out.

The SAF's are highly productive and labor intensive, utilize low-levels of fertilizers, and always have some crops to ship throughout the year. The forest serves to recover the biomass and biodiversity as well (Schroth *et al.*, 2002). The profit is far larger than that from grazing, and contributes to sedentary agriculture and job creation. What SAF's aim for does not contradict with the regional zoning, and federal/state governments encourage the activities of SAF's.



Fuel and vehicle costs burden small farmers living in interior regions, so it is indispensable to raise the product values by receiving authentications of high quality. The Institute of Agricultural and Forest Management and Certification (IMAFLOA), established in São Paulo in 1995, was registered in the Forest Stewardship Council. It authenticates sustainable activities of agriculture, forestry, and stock farming in order to raise the name values of producing areas. The Institute Cabruca is an organization involved in the authentication of cacao, and it started its activities in Ilheus, Bahia in 2007. It encourages fair trade in order to protect the cacao farmers. As an agroforestry chocolate, a Japanese confectionery maker sells chocolates made with the cacao produced in Tomé-Açú, and a Brazilian cosmetic company also authenticates herb oils. The Friends of the Earth Brazilian Amazonia has worked on the authentication of forest management involving Amazonian lumber since 1989.

## 6. Future prospects for Amazonia

When looking back over the development/conservation policies in the past 50 years, it can be said that they basically leaned toward development, and conservation efforts have been attachments pressed down from foreign countries. During 1988 to 1994, the policies were relatively pro-conservation, however, since the Cardoso Administration they have been dominated by development in spite of expressing compatibility/coexistence with development and conservation (Horisaka, 1997). Improving the national power by producing primary products and exporting them was the real intension of most Brazilian authorities (Hongo & Hosono, 2012). Madeira (2014) pointed out that the policies of PAS and MacroZEE which were presented by Lula Administration were not so different from the EINDs under the Cardoso Administration, and have the possibility to blot

out the spirit of conservation cultivated by the PPG7. The uneven geographic developments in the military era brought about socio-spatial inequalities in Amazonia. The PAS-MacroZEE aims to resolve it by connecting to international markets through agribusiness companies, but it does not bear any profits for local inhabitants, he insisted. The federal government with the motto “From Amazonia to the world” is completely consistent with crop majors/meat processors. But instead, the spirit of PPG7 seems to be forgotten. On the other hand, local inhabitants do not care about environmental conservation if no incentive is given, because they only make just enough to get by. They are neither interested in development nor conservation projects. They are only satisfied when they receive monetary stipends from projects.

Settlements and road construction in the era of military governments dulled in the 1990s, but subsequent governments had a willingness to utilize the environmental conservation policies on the stage of diplomatic negotiations. It was Brazil and the U.S. which insisted on the Clean Development Mechanism (CDM) in 1995, and consequently, it was included in the Kyoto Protocol in 1997. Brazil played a leading role in the proposal of Millennium Development Goals (MDGs) in the World Summit on Sustainable Development in Johannesburg (Rio+10) in 2002, developing ethanol diplomacy, and bringing the bioethanol and flex-fuel vehicles to the forefront in the latter half of the 2000s. In 2008, Brazil succeeded in enticing the Amazon Fund from the Norwegian government. In the second year of the Rouseff Administration (2012), Brazil was host in the United Nations Conference on Sustainable Development (Rio+20), and decided to change the MDGs to Sustainable Development Goals (SDGs). There is no doubt that the environmental diplomacy has advanced with a rise in Brazilian national power in the past 20 years (Faustino, 2013). In the second half of 1980s the country was struggling with hyper-inflation

and it seemed politically weak that Brazil had no choice but to yield to the anti-logging campaigns. However, when the domestic economy became stable, Brazil flip-flopped and changed to the offensive, supporting ethanol diplomacy.

The following is also related to environmental diplomacy. Brazil pushed the Reducing Emissions from Deforestation and Forest Degradation/Role of Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks in Developing Countries (REDD/REDD+) on the COP, and the REDD+ was decided to implement it in countries around in the world in 2020 (Moutinho, 2009). Specifically, credits are obtained in response to increases in forest biomass (carbon) during a certain period, and are refunded from contributions by the World Bank, FAO, and other multilateral funds; or, in some cases, credits are traded utilizing either bilateral agreements such as Joint Crediting Mechanism (JCM) or carbon markets. Local communities, and prefecture conserve forests, and assessment companies which are authenticated as impartial organizations measure the increase in biomass, then credits are issued from third party organizations. If local inhabitants and officials understand that the conservation is profitable, cassava cultivation after burning, and stock farming will be dulled (Nepstad *et al.*, 2009). This is an option other than the SAF's. The federal government had better promote the SAF's and REDD+ in order to foster the spontaneity of small settlers and family farmers.

People recognize that it is the best way to combine the know-how on SAF's of environmental NGOs and the agricultural loans and material supply system of SEPROR/IDAM when achieving both the utilization and conservation in the sustainable use unit. Importantly, region-people relationships, sustainable land utilization, reforestation, and circular agriculture should be discussed and initiated among settlers on their own accord. In a top-down way, the military

governments decided everything concerning inland development. There was no room for small settlers/farmers to mention anything in the policy making. During the 20 years since the 1990s, people have passively received what has been provided. What is important is to keep in touch with the members of SEPROR and environmental NGOs who are usually walking around the interiors. They are aware of the current situations of settlements, and have information concerning various ways to help the people.

Climate change of Amazonia caused by deforestation has been investigated since the end of the 1980s (Fisch *et al.*, 1998), and the LBA, the representative project, launched the second phase in 2007 in which the influences of deforestation upon inhabitants have been studied (INPA Plano Científico-LBA2). Further, proper governance for avoiding further deforestation has been proposed from the side of natural sciences (Campos and Nepstad, 2006, Nepstad *et al.*, 2009). As shown in Figure 1, the deforestation area has decreased since the 2010s. This fact is commendable. However, there is an opinion that the annual deforestation is regulated by the economy (Koike, 2005). Therefore, it is necessary for the federal government and various NGOs to pursue appropriate policies to decrease the amount of deforestation without being influenced by domestic economic conditions or international markets.

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