3. Extensive infrastructure programmes as an extreme contrast to concurrent environmental policy measures

3.1. Brasil em Ação (Brazil in Action) (1996–1999) and Avança Brasil (Let's go, Brazil) (2000–2003/07)[211]

Since the installation of the Pilot Programme to Conserve the Brazilian Rain Forests" (PPG7) in the 1990s, state activities in the Amazon region developed in a disparate manner. On the one hand, because of UNCED 1992 and PPG7 there was the commitment to realise sustainable development, protection of the living space of the local and regional population as well as the environment as objective of regional policy. On the other hand, government's goals for the next years concentrated on intense improvement in infrastructure, regional economic growth and global market integration, a large part in the Amazon region.

The new integrated national policy for Amazônia Legal (MMA/SCA 1995; MMA/CONAMAZ 1998; BNDES 1998) aimed at consolidating the situation in Amazonia and planned, at least in the official version, to take decisive steps towards sustainable resource use oriented towards the interests and welfare of the Amazonian population through decentralisation measures and the participation of civil society. This formed a fundamental contrast to the new programme Brazil in Action and its extension in the mega-programme Let's go, Brazil, the government's new development programme, which started after the turn of the century with planning perspectives until 2007 (MPBM 1999; MPOG 2000; BNDES 2000).

The donor countries of the PPG7, which had supported Brazil with great commitment and high financial outlay and had awakened a strong environmental awareness in the regional rural population of the Amazon region, were disappointed about these highly problematic development programmes. These programmes were counterproductive to the previous environmental guidelines and associated with a high potential of forest destruction. Enormous private economic interests were involved in the strengthening of the infrastructure.

Conflicts in many sub-areas and partly of a marked regional significance were foreseeable and destroyed some of the best efforts of PPG7. These new programmes also dampened donor countries' willingness to invest more heavily in the extension of

211 This chapter is based on Kohlhepp (2001b; 2001c).

a second part of PPG7. Since in some countries press publications appeared against the investments in PPG7, which were futile from a journalistic point of view, the governments had to answer to their own population for the financing that had taken place.

As a step to improve infrastructure, "the Brazilian government commissioned a major study of integrated national development regions, identifying and evaluating hundreds of projects that offered the potential to accelerate economic and social development in coming years" (MPBM 1999, 5). Many of these infrastructure projects offered investment opportunities for private companies via privatisation, joint ventures, and other forms of participation. Specific "development structures for investment" were focussing on regional or sectorial topics.

Projects were assessed in groups in order to identify potential synergies and were analysed within the context of nine major development regions, the so-called "national axes of integration and development." These "development regions" had a certain identity, a distinct "economic vocation" and were part of a long-term geostrategic vision of national development. The terminology of the Ministry of Planning in Avança Brasil with "national axes of integration and development," "economic corridors" and the regional progress seen only in terms of economic growth reminded of the Military Governments' approach of exploitation and valorisation of the Amazonian periphery in the 1970s with the National Integration Programme (PIN).

The projects prioritised and officially mentioned, represented a potential of US$ 43 billion of total investment in Amazônia Legal from 2000 to 2007. The Brazilian government made major investments in developing projects throughout Brazil and especially in the Amazon region through the Avança Brasil programme. There, the government's goals included doubling of paved roads, the construction of waterways, ports, railways, and hydroelectric power plants.

The basic guidelines of the Avança Brasil programme (Cardoso 1998) of President Cardoso's government were:

- consolidation of economic stability,
- promotion of sustained economic growth, generating jobs and income opportunities,
- elimination of hunger, fighting poverty and social exclusion, improving income distribution,
- consolidation of democracy, promoting human rights.

As to the Amazon region, there were four bundles of projects (MPBM 1999):

1. Northern international integration,
2. logistics in the Madeira-Amazonas region,
3. logistics in Central Brazil,
4. hydroelectric generation and transmission lines.

1. The two northern Amazon states, Roraima and Amapá, should be linked with neighbouring countries by paved highways. This redrew the map for a new geopolitical scenario. Caracas could be reached by trucks from Manaus via BR-174. Besides the considerable smuggling of timber to Venezuela, the regional trade – the Manaus Free Trade Zone was a major producer of household electronics – could be expanded. It seemed

doubtful whether the government's goal to facilitate eco-tourism would be successful. The paved road connection from Macapá (Amapá) to Cayenne (French Guyana) will be complemented by a road from Boa Vista (Roraima) to Georgetown (Guyana).

Despite the military control over this northern border region, drug traffic, ubiquitous in the Amazon region, was imminent also to the Caribbean and Atlantic ports and airports (Machado 1996). The 200 km transmission line (230 KV) Venezuela–Brazil from the huge hydroelectric power plant Gurí to Boa Vista, the first major cross-border energy project in northern Brazil, completed in 2000, will greatly improve energy supply in Boa Vista. Roraima had been previously excluded from Brazil's energy supply because there were no long-distance lines to the north over the Rio Amazonas.

2. The main objective of infrastructural planning in this group of projects was to allow transport of agricultural production, connecting waterway and road transport systems. Since 1997, after works to improve navigability of the Rio Madeira and the installation of river ports in Porto Velho (Rondônia) and Itacoatiara (Amazonas) by private investors, shipment was possible year-round with modern barges mainly with soybeans from Mato Grosso and Rondônia downriver by barge tows of up to 6000 tons to Itacoatiara, east of Manaus, on the Amazon river. This new transhipment terminal enabled soybean transport directly to the European market by ocean-going freighters of up to 80 000 GRT, reducing considerably transport time and reduced transport costs by half in relation to the grain ports of Paranaguá (Paraná) and Santos (São Paulo) in South and Southeast Brazil which were distant up to 2000 km by road and had a much wider sea route to Europe.[212]

Together with the extension of BR-364 from Cuiabá to Porto Velho and the Mato Grosso section of BR-163 from Cuiabá to Alta Floresta, increasing waterway transport of the production of the rapidly increasing soybean and ranching area of Mato Grosso was northbound. In 2000, the regional production of soybeans was estimated at 6.5 mt and a livestock of 18 million head (Kohlhepp 2001b; 2001c). The agribusiness boom turned Porto Velho to a new port centre with 1.8 mt (1998) and a container terminal in construction.

With the improvement of the highway system in Mato Grosso and Rondônia, overland traffic between South Brazil and the Manaus free trade zone was gradually shifting from the Belém–Brasília route (BR-153) to Porto Velho. This enabled return freight, such as household electronics, from Manaus to the South and Southeast. Paving 490 km of the BR-364 in Acre to Cruzeiro do Sul – with the futurist plan to reach the Pacific via the overland route – and the reconstruction of the totally impassable BR-319 stretch from Porto Velho to Manaus were main points of interest in this infrastructure project. The highly questionable reopening of the road link to Manaus – a hot topic again today – seemed unnecessary in view of the Madeira waterway. Miscellaneous highway improvements were connecting road and river transport also in the region of the Purús river.

It was noteworthy that Avança Brasil initially had no detailed plans for the continuation of the paving of the Cuiabá–Santarém road (BR-163). But it was already clear at that time that economic and regional pressure groups, especially timber trade companies, would achieve this priority goal between the Mato Grosso–Pará border and Santarém at the mouth of the Rio Tapajós into the Rio Amazonas. Sawmills were already

212 See chapter II.4.4.

advancing along the road axis of the BR-163 in Mato Grosso (Schneider *et al*. 2000a, 19). Traffic conditions on the northern section of the route in Pará remained extremely precarious.

A new topic was the gas pipeline project (5 million m^3) from the Rio Urucu natural gas field, Brazil's largest onshore natural gas reserve, to Porto Velho (500 km) and from Coari to Manaus (420 km) to supply the planned thermoelectric plants in Porto Velho and Manaus. The gas pipeline to Manaus, planned to be ready in 2000, was inaugurated in 2009.

3. Although some development projects of Avança Brasil in Central Brazil were realised outside the planning region of Amazônia Legal, the consequences directly and indirectly affected the situation of the southern fringe of Amazonia. As agriculture spread rapidly in the Planalto Central, the transport infrastructure to the main national markets and seaports was complicated and needed to be improved. The Ferronorte, a railway project of continental dimensions, was planned to link southwestern and central Amazonia with the existing rail network running to the coast. Ferronorte, a federal concession, was funded privately by one of the "soybean kings," Olacyr de Moraes, and the first 410 km of the track from the Rio Paraná in north-western direction were built in 1999. This should complete a multimodal system which is executed for the long haul by an alternative either by waterway or by railroad.

4. The main projects in the northern part of Central Brazil were hydro-electric power plants on the Tocantins river and the transmission line completed in 1999, linking the hydro-power system of the North – including Tucuruí extension, doubling the capacity to 8325 MW and installation of locks planned – with the system of the Centre-West region by a 1300 km power grid connection of 500 kV. A series of hydro-electric plants equipped with locks was under construction or planned along the Tocantins river (Fearnside 2015b; Oliveira and Oliveira 2021), e.g., the Lajeado project (850 MW), giving an additional 5000 MW capacity for the regional development of the state of Tocantins, created in 1988 and turning into a new "El Dorado" of agribusiness activities. Ongoing privatisation of the electricity sector will offer the construction of new plants to private investments on long-term concessions.

For the Araguaia–Tocantins waterway with a dozen terminals, only the construction of the Santa Isabel Canal and locks to bypass rapids were included in the Avança Brasil budget. The construction works of the planned waterways Araguaia–Tocantins and Teles Pires–Tapajós had to be stopped by IBAMA because of high environmental risk, irregularities in the studies presented by the Ministry of Transport (Carvalho 1999) and multiple failings in the environmental impact statement (Fearnside 2001c). The official conflict with these projects was accompanied by extensive protests of affected Indigenous groups.

In times of "bottom-up" development efforts and decentralisation in all sectors, it was a strange experience to accompany more "top-down" strategies, absolutely not adapted ecologically and to the basic needs of the regional population. There was a wide gap between planning ideology of the politically strong Ministry of Planning on the one hand and the Ministry of Environment on the other.

The regional development authority SUDAM has never carried out self-determined or even participatory regional planning and development according to the endogenous regional potentials. Rather, under the military governments, national goals of economic growth were implemented in the sense of a centre-oriented upgrading of

Amazonia. Later, SUDAM was more and more degraded to an instrument of regional interest groups. As already mentioned, SUDAM – like the other regional development authorities – has lost much of its importance since the 1980s. Some years later, SUDAM was drowning by fraudulence and corruption, the case being investigated by the Federal Police (*Veja*, April 11, 2001). Even high-ranking politicians were involved in the "rombo amazônico" (Amazon withholding) of some billion reais. In May 2001, SUDAM was abolished and replaced by a new entity, the so-called Agency of Development of Amazonia (ADA).

The second multi-year investment plan did not take into account the needs of the governments of the Amazon states, but favoured national logistical requirements with export corridors to intensify foreign trade with the Northern Hemisphere and with Mercosur partners in South America.

The G7 countries were funders of an innovative environmental programme linked to rainforest protection, and at the same time – at least the European G7 members and Japan – indirectly and directly promoted soybean expansion on the northern pioneer front in Central Brazil, advancing from the *campos cerrados* into the Amazon rain forest areas, supported by huge public and private financial investments in infrastructure and agricultural research. At the end of the 1990s, soybean cultivation could be observed in Pará state in Paragominas and the Santarém area. In the state of Amazonas, it had penetrated into the surroundings of Humaitá.

When the European market needed more protein-rich fattening feed to replace animal waste after the BSE crisis, the export of genetically unmodified soybeans from Brazil experienced a new boom. The new "soybean king" Blairo Maggi in Mato Grosso was in a superior position, being the largest private investor in soybean cultivation and one of the defenders of soybean expansion in rain forest areas. As owner of the Amaggi Group, a large company that harvests, processes and exports soybeans, and owns soybean terminals and highways, he benefitted greatly from Avança Brasil which provided the appropriate infrastructural basis for his economic activities. In 2003, he became Governor (2003–2010) of the state of Mato Grosso and was now also politically able to determine the agribusiness development in the central Amazonian region. "To me, a 40 percent increase in deforestation doesn't mean anything at all, and I don't feel the slightest guilt over what we are doing here […]."[213]

Large landowners who grew soybeans were able, through the forces of the world market, to convert cleared land of smallholders who were displaced to new pioneer areas into more soybean plantations. Because of massive infrastructure development needed to provide transportation for harvest and agrochemical inputs, the environmental impacts of soybean expansion were threatening tropical biodiversity. The social parameters were also extremely problematic. According to EMBRAPA research in Maranhão, only one worker is needed for a cultivation area of 167 ha of soybeans (Carvalho 1999; Fearnside 2001c). This meant that the expansion of soybean production offered no prospects for the rural labour market, especially as the remaining smallholders were displaced and forced to migrate to the urban centres where they didn't have any job opportunities.

The Avança Brasil programme was an undertaking of conservative modernisation, without any environmental component or social relevance for the mass of the Ama-

213 Blairo Maggi in an interview in *The New York Times*, September 13, 2003.

zonian population (Becker 1999; Nepstad *et al*. 2000). Wide-ranging negative consequences occurred and there was a lack of rigid measures of checking the environmental compatibility of the projects in preparation and in monitoring ongoing projects.

It was not the first time that justified doubts arose regarding the seriousness of environmental impact assessments. In these assessments (EIA/RIMA) only direct impacts, e.g., quality of the road surface and bed, were considered, however, the associated economic side effects of the implementation of the projects, causing environmental damage, were not assessed at all. In many cases, consulting companies prepared reports favourable to the approved projects, because they were contracted by the proponents of the projects, interested in the positive assessment of EIA/RIMA due to strong financial investment in the project (Fearnside 2001b).

Unfortunately, it could often be stated that a positive assessment of projects within government development programmes increased the chances of the reviewers to be considered again. This was especially the case at a time when only a few specialised consultants existed and some of the consulting firms also involved former employees of environmental authorities.

Environmental impacts of the Avança Brasil programme had been studied very carefully by several groups of scientists. One of the main problems was that powerful interest groups with direct financial involvement and in favour of realising a project were mobilized before environmental impacts were assessed. Only shortly before the beginning of construction works of a project, environmental studies and the assessment of possible impacts happened. Even international funding was attracted before environmental consequences of a project were studied (Fearnside 2001b).

The planned infrastructure would provoke an additional deforestation of 120 000–270 000 km² within 20 to 30 years (0.4–1.35 million ha/year) which would liberate 6–11 Gt C (200–550 million t C/year) in the period of deforestation (Barros, Nepstad, and Capobianco *et al*. 2001). Forest loss and loss of biodiversity, in particular the lost possibilities for sustainable use of forests, were irresponsible. In addition, the huge emissions of CO_2 will have a considerable negative impact on climate change which was also becoming increasingly noticeable in this period in Amazonia.

3.2. New challenges regarding forest destruction: El Niño events and forest fires in Roraima

After the extensive infrastructure measures in the development programmes Brasil em ação and Avança Brasil had already contributed greatly to further deforestation, the El Niño phenomenon now brought further challenges – for the first time with major regional consequences and the certainty that this will occur repeatedly.

During El Niño, the system of the Walker Circulation of air and water breaks down. This is caused by a warming of the ocean surface to above-average sea surface temperatures, in the eastern tropical Pacific Ocean. While El Niño brings rainfall to the west coast of North America, South America tends to experience drought during El Niño. Dry climatic conditions that occur because of El Niño and burning to clear rain forest for agriculture are the perfect situation to cause forest fires all over the Amazon. These fires can spread out of control and cause even more forest loss than would "normally" occur.

The El Niño dryness reduces tree growth and trees store less carbon. The Amazon basin plays an important role in the global carbon budget as the Amazon is one of the most important regions of the world for the storage of CO_2 from the atmosphere. Interannual climate variability associated with El Niño can affect the Amazon ecosystem carbon balance. In addition, dry weather causes the soil to release carbon.

El Niño events have been known during the past 2000 years in Amazonia (Meggers 1994), but became more frequent in the last decades. Long drought periods affect huge areas of Amazonia. Moreover, rainfall reductions are a result of deforestation in the Amazon region (Nobre *et al*. 1991). It increased – together with selected logging – the inflammability of intact tropical rain forests, which in years of average precipitation are hardly vulnerable to burning.

During the severe drought from July/August of 1997 to April/May of 1998 rainfall reduction in locations far away from each other caused an enormous deficit in precipitation, compared with the cumulative amount of rainfall in "average" years. The nine months' deficit ranged from 500 mm in Belém and 900 mm in Marabá to 1200 mm in Belterra on the Rio Tapajós in Central Amazonia (Nepstad *et al*. 1999; cf. Kohlhepp 2001b, Fig. 4).[214]

Case study: Roraima

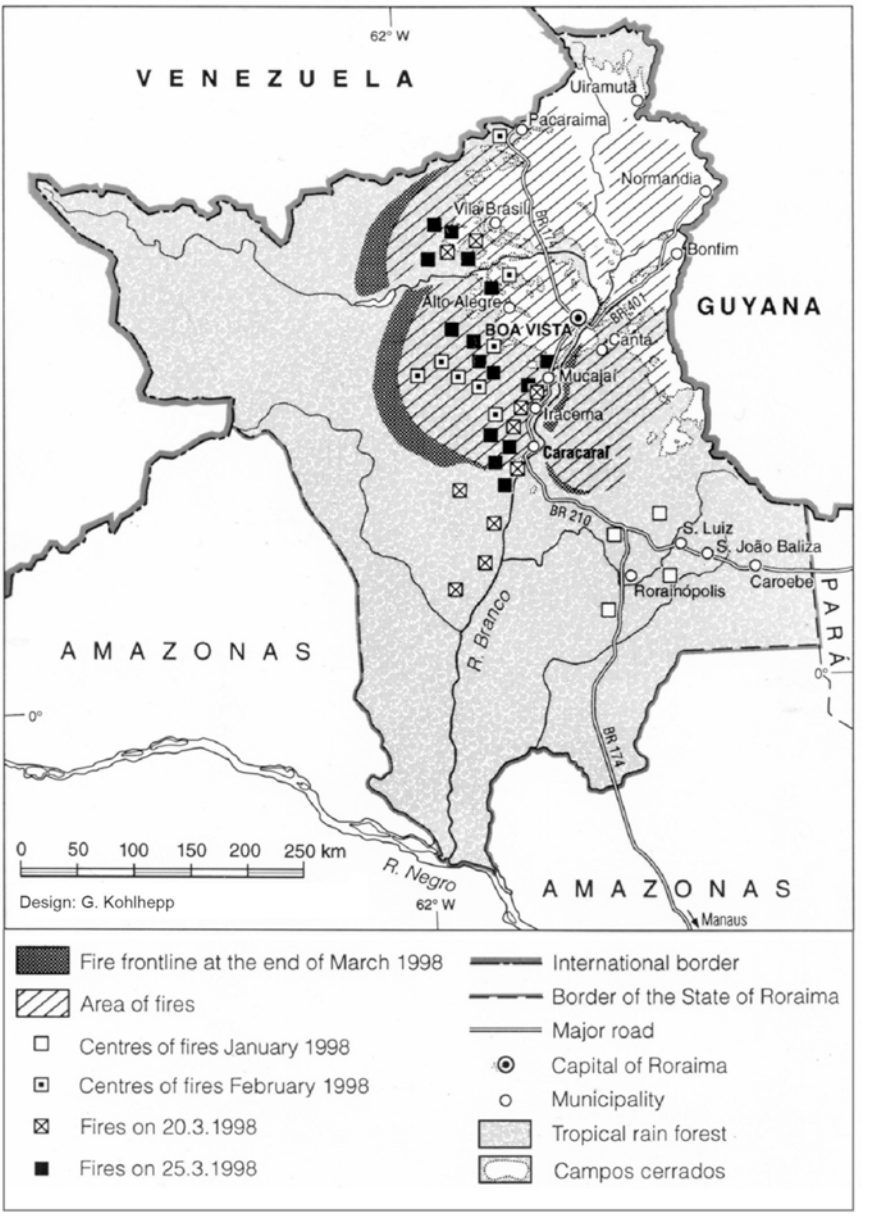
After a nine-month drought, in the first quarter of 1998 extensive fires in the northernmost state of Brazilian Amazonia had catastrophic consequences. Fires for pasture preparation in the *campos cerrados* areas of Roraima and fires to clear-cut primary forest by slash-and-burn agriculture escaped to standing forests, dried by the El Niño phenomenon. A fire frontline of 115 km extension at the end of March 1998 even threatened dense rain forests near the Yanomami reservation. In Roraima, an area of 33 000 km² (larger than the area of Belgium) was destroyed by fires, nearly 10 000 km² of rain forest (Kohlhepp 1998a). Roraima declared a state of emergency. About 12 000 people, including 7000 Indigenous people, needed immediate support. The loss of houses, plantations, seeds, and about 14 000 cattle, the sharp increase of health problems, in particular respiratory diseases, and water shortage required national and international relief efforts (Estado de Roraima/SEPLAN 1998).

As a result of this disaster, the actions of the PPG7-Prodesque project were accelerated to improve fire risk prediction, reduce the occurrence of accidental fires and the techniques to fight them, and improve fire management and organisational structures for firefighting, including training programmes.

The vulnerability of Amazonian rain forests regarding fires favoured by El Niño droughts was highly increasing. According to a very meritorious map on fire risks in Amazonia (IPAM *et al*. 1998), in 1998 about 400 000 km² of intact forests, i.e., 11.5 % of the forest area of Amazônia Legal, were at risk of fire. Nearly 50 % were classified as forest regions "with high risk." Among them, large parts of the municipalities of São Félix do Xingu, Marabá, Altamira, Santarém in Pará or Boa Vista in Roraima were very much endangered.

214 Another example from Paragominas in East Pará 1997: For 200 days a precipitation of only 88 mm, but an evapotranspiration of 800 mm.

Figure 25. Fires in the state of Roraima (Northern Amazonia) in 1998



Source: Estado de Roraima/SEPLAN (1998); published in Kohlhepp (1998a, Fig. 8 and 2001b, Fig. 6).

3.3. Amazonia: an "urbanised forest"

In 2000, about 20.1 million people were living in the planning region of Amazônia Legal, 71.4 % in urban settlements and 28.6 % belonged to the rural population (IBGE 2001).[215] About 380 000 people referred to themselves as Indigenous, 40 % living in the rain forest.[216] There was a number of tribes that had not yet been contacted.

From the point of view of the distribution of the population, Amazonia was called "an urbanised forest" (Becker 1995) with "rain forest cities" (Machado 1982; Browder and Godfrey 1997) and pioneer towns with an extremely rapid growth (Volbeda 1986; Coy 1992; 2001). Since the second half of the 1970s, urbanisation in Amazônia Legal had brought about fundamental changes. The Amazonian towns attracted migration from the riverside population of the surroundings and in some cases also Indigenous people. The vast majority were people who had been expelled from colonisation projects. Others were displaced from the pioneer front or *garimpeiros* who lost their job. Waves of migrants came from Brazilian regions outside Amazonia.

Unfortunately, the hope of finding a job in the urban sphere was very often disappointed. The huge development projects with large construction works such as dams and hydroelectric power plants, mining projects or infrastructure constructions attracted a large number of workers who found employment only at the beginning and had no follow-up employment after the project was completed. In the larger cities, slums were created by displaced people for whom the urban labour market offered hardly any opportunities. A "new urban poverty" emerged (Ab'Sáber 2005, 23).

The two outstanding metropolitan areas of Manaus (2019: 2.68 million inhabitants [IBGE estimate]) and Belém (2.51 million) are dominating Amazônia Legal.

Manaus with the Free Trade Zone, managed by SUFRAMA, the river port, and an important industrial district[217] is the main administrative centre in Central Amazonia. The capital of the huge state of Amazonas, situated near the confluence of the Rio Negro and Rio Solimões, owns universities and the renowned research institute INPA (National Institute for Amazon Research). In addition to the strong pull effect of the city and the associated migration, Manaus has a touristic significance. Manaus is a transport hub for shipping and air traffic.

The Free Trade Zone of Manaus (FTZM) had three different phases[218]:

1. The first phase from 1967 to 1980 was characterised by a policy of subsidies for the industrial sectors. Some industrial goods could only be imported by retailers located in Manaus. The city of Manaus received many Brazilian tourists who had the possibility to buy tax-free and cheap imported goods. Numerous shops with duty-free goods were concentrated in downtown Manaus and offered a popular buying pleasure up to a few hundred dollars' worth. At the same time, this increased the turnover of hotels and restaurants and increased the occupancy rates of flight connections to and from Manaus.[219]

215 Total population of Amazônia Legal in 2022: 27.8 million (IBGE 2023).

216 Data of the Instituto SocioAmbiental.

217 Cf. chapter I.1.2.4

218 Cf. https://www.suframa.gov.br/zfm_historia.cfm (accessed August 20, 2022).

219 A map of the functional structure of shops in downtown Manaus see Kohlhepp (1986, Fig. 13).

2. The second phase ran from 1975/80 to 1990 and consisted of even larger subsidies to the industrial and services sectors. To receive the fiscal benefits associated with the Free Trade Zone, companies should not only be located in Manaus, but also use at least a minimum percentage of national products as inputs.
3. The third phase (1991–1996) coincided with the opening of the Brazilian economy. Since import tariffs were reduced in Brazil, the relative subsidy received by firms located in Manaus – compared to firms in other parts of the country – was reduced and the FTZM lost part of its relevance.

Today more than 60 % of all trading within the Free Trade Zone is related to electronics and motorcycles, with chemicals and metallurgy as two other significant industries. Companies within the FTZM enjoy up to an 88 % reduction in import duties on the inputs of industrial goods and an exclusive 75 % reduction on income tax for reinvestments. The industrial zone directly employs more than 80 000 people and generates annual revenue of R$ 120 billion.

Belém is situated on the Guajará Bay, part of the vast delta of the Amazon river, about 130 km up the Pará river from the Atlantic Ocean, separated from the larger part of the Amazon delta by the huge Marajo Island. Belém is the gateway to the Amazon river, its river navigation is connected to the extra-Amazonian regions of the country by main roads. The intense migration caused severe problems for the urban infrastructure and led to the spread of suburban slums.

Belém had been the headquarters of the Brazilian agency SUDAM, the Superintendency for the Development of Amazonia. After a massive corruption scandal involving high-ranking politicians, the Brazilian government closed the agency in 2002. Belém is also home of important research institutes and universities. The Museu Paraense Emílio Goeldi is a Brazilian research institution and museum. The institution is well known for researching and analysing the biological and sociocultural diversity of the Amazon Basin, contributing to its cultural memory. It has also the aim of increasing public awareness of science in the Amazon by means of its museums, botanical garden, and zoological park. A famous centre of agricultural and agroforestry research and an institute for research on tropical diseases are located in Belém.

São Luís (metropolitan area 2019: 1.63 million) and the booming Mato Grosso capital **Cuiabá** (metropolitan area 2019: 1.04 million) are very important urban centres. São Luís, capital of the poor state of Maranhão, had been greatly upgraded economically by the Carajás railway, the important port for the booming iron ore export and the alumina and aluminium industries, but suffered from increasing migration and excessive demands on urban infrastructure.[220] Since 1960, Cuiabá has been the door to the new colonisation regions of North Mato Grosso and became the starting point for the economic and urban development along the BR-163 through the expanding agribusiness with soybean cultivation, timber industry and cattle breeding. Capital concentration of the regional economic elite and large migration flows changed the cityscape (Coy 1992; 1995).[221]

In the state capitals of Rondônia, **Porto Velho** (municipality 2022: 0.45 million), of Amapá, **Macapá** (0.44 m.), of Acre, **Rio Branco** (0,36 m.) and Roraima, **Boa Vista** (0,41 m.) the population increased rapidly. Decentralised state entities gained influ-

220 Cf. chapter I.4.4.4

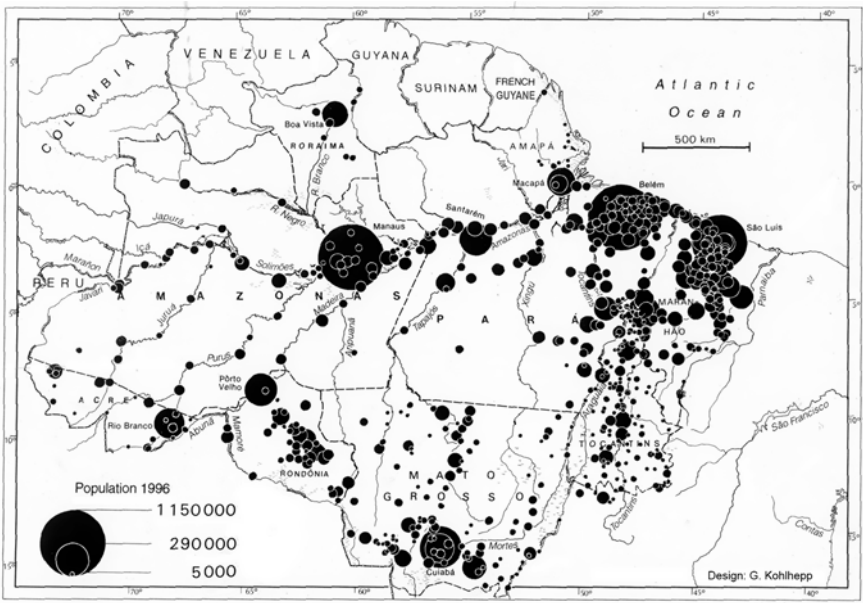
221 Cf. chapter II.4.1.

ence and tried to organise economic activities in these states. Some state capitals have multiplied their population since 1970, Boa Vista, Porto Velho, Manaus and Cuiabá have more than quadrupled. After the founding of the state of Tocantins, the former northern part of the state of Goiás, the new capital Palmas, founded in 1990 on the Rio Tocantins, had already grown to over 300 000 inhabitants today.

The traditional location of urban settlements along the Solimões and Amazon river and some main tributaries was completed by an increasing population in medium-sized and small towns along the different development axis. This was obvious along the BR-364 in Rondônia, along the BR-163 northwards of Cuiabá in Mato Grosso, the BR-010 (Brasília–Belém) and the central part of the Transamazônica (BR-230).

Marabá (PA) and **Imperatriz** (MA) and their sub-region, which is strongly influenced by the Grande Carajás programme, as well as the east of Maranhão have a concentration of small towns. Santarém, the port city on the Rio Amazon, at the mouth of the Rio Tapajós, already had a special significance as the terminus of the BR-163. Its significance increased greatly after the asphalting of this main road, which is very important for soybean transports for export via river ports on the Rio Amazon or the Rio Tapajós. **Altamira** (PA), which had already grown strongly through the construction of the Transamazônica, and **Tucuruí** (PA) have grown enormously due to the construction of the large hydroelectric power plants – Tucuruí on the Rio Tocantins and later Belo Monte on the Rio Xingu. Due to high migration, there are numerous problems of urban social fragmentation.

Figure 26. Population in the Brazilian Amazon region in 1996 (without Indigenous population)



Source: Théry (1997a; 1997b); map published in Kohlhepp (1998a, Fig. 4 and 2001b, Fig. 2).

Because of the extensive migration, frontiers advance rapidly, and towns try to concentrate efforts to reorganise urbanisation and to establish new urban development models with a sustainable social and ecological basis (Coy 1992).[222]

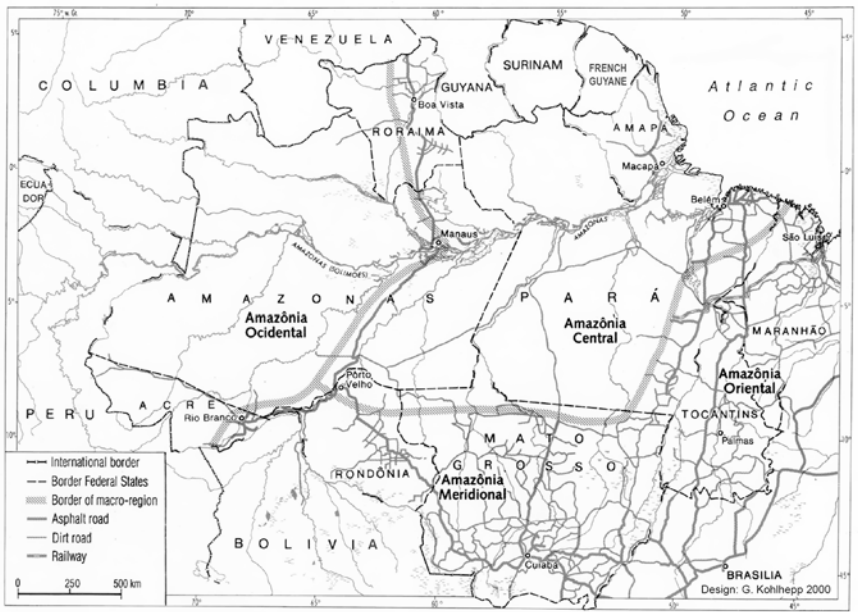
3.4. Situation in 2000: A new macro-zoning of Amazonia as result of development programmes in the 1980s and 1990s

In the Avança Brasil programme the planning region Amazônia Legal was cut up in sub-regions. A new macro-zoning developed, which was formed by the current axes. It was obvious that cattle ranching, subsistence agriculture and logging activities would not remain concentrated on a strip of 50 km on both sides of the roads (Nepstad *et al.* 2000), but will cause wide-spread environmental impacts by deforestation and an increase in accidental fires.

In southern and eastern Amazonia, infrastructure, settlement systems, agricultural production and cattle ranching with large holdings prevail, causing a conflicting situation for small-scale agriculture and squatters. In those sub-regions of Amazônia, production dominated conservation and social measures were strongly needed.

In the new macro-zoning, there remained two core regions (Fig. 27) (Becker 1999):[223]

Figure 27. Amazônia Legal. Scheme of the new macro-zoning



Sources: Becker (1999); map published in Kohlhepp (2001b, Fig. 10 and 2007a, Fig. 10).

222 See chapter II.4.1.

223 Chapter II.3.4.; based on Kohlhepp (2001b).

1. **Central Amazônia**, mostly the state of Pará and the east of Amazonia, cut through by transport axes south of the Rio Amazonas and containing numerous Indigenous lands and conservation units. This was a highly vulnerable region under very strong pressure, caused by the invading agribusiness frontier and Avança Brasil infrastructural projects. The goal for the future must be to reconcile production and conservation, with the part of the subregion north of the Amazon river reserved for conservation units.
2. **Amazônia Ocidental**, the huge region west of the central axis Rio Branco–Porto Velho–Manaus–Boa Vista, with a very low rate of deforestation – in 2000 – should be destined for conservation issues. Large Indigenous territories, the creation of the so-called "Central Ecological Corridor" along the Rio Solimões, new conservation units, such as the "reserves of sustainable development" (Becker 1999; 2001; 2005) should be protected against any "development" euphoria. This could be realised with support of SIVAN, the military-based satellite monitoring programme in Amazonia, given the specific need of vigilance and control in view of increasing drug trafficking activities. No road construction and no large-scale project should be permitted in this region.

The traditional geopolitical vision of Amazonia as a vast empty space, reflected in regional planning of the past decades, has been a fundamental error. The sustainability approach as the only acceptable alternative of future development[224] and the concept of productive conservation (Hall 1997a) compete with the mostly destructive development ideology of mega-programmes in Para and Mato Grosso (Dubreuil, Bariou, and Passos 2004; Kohlhepp 2005).

In addition, the proposal by the "bancada ruralista", which represents large landowners in the Brazilian Congress, to change the forestry law, which still requires private farms in Amazonia to keep 80 % of their land forested, threatened Amazonia's forests. In contrast to the CONAMA and the Brazilian Ministry of Environment, the *fazendeiros*' lobby was trying to reduce land use restrictions to a 20 % or at least 50 % rate of forest cover, opening the Amazon region to a large-scale expansion of the agricultural frontier. As the Congress decision was postponed several times and discussions continued, the struggle between the traditional exploitation model of regional development based on deforestation and the new goal of sustainable use of forest resources was still prevalent.

As scientific research increasingly focused on the problem of greenhouse gas emissions from deforestation, it became clear that mega-programmes such as the Grande Carajás programme and its follow-up programmes Brasil em Ação and Avança Brasil were no longer justified in a sustainability-oriented strategy for the future. The destruction of each hectare of forest causes a net release of nearly 200 metric tons of CO_2-equivalent carbon (Fearnside 2001d). Carbon-offset funds to be paid to developing countries and discussed in the Kyoto Protocol could become an important mechanism for promoting forest conservation (Laurance *et al*. 2001; Fearnside 1997a, 2000, 2001d).

224 Anderson (1990); Clüsener-Godt and Sachs (1995); Castro and Pinton (1997); Schneider *et al.* (2000a; 2000b); Hall (2000); Haddad and Resende (2002); Coy and Kohlhepp (2005); Mello-Théry (2006).

At the turn of the century, Amazonia was at the crossroads (Hall 2000). It is hoped that political decisions and regional self-determination will support sustainable resource management and become of great importance for improving the living conditions of the regional population, especially all survival-oriented social groups. The government's previous goals focused on improving infrastructure, growing the regional economy and strengthening integration into global markets. Traditional planning terminology like regional "economic vocation" led to projects of conservative modernisation without any environmental and social responsibility. Preventing processes of rapid ecological and socio-economic degradation for the benefit of the Amazonian people and preserving Amazonia's rich biodiversity must be the new guiding principles.