

This file has been cleaned of potential threats.

If you confirm that the file is coming from a trusted source, you can send the following SHA-256 hash value to your admin for the original file.

81ac0f13ec1ce66186ac616e674c8e1562c62dbe50e94ed052a1fa18f6f9a6da

To view the reconstructed contents, please SCROLL DOWN to next page.

Dams and *Hidrovi*as in the Tapajos Basin of Brazilian Amazonia: Dilemmas and Challenges for Netherlands-Brazil relations

Final Report¹

February 2011

Introduction

This report presents an overview analysis of recent developments in transportation and energy infrastructure in the Brazilian Amazon, focusing on the unprecedented complex of planned hydroelectric dams and industrial waterways in the Tapaj

os River basin, with particular attention to underlying political and economic interests and related models of economic growth, social and environmental impacts and risks of large infrastructure projects and implications for Dutch-Brazilian relations in trade and bilateral cooperation.

According to the Brazilian government's current plans, six large hydroelectric dams will be constructed by 2019 along the Tapaj

os river and its tributary, Rio Jamanxim, in the state of Pará, while another five dams will be built by 2015 along the Teles Pires river (another major tributary of the Tapajos) in the border region of the states of Mato Grosso and Pará. These hydroelectric dams would be part of a ambitious "complex" including industrial waterways (*hidrovias*) for transport of agribusiness and mining commodities. The reservoirs formed by the hydroelectric dams would allow for barge traffic along stretches of the river that are not currently navigable, due to the extensive presence of rapids and other "obstacles".

The study analyzes the Tapaj

os Complex within the context of a series of plans, programs and agreements at the national and international levels that involve logistical centers with elaborate transportation infrastructure, communications and storage, in which electrical energy generation is an important, but not exclusive component. These uniquely integrated logistics reflect the objectives of the Brazilian government to stimulate domestic consumption and intensify foreign trade in agricultural and mining commodities as the centerpiece of an economic growth model led by large parastatal and private corporations, both Brazilian and foreign.

While this model reflects the interests of state planning elites and powerful economic and political actors that wield significant influence over decision-making in government institutions, the study highlights how mega-infrastructure projects in the Amazon, such the Tapaj

os Complex, are characterized by serious conflicts related to the appropriation of natural resources within territories occupied by indigenous and other traditional populations. Indeed, the appropriation of these territories by mega-infrastructure project and related economic activities are closely linked to both violations of human rights and the systematic externalization of negative impacts on biodiversity and ecosystem services, allowing for artificial reduction in the costs hydroelectric energy generation, transportation, and production of agricultural and mining commodities. This systematic

¹ This final report in English was prepared by Brent Millikan (Amazon Program Director, International River). An initial version of this report was written in Portuguese by consultant Telma Monteiro.

marginalization of social and environmental dimensions of development has profound implications for Dutch-Brazil relations in both foreign trade and bilateral cooperation.

Map of the Amazon Basin with the Tapajós River highlighted

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

The methodology adopted for the case study involved an extensive literature review, including both academic and government sources, and consultations with members of local communities in the Tapajos region. Initial findings of the study were presented and discussed at the Panamazonia Social Forum (Forum Social Panamazônico), held in Santarém (PA) at the mouth of the Tapajos River, in November 2010. The study is organized in the following manner:

- Chapter 1 analysis recent trends in infrastructure planning in the Brazilian Amazon, particularly in terms of dams and industrial waterways, focusing on the period since the launching of the Accelerated Growth Program (PAC) in February 2007 (page 3);
- Chapter 2 presents the case study of the Tapajos Complex, including an overview of the socio-environmental and historical context; analysis of the Tapajos Complex; and social and environmental impacts, addressing such issues as cumulative impacts and recent technological innovations, such as "platform dams" (page 15);
- Chapter 3 discusses Dutch-Brazilian relations in bilateral cooperation and trade in light of the findings of the previous two chapters, including suggestions for further debate and policy dialogue (page 33).

1. Contemporary development and infrastructure planning in the Brazilian Amazon: dams, highways and industrial waterways

The Amazon forest biome covers a total area of 6.4 million km² among nine countries, of which nearly two-thirds (63%) are located within Brazil's national boundaries. The Amazon River basin - with headwaters and tributaries located in the Andes *cordillera*, Guiana Shield and Brazilian savannas (*cerrado*) - covers approximately 7 million km², equivalent to 25% of the land surface of South America. With over a thousand rivers and tributaries, the Amazon is the world's largest hydrographic basin and the source of 15% of all fresh water on the planet.

Figure 1.1 - The Amazon forest biome and the "Legal Amazon" of Brazil



Source: Imazon (2005)

From the earliest known periods of human occupation by indigenous peoples over 10,000 years ago until recent decades, transportation of people and goods in the Brazilian Amazon was essentially based on the region's immense network of rivers and streams.² This situation radically changed in the 1960s and 1970s, with the dramatically-increased level of state intervention in the Amazon that accompanied the military dictatorship, exemplified by the creation in 1966 of a new regional development agency, SUDAM. During this period, planning doctrines were highly influenced by geopolitical concerns for "national integration" and "national security" in the Amazon (following the slogan 'integrate it to avoid losing it' (*integrar para não entregar*), *apud* Becker 1990). The region was characterized as a demographic void, where urgent measures should be taken to allocate 'lands without men to men without lands' (*terra sem homens para homens sem terra*). This view ignored the presence of pre-existing populations, such as indigenous peoples, extractivists and river-dwellers. (Hall 1997).

² When referring to the Brazilian Amazon, it is useful to distinguish between the portion of the biome located within the country's boundaries (4.1 million km² or 48% of the country's surface area) and the "Legal Amazon" (*Amazônia Legal*) a geopolitical region created for administrative purposes that encompasses over 5.2 million km², or 61% of the country's total area, including all or part of nine Brazilian states (Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima and Tocantins). In terms of administrative regions, the Northern region of Brazil corresponds to the Legal Amazon, excluding Mato Grosso (located in the Center West region) and Maranhão (located in the Northeast region).

During the early 1970s, government policies prioritized the construction of the east-west Transamazon highway (BR-230) where an ambitious small-farmer colonization scheme in so-called 'agrovilas', under the responsibility of a new federal land agency, INCRA, would purportedly settle 100,000 migrant families - three-fourths of them impoverished Northeasterners (Moran 1981, Bunker 1985). Other major highways opened during the 1960s and 1970s included the BR-153 (Belem-Brasilia (during the previous Kubitscheck administration), BR-158, BR-163 (Cuiabá-Santarém) and BR-364 (Cuiabá-Porto Velho-Rio Branco)..

Figure 1.2 - Federal highways in the Brazilian Amazon



source: DNIT/MT

By the mid-1970s, the federal government had essentially abandoned its ambitious plans for small-farmer colonization along the Transamazon highway, leaving migrant families to their fate. Although purported to derive from a series of technical difficulties and the alleged shortcomings of migrant farmers, this change of course was traceable to pressures exerted by powerful lobbies based largely in the Center-South region, interested in new economic opportunities (especially large-scale cattle ranching) associated with the opening of roads and other infrastructure in the Amazon (Schmink and Wood 1979; Hecht 1985). Beginning in the mid-1970s, development paradigms were increasingly centered on promotion of private enterprises through generous credit and fiscal incentives, with particular attention to the ranching, timber and mining sectors (Gasques and Yokomizo 1985).

This period coincided with the initiation of large hydroelectric projects in the Amazon, exemplified by Tucuruí (PA), Balbina (AM) and Samuel (RO). Particularly in the case of Tucuruí, the motivation for dam construction was to provide subsidized energy for the electro-intensive aluminum industry, dominated by the huge Alubras and Alunorte conglomerates in Pará, whose production has been mainly aimed for export markets, especially Japan. The construction of the three dams was characterized by serious violations of human rights and major environmental damage, both upstream in large reservoirs and downstream from dam sites.

During the 1970s, impoverished migrant settlers continued to be attracted to the region, especially along the BR-364 highway in Rondônia and the Transamazon and BR-163 (Cuiabá-Santarém) highways in Pará, largely in the hopes of access to land or employment, including in activities related to dam construction.

During the 1980s, conventional models of Amazonian "development" were increasingly questioned by social movements, human rights advocates, environmentalists, academics and other concerned citizens. By the late 1980s, the rubber-tapper (*seringueiro*) and indigenous peoples' movements, in conjunction with environmentalists, were successful not only in calling public attention to the negative social and environmental impacts of mainstream development schemes (such as the World Bank-funded POLONOROESTE program) but also to their positive contributions towards the conservation of forests (Schwartzman and Allegratti 1987, Hall 1997).

Following the brutal murder of rubber-tapper leader Chico Mendes in December 1988, some positive steps were taken in the Amazon, such as the creation in March 1990 of the first four Extractive Reserves (RESEX), conceived by the rubber-tapper movement as a means to combine community-based development with forest conservation (Allegratti 1990). This period also witnessed creation of the national environmental agency IBAMA, whose primary roles have included licensing of economic activities with significant environment impacts (e.g. deforestation, infrastructure projects), creation and management of protected areas and promotion of forest management. Regular annual measurement by INPE of deforestation in the Amazon forest biome also began in 1988.

Throughout the late 1980s and 1990s, however, conventional development paradigms predominated in the region, as exemplified by the creation of a series of export-oriented multimodal transportation corridors within the *Brasil em Ação* (Brazil in Action) and *Avança Brasil* (Advance Brazil) infrastructure investment programs of the Cardoso administration (1994-2002).

During the government of Luiz Inácio Lula da Silva (2003-2010), a significant upsurge occurred in the implementation of mega-infrastructure projects in the Amazon basin, particularly with regard to the construction of large hydroelectric dams. Large dams and other major infrastructure projects – i.e. paving of highways, industrial waterways, and railroads – have been centerpieces of the federal government's Program for Accelerated Economic Growth (PAC). The PAC was launched February 2007, with a second phase (PAC 2) beginning in March 2010.³ Several projects located along international borders, such as the hydroelectric dams on the Madeira river, have been included in the Initiative for the Regional Integration of South American Infrastructure – IIRSA.

1.1 Energy Sector Planning and Dams in the Brazilian Amazon

Together with the Accelerated Growth Program (PAC), energy sector planning in Brazil is guided by the Ministry of Mines and Energy's National Energy Plan (*Plano Nacional de Energia* – PNE), the latest version of which was launched in 2006 (PNE 2030). A more concrete list of planned investments is included in a ten-year plan for the expansion of electrical energy generation, *Plano Decenal de Expansão de Energia* - PDE, the latest version of which (PDE 2019) was launched in 2010.

The stated objectives of the PNE and PDE 2019 include promotion of energy efficiency and conservation, diversification of Brazil's energy matrix, prioritization of "clean" sources of renewable energy and ensuring that energy policy is compatible with other strategic public policies in such areas as environmental protection, climate change, water resources, industrial development and transport. Despite these laudable objectives, little has been done to put this discourse into practice. Indeed, the PAC, PNE and PDE 2019 have been characterized a startling lack of attention to

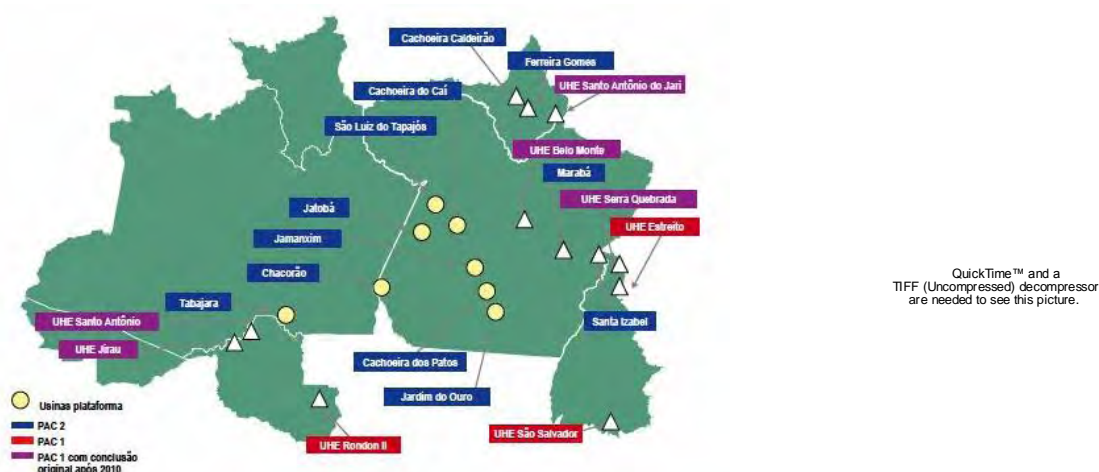
³ During most of the PAC's existence, the program has been centrally-managed by Dilma Rousseff, acting as Lula's Chief-of-Staff. Prior to taking over this job in 2005, in the midst of a corruption scandal involving her predecessor, Dilma served in the Lula government as Minister of Mines and Energy, where she played a key role in the intensification of plans for dam construction in the Amazon.

opportunities for energy efficiency and alternative sources of renewables (solar, wind, etc.) along with a pronounced bias towards the construction of large hydroelectric dams in the Amazon Region.

The current version of the National Energy Plan (PNE 2030) prioritizes dam building in the Amazon as a means to contribute 80% of the country's projected increase in generating capacity over the next twenty years. The plan calls for the exploitation of two-thirds of the Northern Region's estimated 112 GW hydroelectric potential during this period, involving the construction of up to 40 large dams in the Amazon. The current ten-year plan for energy expansion (PDE 2019) calls for an increase of 11,418 MW of installed capacity in new hydroelectric dams in the 2014-2016 period, with 89.2% coming from the Northern Region. An additional 10,733 MW of hydropower would come on line in the 2017-2019 period, of which 77% would come from new dams in the Northern Region.

The following maps provide illustrate the status of hydroelectric dams that are both under construction and planned within PAC 2:

Figure 1.3: Large Hydroelectric dams in the Northern and Central West Regions (PAC 1 and 2)



Source: PAC 2 (2010)

As illustrated above, two large dams, Santo Antonio and Jirau, are already under construction on the Madeira River, the Amazon's largest tributary.⁴ A highly controversial project, Belo Monte on the Xingu River, would constitute the world's third largest dam. In late January 2011, the project received a "partial" installation license, granted illegally by the federal environmental agency, IBAMA. However, the top priority of the Brazilian government's current rush to build dams in the Amazon is the Tapajós river basin, where a total of 13 large dams are planned for construction by 2019.

Dam planning in the Brazilian Amazon has been repeatedly plagued by practices of systematically underestimating social and environmental impacts and risks, and their related economic costs.⁵ Moreover, in addition to problems of disregard for human rights and

⁴ For further information on the Madeira dams, see: Aguas Turvas....

⁵ See: *Mega-projeto, Mega-riscos: Análise de Riscos para Investidores no Complexo Hidrelétrico Belo Monte* International Rivers, Amigos da Terra (2011).

environmental legislation, there has been a fundamental disconnect between dam planning and other public policies related to biodiversity, climate change, and river basin management.

Recently, the Ministry of Mines and Energy (MME) has carried out measures to supposedly promote the "greening" of hydroelectric dams in the Amazon. One such initiative, supported by the World Bank, has been the implementation by MME of "integrated environmental assessments" as part of basin inventory studies to identify the ideal location of future dams. However, such initiatives have criticized as little more than "greenwashing".

What are the forces behind the current frenzy of dam-building in the Brazilian Amazon, to the detriment of the rule of law and promising alternatives in the energy sector?⁶ A partial answer is that the planning elite within Brazil's Ministry of Mines and Energy is dominated by technicians trained as large dam-builders, with little or no knowledge in such areas as energy efficiency and alternatives sources of generation such as wind and solar, despite their enormous potential. However, the pronounced bias of Brazil's energy bureaucracy towards large destructive dams is much more political than technical.

To better grasp the forces underlying the surge of dam construction promoted by the Brazilian government, it is useful to sketch a power map of key economic and political players, and their strategies for promoting their interests.

An important characteristic of today's dam-building industry in Brazil is the presence of the parastatal energy company Eletrobras and its subsidiaries (Eletronorte, Furnas, Eletronorte, CHESF and others) and its close relations to private Brazilian multinational construction companies (such as Odebrecht, Camargo Correa and Andrade Gutierrez⁷), as well as the central role played by the Brazilian National Bank for Economic and Social Development (BNDES).⁸

The huge construction companies that dominate Brazil's hydro industry have grown and prospered by maintaining close relationships with politicians belonging to traditional regional oligarchies and their political appointees within the energy sector bureaucracy. Such relationships have been cultivated through practices such as "grafting" from contracts that originate from rigged public bidding, under-the-table campaign financing and other (often creative) uses of corruption.

The profitability of mega-dam projects has been enhanced by increasingly generous policies of subsidized credit, government-backed loan guarantees, and tax breaks, as well as the externalization of social and environmental impacts, often associated with violation of environmental and human rights legislation. Such factors at the same time reflect and harbor promiscuous relationships between dam-builders and the public sector. In the case of the Eletrobras group, the conflation of public and private roles has created a situation where a parastatal company occupies a privileged position to lobby for the its own corporate interests, and those of its private sector partners.

Luiz Inácio Lula da Silva was elected President of Brazil in 2002 on a platform of promises to reduce poverty, while fighting corruption and reinstating "ethics in politics". Once in office, Lula

⁶ The following paragraphs are based on a short article published in World Rivers Review (December 2010) entitled "Brazil's Dam Industry: Crony Capitalism Goes Global" (p.4)

⁷ In some cases, this alliance may include multinational corporations from northern countries, such as GDF Suez, still partially owned by the French government.

⁸ This "triple alliance" of public-private actors is increasingly extending its scope beyond Brazil's borders; currently, they are deeply involved in the design, financing and construction of large dams in other countries of the Amazon basin and elsewhere in Latin American (Bolivia, Peru, Ecuador, Nicaragua, etc.) and in African nations such as Mozambique, Ghana and Angola.

proceeded to form political alliances with many of Brazil's most backward regional oligarchs, including enemies from his previous days as a union leader, supposedly to guarantee a majority of votes in Congress. Following tradition, clientelistic alliances in the Lula administration were based on allocating control over key public institutions among political allies that are proceed to serve the private interests of political parties that are best described as patronage groups. The domination of the Sarney clan over the Ministry of Mines and Energy is an excellent example of such practices.

After an initial Sarney appointee was dismissed amid corruption charges, a Edison Lobão, known as a violent land-grabber in the northeast state of Maranhão, continued his predecessor's obsession with large dams. Lobão became famous for his public statement that "demonic forces" were impeding the construction of dams in the Amazon, referring to opposition from indigenous peoples and NGOs. After leaving office to run for a chair in the Brazilian Senate, Lobão was invited to return to his job as Energy Ministry in the government of Dilma Rousseff.

The opportunities for corruption arising from multi-billion dollar dam contracts, typically immune to public bidding procedures, are highly attractive to political patronage networks that often extend to the local level. This helps to explain the unrelenting support that mega-dam projects typically enjoy among politicians, as well as the keen interest of political parties such as the PMDB to secure control of the Ministry of Mines and Energy and its affiliates (Eletrobras, EPE, ANEEL, etc.).

1.2 Transportation logistics in the Brazilian Amazon

According to legislation dating back to the early 1970s (Federal Law no. 5917/73)⁹ transportation planning in Brazil should be guided by a document known as the *Plano Nacional de Viação* (PNV).¹⁰ Recently, a more influential planning tool, linked to entrepreneurial interests, has been the National Plan for Transportation Logistics (*Plano Nacional de Logística de Transportes - PNLT*) launched in 2007 by the ministries of transport and defense and updated in late 2009.¹¹

In recent years, the Accelerated Growth Program - PAC has, in practice, played an even more central role in transportation planning, given its influence over which projects will be prioritized for receiving investments. The PAC, in both its original version (February 2007) and the more recent PAC 2 (March 2010) calls for a series of investments in highway paving, industrial waterways and related port infrastructure, including both new projects and a recycling of old projects from past governments.

A) Amazonian highways

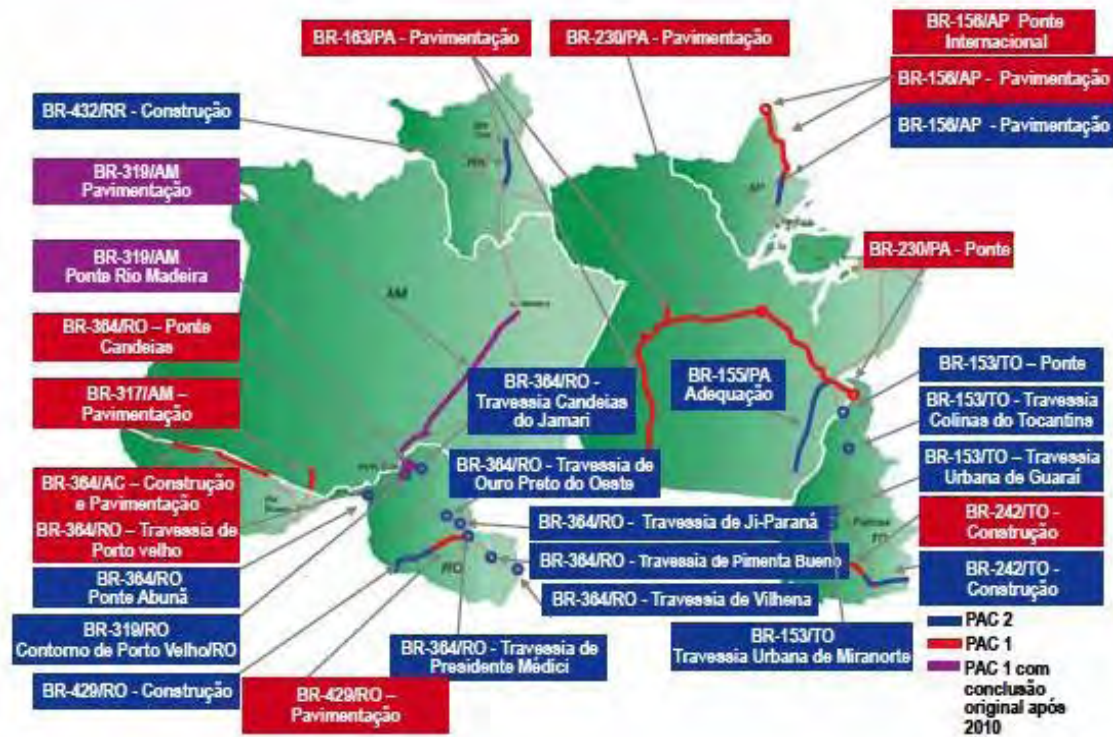
The following maps illustrate highways scheduled for paving under the PAC in the North and Center-West regions. In the Amazon, these highways include, among others, the BR-319 (Manaus-Porto Velho), BR-163 (Cuiabá-Santarém), BR-230 (Transamazonia – between Marabá and Itaituba), BR-364 (sections between Rio Branco and Cruzeiro do Sul) and the north-south BR-158 east of the Araguaia river in Mato Grosso and Pará.

⁹ http://www.planalto.gov.br/ccivil_03/LEIS/L5917.htm

¹⁰ <http://www.dnit.gov.br/plano-nacional-de-viacao>

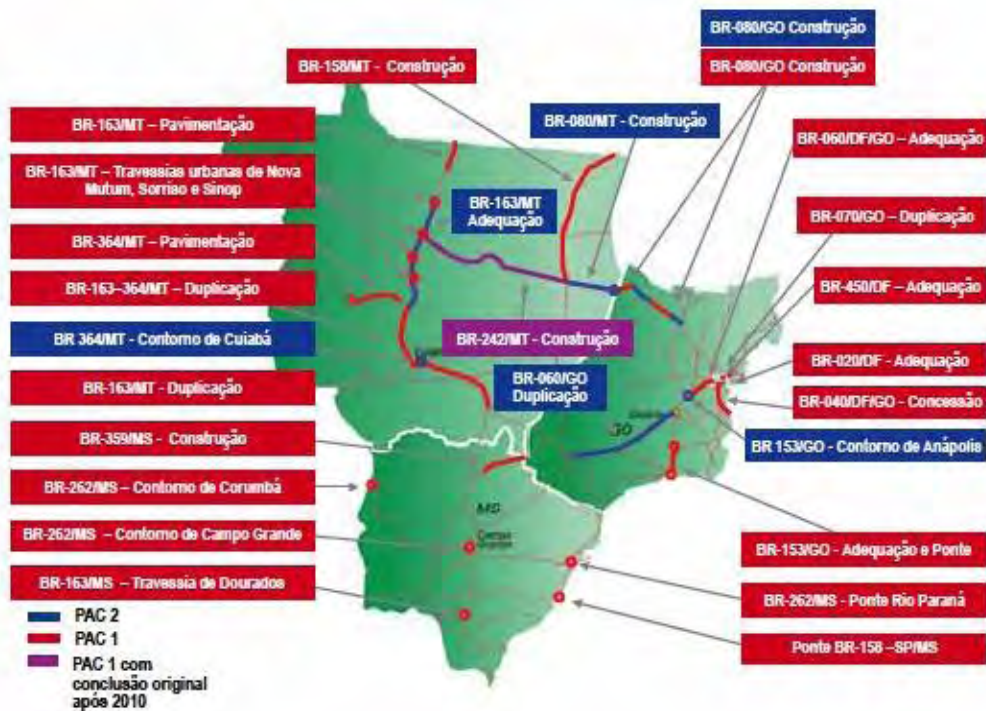
¹¹ For executive summary of the PNLT, see: <http://www.transportes.gov.br/index/conteudo/id/3280>

Figure 1.4: PAC: Major Highway Projects in the Northern Region



Source: PAC 2 (March 2010)

Figure 1.5: PAC: Major Highway Projects in the Center-West Region



Source: PAC 2 (March 2010)

The criteria used for prioritizing highways in the PAC clearly include agribusiness interests, such as those of soybean producers in Mato Grosso, and political interests, including those of Transport Minister Alfredo Nascimento, a politician from Amazonas state who has championed the reconstruction and paving of the Manaus-Porto Velho highway (BR-319).

During the early phase of President Lula's first administration (2003-2006), the federal government supported an innovative initiative proposed by social movements and other civil society organizations to formulate a sustainable regional development plan, known as *Plano BR-163 Sustentável*, that would prioritize actions to secure access rights to natural resources and strengthen livelihoods of vulnerable local populations, in conjunction with the asphaltting of the Cuiabá-Santarém highway. However, instead of being consolidated and upscaled to other highway projects, the initiative was essentially abandoned by the Lula government after the launching of the PAC in February 2007.

B) Inland industrial waterways (Hidrovias)

Recently, the federal Ministry of Transportation (MT) has taken initial steps towards establishing strategic planning of industrial waterways at the national level. This initiative is partially linked to conflicts with the Ministry of Mines and Energy (MME) whose dam construction initiatives have often failed to include navigation locks along rivers considered by the MT as priorities for *hidrovias* (e.g. Madeira). The energy sector has often argued that navigation locks are highly expensive, complicate environmental licensing procedures and cannot be justified by limited barge traffic to be expected along most waterways. The transportation ministry has, in turn, argued that construction costs of navigation locks are significantly higher *after* dam construction has been completed, and that booming markets for agribusiness and mining commodities will justify investments.

In December 2009, during a national seminar on ports and hidrovias, the Ministry of Transportation (MT) announced its intentions to develop a "strategic plan for waterways" (*Plano Hidroviário Estratégico*).¹² The seminar was sponsored by a caucus of the Brazilian Congress that focuses on infrastructure development issues, with support from the National Agency of Waterway Transportation (Antaq). Key issues discussed at the event included legal norms for requiring construction of navigation locks on new dams¹³, use of reservoirs to overcome natural obstacles) and privatization of port operations and water transportation as part of efforts to "modernize" the economy. During the seminar, another issue discussed was the need for collaboration with ANA (National Water Agency) with regard to establishing "multiple use rights" along hidrovias.

In March 2010, on the eve of the launching of PAC 2, the Ministry of Transportation announced that it had negotiated support from the World Bank for development of the *Plano Hidroviário Estratégico - PHE*.¹⁴ Apparently, the Bank agreed to finance studies to prepare the PHE, using an existing project, known as the "Program to Reduce Logistics Costs" (*Programa de Redução de Custos Logísticos* – PREMEF). In October 2010, the Ministry announced a set of guidelines for a "National Policy for River Transportation" (*Política Nacional de Transporte Hidroviário*) that calls for the construction of an extensive series of navigation locks on dams located along the Madeira,

¹² <http://www.jusbrasil.com.br/noticias/2036786/ministerio-anuncia-estudos-para-criar-plano-hidroviario-estrategico>

¹³ See: Projeto de Lei n.º 3.009-b, de 1997 *Estabelece a obrigatoriedade da inclusão de eclusas e de equipamentos e procedimentos de proteção à fauna aquática dos cursos d'água, quando da construção de barragens.* <http://www.camara.gov.br/sileg/integras/766751.pdf>

¹⁴ <http://www.tendenciasmercado.com.br/negocios/banco-mundial-linha-de-financiamento-para-hidrovias-no-br/>
http://www.emap.ma.gov.br/frmNoticiaDetalhe.aspx?id_noticia=3340

The PAC 2 includes plans for the opening and consolidation of industrial waterways (*hidrovias*) along major stretches of the Madeira (Porto Velho-Humaitá-Itacoatiara), Tapajos (Miritituba-Santarém) and Tocantins rivers. The *hidrovias* are linked to highways and railroads as components of transport corridors geared towards export-oriented agricultural and mining commodities.

The transportation logistics for *hidrovias* within the PAC include: dredging and removal of rocks (*derrocagem*), as well as flooding by hydroelectric dams, along stretches of rivers that are currently not navigable by large barges; installation of navigation locks on hydroelectric dams located along priority *hidrovias* (as in the case of the recently completed locks on the Tucuruí dam); upgrades of major port facilities in strategic locations (such as Santarém at the mouth of the Tapajós) to provide ocean-going ship access, as well as storage and loading facilities for agricultural and mining commodities; a series of secondary ports along the main stem and major tributaries of the Amazon, and promotion of shipyards and ship-building.

As further discussed in the Chapter 2, the planning of *hidrovias*, in a manner similar to hydroelectric dams, typically underestimates negative social and environmental consequences and risks - including cumulative impacts with other large infrastructure projects - and has not involved effective population of local populations in the planning process, including free, prior and informed consent of indigenous communities and other traditional populations.

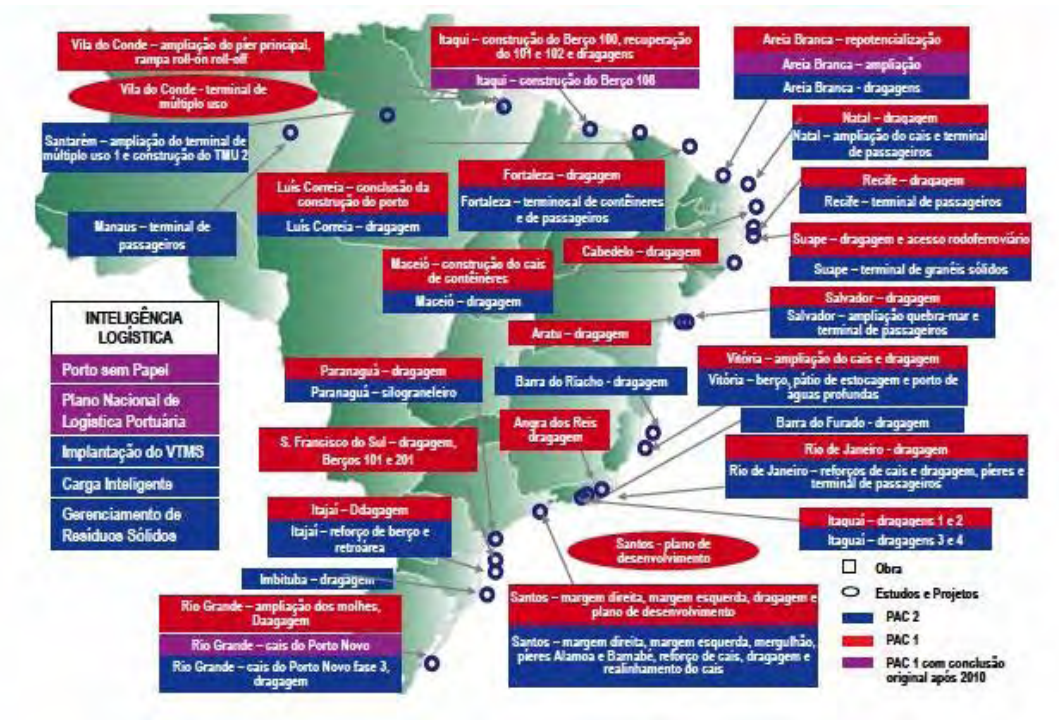
Figure 1.6: Priority Investments in Hidrovias (PAC 2)



Source: PAC 2 (March 2011)

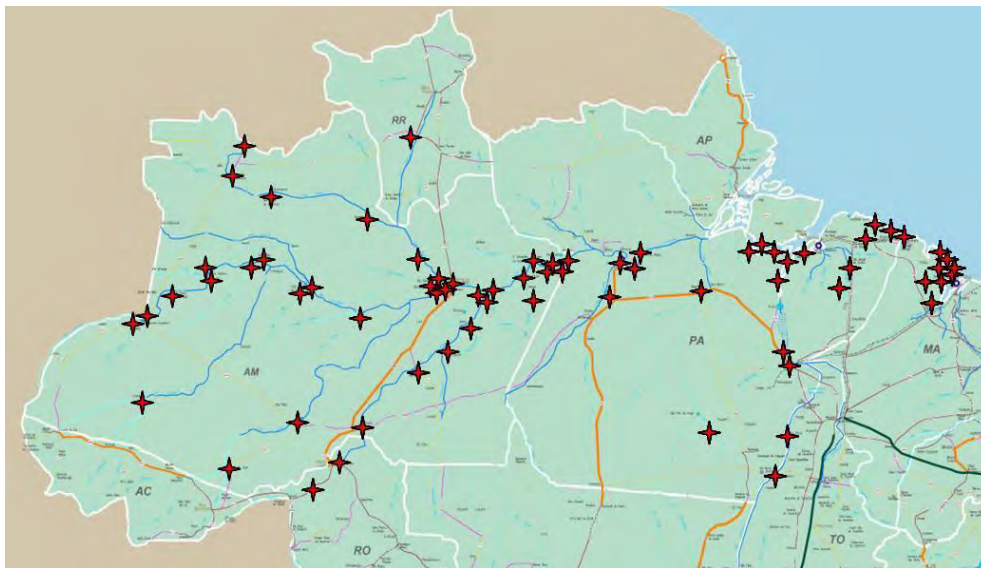
¹⁵ <http://www2.transportes.gov.br/Modal/Hidroviario/PNHidroviario.pdf>

Figure 1.7: Priority Investments in Port Facilities (PAC 2)



Source: PAC 2 (March 2010)

Figure 1.8: Port Terminals in implementation in the Northern Region



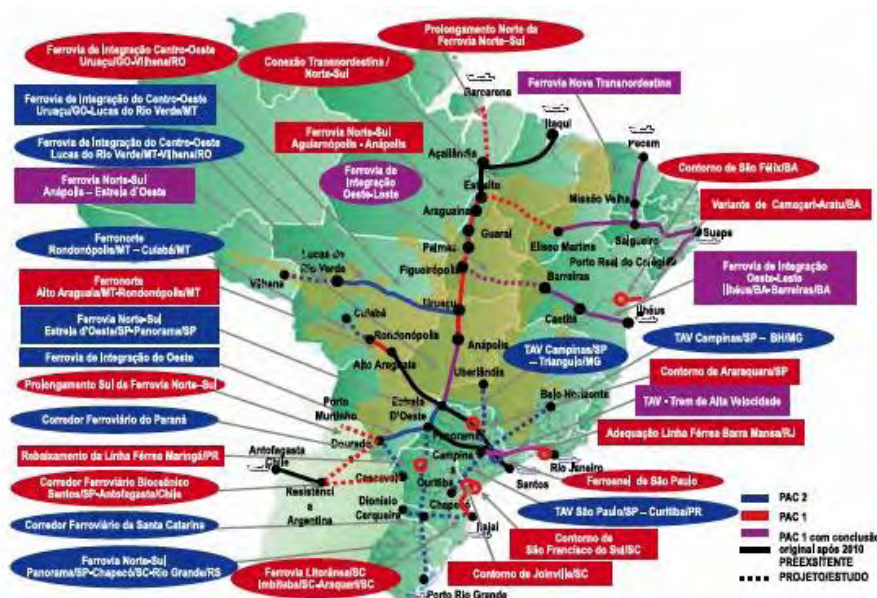
Source: Drummond 2009 (MT)

C) Railway transportation in the Brazilian Amazon

Plans for transportation logistics within the PAC and PNLT includes investments in railroad transportation, most notably the North-South railroad (Ferrovia Norte Sul), currently under construction, that will reach the port of Itaqui in São Luiz (MA) and the industrial port of Barcarena (Pará). Furthermore, the PAC 2 calls for the construction of railroad linking the Ferrovia Norte Sul in Uruaçu (GO) to Lucas do Rio Verde (MT) to Vilhena and Porto Velho (RO) in the western Amazon.

Both railroads include linkages to highways and *hidrovias*.

Figure 1.9 - PAC 2: Expansion of Railroads



Source: PAC 2 (March 2010)

In summation, planning for hydroelectric projects and transportation corridors in the Amazon is closely linked to economic interests related to export-oriented agribusiness and mining commodities, as well as those of the dam construction industry, all of which maintain close reciprocal relationships with political patronage groups, such as the Sarney clan within the PMDB, that control key government institutions, such as the Ministry of Mines and Energy. As described in the case study of the Tapajos Complex, major infrastructure projects proposed and currently under construction in the Brazilian Amazon, such as those outlined in this chapter, may have huge implications in terms of their potential social and environmental consequences – including conflicts over access rights to natural resources within territories occupied by indigenous peoples and other traditional populations. However, socio-environmental impacts and risks (including cumulative impacts with other major projects, mitigation and compensation costs and alternative investments) have been systematically underestimated and neglected in procedures of project planning and environmental licensing.

An issue that merits further investigation is the new role of the World Bank in supporting the strategic planning of industrial waterways (*hidrovias*) in Brazil, particularly with regard to prevention and mitigation of social and environmental impacts. In principle, this should include the challenge of ensuring compatibility of *hidrovias* vis-à-vis river basin management strategies (that the Bank has supported in Brazil, particularly in the southern region), management of protected areas, human rights and related issues of territorial planning.

Recently, private sector groups are playing an increasing active role in infrastructure planning in the Amazon, particularly with regard to the transport sector, as illustrated by a major report "Norte Competitivo" (Competitive North) produced by the consultancy firm Macrologística under contract to the National Industrial Council (CNI) and its members federations from the Amazonian states, launched in November 2010.¹⁶ The study analyzes current and projected barge

¹⁶ <http://www.macrologistica.com.br/9512.html>

traffic for key agricultural, mining and industrial commodities on current and potential transportation corridors, logistical costs and returns to investment to define priority "axes of integration" in the Brazilian Amazon It is noteworthy that the Norte Competitivo study considers the Juruena/Tapajos as a top priority (Figures 1.10 and 1.11)

Figure 1.10: Proposal for the Juruena/Tapajos Waterway a new "Axis of Integration" (Projeto Norte Competitivo)



Figure 1.11: Priority Transportation Corridors in the Legal Amazon - Projeto Norte Competitivo



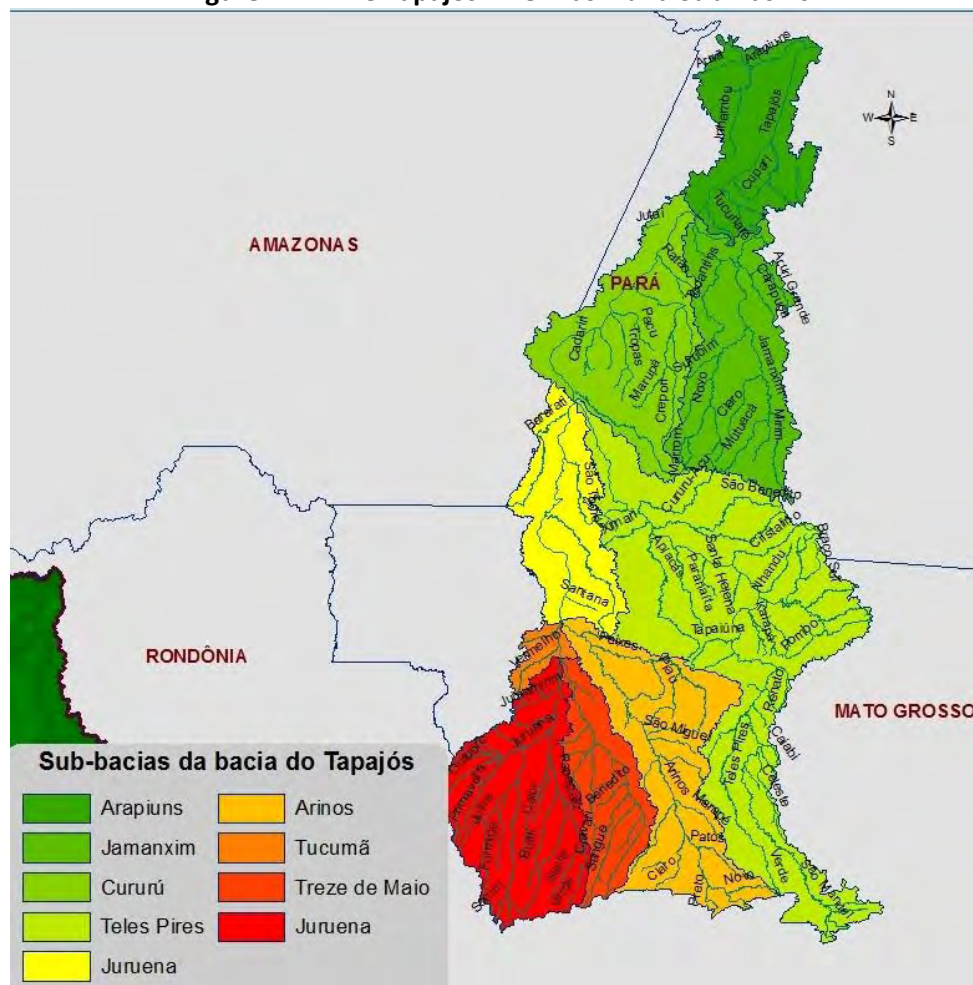
source: Macrologística (November 2010)

2. Hydroelectric dams and inland waterways in the Amazon: case study of the Tapajós Complex

2.1 Socio-environmental and historical context

The Tapajós River initiates in the border region between the states of Mato Grosso, Pará and Amazonas at the confluence of the Teles Pires and Juruena rivers, whose headwaters lie in the upland central plateau of Brazil. From that point, the Tapajós flows some 825 kilometers in a mainly northeastern direction until reaching the right margin of the Amazon River. The Jamanxim and Arapiuns rivers, located entirely in the state of Pará, are also the tributaries of the Tapajós. The entire Tapajós sub-basin of the Amazon covers an estimated 493,000 square kilometers.

Figure 2.1 – The Tapajos River Basin and Sub-Basins



source: Arnaldo Coelho (RAISG/ISA)

The Tapajós River is often divided into four distinct segments: (i) a relatively short stretch that runs from the confluence of the Teles Pires and Juruena rivers to the mouth of the Cururu River, with relatively flat terrain and multiple sand banks (ii) an extended stretch from the mouth of the Cururu to the town of Itaituba, characterized by rapids, islands, sand banks and erosive processes, including the São Luiz rapids, located approximately 50km upriver from Itaituba, (iii) a segment of some 120 km between Itaituba and Aveiro marked by a string of islands and (iv) the long stretch of approximately 150km between Aveiro and the right margin of the Amazon River, known as the *Ria de Tapajós*, where distances between the margins of the Tapajós reach up to 20 km, a legacy of erosive processes during low sea levels of glacial periods. Before reaching the Amazon River near the

historical town of Santarém, the Tapajós tapers to a channel of 1.1 km.

The portion of the Tapajos basin located below the confluence of the Juruena and Teles Pires Rivers is generally characterized by lush forest vegetation and tremendous biodiversity of flora and fauna, including species threatened with extinction. Transitional vegetation types between the Cerrado and Amazon Forest biomes are typical in the portion of the basin located within Mato Grosso state. The region has a humid climate with high rainfall levels, including two distinct seasons and a mean annual high temperature of 26.7° C. September to November are the warmest months, with January to April being the months of heaviest rainfall. The seasonality of the Tapajos is linked to rainfall regimes and vegetation in the catchment areas of its various sub-basins.

The waters of the Tapajós River are characterized by high transparency and relatively high acidity, as well as low levels of turbidity and suspended sediments, reflecting the influence of the Pre-Cambrian Brazilian Shield that accounts for much of area drained by the basin. Near the mouth of the Tapajos, the amount of suspended matter and sediments increases somewhat, largely as a backwater influence of the Amazon Rive itself.

The earliest occupation of the Tapajos basin by indigenous peoples involved tremendous ethnic diversity and complex social interactions, including the presence of such groups as the Munduruku, Apiaká, Tupinambarana, Cumaru Maytapu, Tapajos, Cara-Preta, Arapiun, Arara Vermelha and Jaraqui.

Occupation of the Tapajós basin during the colonial period was characterized by efforts of the Portuguese to ensure political and economic hegemony of the region through installation of military forts and missions along rivers, especially after the expulsion of the Dutch in the seventeenth century. The first Portuguese settlements were founded along the banks of the Tapajós River and its tributaries in the first half of the 17th century, including the village of Tapajós in 1639 at the site of present-day Santarém.

Portuguese expansionism subsequently moved upriver on the Tapajos, where new villages were created, attracting adventurers in search of gold and other riches. The first recorded contacts between the Portuguese and the Mundurukú people occurred in 1768. In response to foreign occupation of their territories, the Mundurukú became increasingly nomadic during the eighteenth century, migrating as far as the Madeira to the west, and the Xingu and Tocantins rivers at the eastern flank of the Amazon rainforest.¹⁷

With the onset of the Amazon rubber boom in the late 19th century, occupation of the Tapajós region was greatly intensified. In 1861, the British geographer Chandless observed rubber trees at the confluence of the Teles Pires and Juruena rivers. No long after, indigenous peoples were working as rubber-tappers (*seringueiros*) in conditions of debt peonage and semi-slavery. Later, migrant workers from Northeast Brazil largely substituted indigenous peoples in the rubber estates (*seringais*).

With the decline of the rubber booms, much of the population in the Tapajos region of Pará - including migrants from the Northeast, communities of runaway slaves (*quilombolas*) and an increasing number of mixed-blood *caboclos* - developed an increasingly diversified subsistence base and market activities including timber and non-timber forest extraction, agriculture on the upland *terra firme* and *varzea* floodplains, hunting and fishing. Such activities persist today, especially in the Lower Tapajos, despite pressures of recent frontier expansion, described below. For example,

¹⁷ According to Ramos (2003), the Mundurucu traditionally inhabited areas of forests along navigable rivers, especially in areas where there is a juxtaposition of savanna vegetation, such as the "campos do Tapajós".

local fisherman currently market over 30 species of fish, the most important of which are Curimatá (*Prochilodus spp.*), Dourado (*Salminus spp.*) and Tambaqui (*Colossoma macropomum*). Among extractive activities based on non-timber forest products, açai (*Euterpe oleracea*) and Brazil nuts (*Bertholletia excelsa*) have especially significant, especially in municipalities of Santarém and Jacareacanga. The economic difficulties faced by local populations in the Tapajos are largely related to a historical lack of priorities among development policies to the promotion of supply chains based on sustainably-managed products, as a source of employment and income.

In recent decades, occupation of the Tapajos region has been strongly influenced by development policies initiated during the military dictatorship. As described in section 1, by the early 1970s these policies included the opening of the east-west Transamazon highway (BR-230) associated with an ambitious small-farmer colonization scheme, and the construction of the Cuiabá-Santarém (BR-163) highway as a north-south penetration road (the latter with particularly devastating effects for the Panará indigenous people). As noted, the federal government essentially abandoned its ambitious plans for small-farmer colonization along the Transamazon highway by the mid-1970s, in favor of incentives for large-scale cattle ranching, logging and mining activities.

One of the world's largest natural deposits of gold is located in the Tapajós river basin, where wildcat mining (*garimpos*) became increasingly prevalent in the late 1950s. In 1983, the federal government issued legislation (Portaria n.º 882 de 25/07/83) that created a "reserva garimpeira" of approximately 28,745 km² in the Tapajos region, with the stated objective of reducing conflicts between *garimpeiros* and large mining companies in such locations as *Castelo dos Sonhos*. Nevertheless, conflicts over access to gold deposits and related problems, such as mercury contamination, have continued to occur, in some cases on indigenous lands.

The human population of the Tapajós region was recently estimated at 820,000 (IBGE 2000). Current municipalities in Pará state include: Santarém, Itaituba, Belterra, Aveiro, Novo Progresso, Juruti, Jacareacanga, Rurópolis and Trairão. Only one municipality in the state of Amazonas is located partially in the basin, Maués (11% of the total area). These municipalities constitute what are considered as the "meso-regions" of Lower Amazonas and Southeast Pará. Present-day municipalities are a result of the dismemberment of the territory of Santarém, created in 1755. First came Juruti, Itaituba, and Aveiro, and then Itaituba was subdivided into three new municipalities: Trairão, Novo Progresso and Jacareacanga. Aveiro was dismembered to create the municipality of Rurópolis, which emerged with the construction of the Transamazon highway. The most recently-created municipality of the Tapajos basin is Belterra, established in 1997, also dismembered from Santarém.

The city of Itaituba, with an estimated population of 102,500 inhabitants in 2000 (IBGE, 2000) is the largest urban center of the Tapajós in Pará, after Santarém (with a population of approximately 176,000 inhabitants). Land access to Itaituba is only possible via the Trans-Amazon Highway (BR-230), most of which is still unpaved, and by the Cuiabá-Santarém (BR-163). As illustrated in section 1, the Transamazon highway between Marabá and Itaituba, as well as the Cuiabá-Santarém highway are scheduled for paving under the PAC. Itaituba has an airport with a paved runway that is served by regional airlines. With approximately 25,000 inhabitants, the town of Jacareacanga is located upstream from Itaituba on the Tapajós River and along the Transamazon highway. Navigation on the Tapajós upriver from Jacareacanga is limited by stretches of rapids, especially in the area known as *Chacorão*. Urban areas in the region are characterized by serious sanitation problems, in terms of water treatment, sewage systems and solid waste disposal and recycling.

In recent decades, logging, cattle ranching and mining have become predominant economic

activities in the Tapajós basin. Such phenomena are associated with processes of frontier expansion originating from northern Mato Grosso, particularly along the axis of the BR-163 highway. Especially in the case of the logging industry, expansion to Pará has been associated with exhaustion of natural resources in northern Mato Grosso. In the Tapajós region of Para state, the cattle population increased from some 565,000 in 2000 to over one million in 2005. The largest increase occurred in the municipalities of Novo Progresso and Itaituba.

In Mato Grosso, the catchment areas of both the Teles Pires and Juruena rivers have been subjected to extensive logging, ranching and expansion of large-scale mechanized cultivation of soybeans and other grains, involving migrants originating from southern Brazil. In Mato Grosso, there is a clear trend towards verticalization, with investments in processing, storage and transportation logistics.

Particularly in Mato Grosso, agribusiness elites increasingly exercise control of the direction of regional policy, exercising strong influence over new infrastructure projects - roads, railways, dams, waterways – with the objective of reducing production and transportation costs of low value-added commodities aimed largely at global markets. Increasingly, large mining corporations have become interested in intensifying their operations, especially in the gold, bauxite and iron ore sectors of Pará, with enormous implications for demands for cheap and abundant electrical energy, river ports and inland waterways.

With the installation of the Cargill terminal in Santarém, an unprecedented expansion of soybean cultivation (in conjunction with land speculation) occurred in the vicinity of the "Planalto Santareno", with a rapid increase from an estimated 50 hectares in 2000 to 36,000 hectares in 2005. The expansion of the agricultural frontier, particularly soybeans and cattle ranching, is linked to phenomena of increasing sedimentation within the Tapajós basin, in addition to other social and environmental problems

To a large extent, frontier economies have been based on illegal activities (logging, mining, ranching) often in conjunction with speculation and illegal expropriation (*grilagem*) of public lands, ultimately leading to pressures on indigenous lands and conservation units. Proceeds from sales of higher-value timber species, often logged illegally, have been used to finance clear-cutting of remaining forest and purchase of cattle.

For indigenous peoples and other traditional populations, frontier activities such as cattle ranching, logging, mining and agribusiness have typically been accompanied by serious disputes over territories and natural resources. Such losses have devastating impacts on subsistence activities, such as hunting, that contribute to malnutrition and a variety of other problems that are exacerbated by a lack of adequate health care, contributing further to socio-cultural instability. The model of rapid economic growth promoted as "development" in the Amazon, without due safeguards for indigenous peoples and other traditional populations, leads to progressive losses of territories and natural resources, and ecosystem degradation, associated with the undermining of cultures and quality of life of local populations.

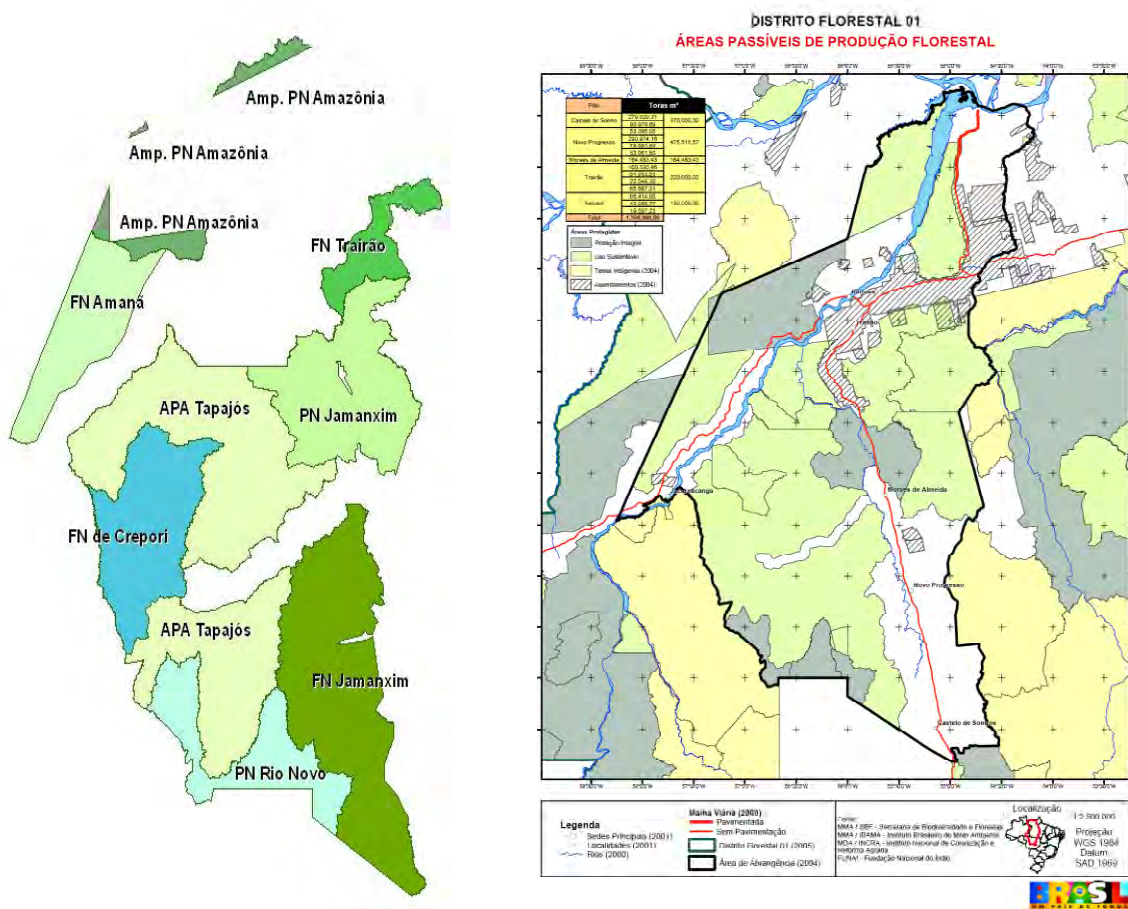
With the federal government's announcement in 2003 of plans to pave the BR-163 (Cuiabá-Santarém) highway, deforestation and land speculation, often involving violent conflicts, increased dramatically in the region, especially in the municipality of Novo Progresso, Pará.¹⁸ Due largely to the protagonism of local social movements and NGOs, a participatory process was initiated that led to the preparation of a sustainable regional development plan for the area of influence of the

¹⁸ <http://www.obt.inpe.br/prodes/seminario2005>

Cuiaba-Santarém highway.¹⁹ This initiative was subsequently abandoned as a result of an increasingly realignment of the Lula government with traditional political and economic elites, evidenced by the launching of the PAC in February 2007 (see section 1).

Between May 2005 and February 2006, coinciding with preparations of the *Plano BR-163 Sustentável*, the Ministry of the Environment (MMA) successfully promoted the creation by presidential decree of a mosaic of conservation units in the region of the Cuiabá-Santarém highway (largely in the Tapajos basin). Together with a Presidential decree creating Brazil's first "sustainable forest district", the goal would be to promote sustainable management of timber and non-timber forest products, environmental preservation and the "ordering" of wildcat mining activities (garimpos). During this period, nine sustainable use conservation units were created in a total of 4.9 million hectares, including the Jamanxim National Forest (1.3 million ha), Crepori National Forest (740,000 ha), Amanã National Forest (540,000 ha), Trairão National Forest (257,000 ha) and the Tapajós Area of Environmental Protection (2.1 million hectares), the latter involving nearly the entirety of the *Reserva Garimpeira do Tapajós*. In addition, more restricted use conservation units of "integral protection" were created in a total of 1.9 million hectares, including the Nascentes da Serra do Cachimbo Biological Reserve (342,000 ha), the Jamanxim National Park (859,000 ha, traversed by the BR-163 highway), the Rio Novo National Park (537,000 ha) and amplification of the limits of the Amazônia National Park (167 mil ha).

Figure 2.2 – Conservation Units and Sustainable BR-163 Forest District created in 2005-2006



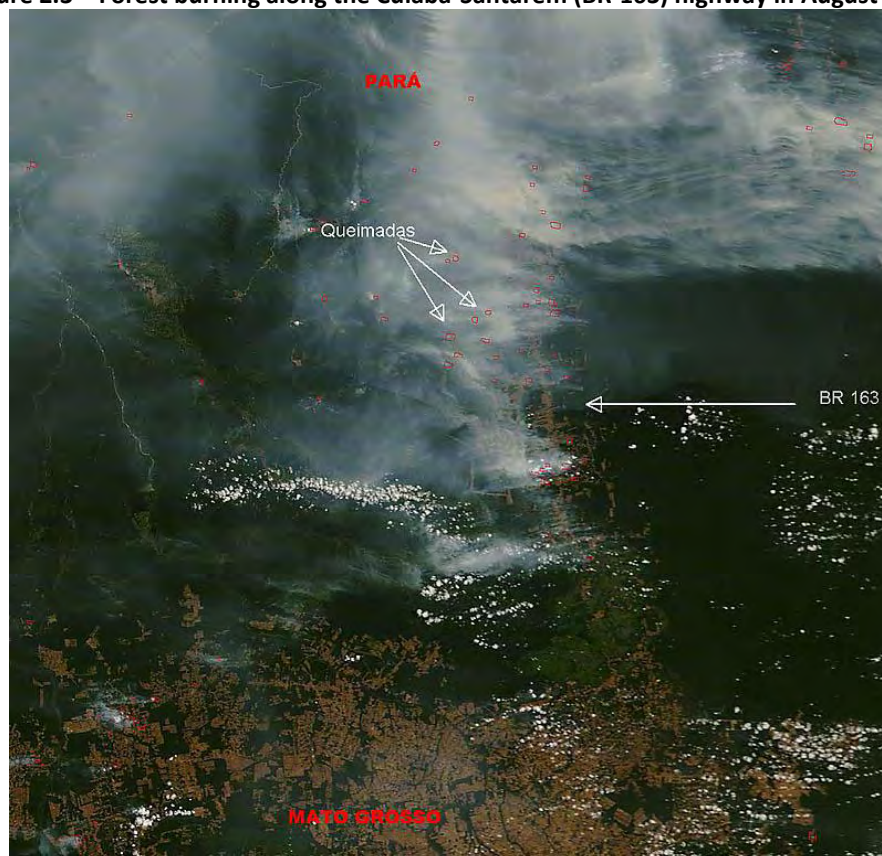
Source: MMA/Serviço Florestal Brasileiro - SFB

¹⁹ <http://www.planalto.gov.br/casacivil/arquivosPDF/BR163.pdf>

During the same period, the state government of Amazonas created a second mosaic of seven conservation units totaling 2.3 million hectares to the west of the Mundurucu and Kayabi indigenous territories, near the confluence of the Juruena and Teles Pires Rivers. These included: the Sucunduri State Park (808 mil ha), the Sucunduri (493 mil ha), Aripuanã (336 mil ha) e Apuí (186 mil ha) state forests; the Guariba Extractive Reserve (150 mil ha) and the Aripuanã (224 mil ha) e Bararati (114 mil ha) Sustainable Development Reserves. These areas complemented Jatuarana National Park, created in 2002 with 837 mil hectares.

Clearly, the unprecedented creation of a mosaic of conservation units in the area of influence of the BR-163 highway, in conjunction with increased enforcement of illegal activities, was highly significant in terms of reducing deforestation. However, the lack of effective follow-up actions to implement these conservation units, including support for a new economic model based on sustainable use of forest resources, as well as attempts by influential political and economic elites to revoke decrees creating protected areas, are linked to a resurgence of deforestation and burning in the region

Figure 2.3 – Forest burning along the Cuiabá-Santarém (BR-163) highway in August 2008



Source: MODIS/NASA

The creation of new conservation units complemented indigenous lands in the composition of a mosaic of protected areas in the region. Important indigenous territories of the Tapajós basin in the border region between Pará, Mato Grosso and Amazonas include: the TI Mundurucu (2.4 million ha), TI Sai Cinza (125,552 ha) occupied by the Mundurucu, and TI Kayabi (568,210 ha) occupied by the Kayabi, Apiaká and Mundurucu ethnicities. Along the Teles Pires and Juruena rivers, the rapid expansion of agricultural and ranching activities had severe impacts in terms of displacement of indigenous peoples. Today, scattered indigenous lands, covering much relatively small areas, can be found along the Juruena river and its tributaries in Mato Grosso, including TI Escondido (79,935 ha), TI Japuíra (152,509 ha) and TI Erikpatsa (79,935ha), all occupied

by the Rikbatsa people, TI Apiaká-Kayabi (109,245 ha, occupied by the Apiaká, Mundurucu and Kayabi peoples) and TI Batelão (117,050 ha, occupied by the Kayabi).

The legal recognition of most indigenous lands in the Tapajós basin began in the late 1990s, although mobilization of indigenous peoples to defend these rights, based on article 231 of the Federal Constitution of 1988, began much earlier. In areas such as the TI Kayabi, located along the Teles Pires river on the Mato Grosso-Pará border, important steps remain to be taken to ensure full territorial rights and demarcation. Such delays have been largely related to agribusiness and ranching interests, that perceive recognition of territorial rights of the Kayabi as a threat to further frontier expansion, including opening of the Teles Pires-Tapajos inland waterway (hidrovia). The lack of effective protection of indigenous lands facilitates pressures on these areas and their populations. Today, indigenous peoples of the Tapajós basin face a variety of pressures from such activities as mechanized soybeans, cattle ranching, illegal logging and mining. Perhaps none is as significant as the threat now posed by the imminent construction of the Tapajos Complex of hydroelectric dams and industrial waterways.

Figure 2.4 Major watersheds of the Brazilian Legal Amazon and distribution of deforestation, protected areas (sustainable use areas and strictly protected areas) and indigenous lands.

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

source: Trancoso et. al (2010)

2.2 Damming the Tapajós

Preliminary studies to determine the hydroelectric potential of the Tapajós basin were carried out between 1986 and 1991 by the parastatal energy company *Centrais Elétricas do Norte do Brasil, S.A.* (Eletronorte), part of the Eletrobras holding. The first project to dam the Tapajos River was developed by Eletronorte in the 1980s, envisioning a gigantic reservoir that would flood a long stretch of the Tapajós, including the town of Jacareacanga, before reaching the confluence of the Teles Pires and Jurueña rivers. In absence of prospects for domestic funding and in the context of

mounting public opposition to financing of large dams by the World Bank, Eletronorte's initial project for the Tapajos never materialized.

In 2006, Eletronorte signed an agreement with one of Brazil's largest construction companies, Camargo Correa Construções e Comercio, S.A. (CCCC) to carry out hydroelectric inventory studies of the Tapajos and Jamanxim sub-basins. The study concluded in 2008 that a series of seven hydroelectric projects could be built along the Tapajos and Jamanxim rivers, with a total installed capacity of 14,245 megawatts (MW).²⁰ The largest of the proposed dams, São Luiz de Tapajós, was quickly incorporated into the Ministry of Mines and Energy's Ten Year Energy Expansion Plan (PDE) for the 2008-2017 period.

The Tapajós Complex was initially planned to generate 10,682 MW in a set of five cascade dams. Out of the seven identified in the inventory, the plans included two dams on the Tapajos: São Luiz do Tapajós (6,138 MW) and Jatobá (2338 MW); and three dams on the Jamanxim river: Cachoeira Cai (802 MW), Jamanxim (881 MW) and Cachoeira dos Patos (528 MW). In late 2010, Eletrobras announced that subsequent hydrology studies concluded that the capacity of the São Luiz do Tapajós hydroelectric project could be expanded from 6,138 MW to 7,880 MW.

In 2010, new planning documents for the energy sector – PAC 2 (launched in March 2010), the Ten-Year Energy Plan launched in 2010 (PDE 2019) and Eletrobras' Strategic Action Plan for 2009-2012 – identified two additional large dams to be built: Jardim de Ouro (227MW) on the Jamanxim river, and Chacorão (3.336 MW) on the Tapajos River.

The federal government initially announced that the Tapajós Complex dams were scheduled for auction in 2010, but then moved the projected date back to 2011. According to the current ten-year energy plan (PDE 2019), the São Luiz do Tapajos dam should begin operations in 2016, with the remaining six dams coming on-line in 2019. The inventory studies conducted by Eletronorte and Camargo Correa have been delivered to the National Energy Agency (ANEEL), and the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA). According to the IBAMA website, the licensing process for dams was initiated in May 2009, but the Terms of Reference for Environmental Impact Assessments (EIAs) have not yet been posted.

As illustrated in Figure 2.5, Eletronorte's ambitious plans to construct an unprecedented series of seven large dams along the Tapajós and Jamanxim Rivers in Pará represents a direct contradiction to the mosaic of conservation units established in 2005-2006, as well as a threat to indigenous lands. Together, the seven dams, budgeted initially at US\$ 20.8 billion, would flood 302,179 hectares. Of the total area to be flooded, 93,073 hectares would be located within conservation units, including the Amazonia and Jurueña National Parks, the Altamira, Itaituba, Itaituba II and Jamanxim National Forests, the Tapajós Environmental Protected Area (APA). Additionally, some 18,700 hectares of the Mundurucu Indigenous Lands would be flooded by the Chacarão dam.

²⁰ Estudos de Inventário Hidrelétrico das Bacias dos Rios Tapajós e Jamanxim - Centrais Elétricas do Norte do Brasil S. A. – Eletronorte e Construções e Comércio Camargo Corrêa S.A. – CCCC - 2008

Figure 2.5 – Seven Planned Dams on the Tapajos and Jamanxim Rivers in the State of Pará

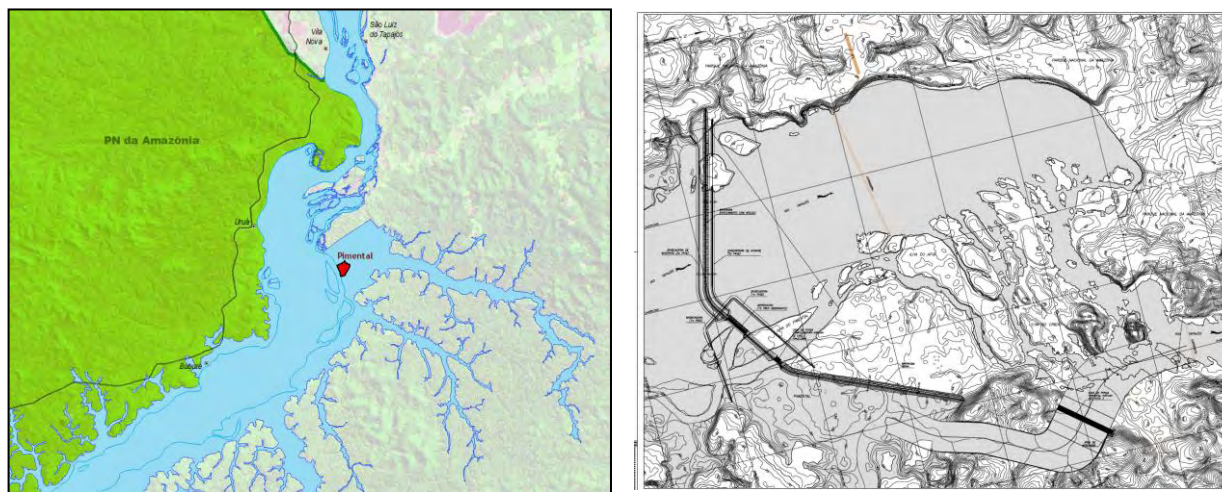
QualiPro 7.0.0.0
TPT (C:\Program Files\QualiPro\TPT.exe)
2010-01-01 10:00:00

Figure 2.6 - Tapajos-Jamanxim Dams: Location, costs, reservoir size and protected areas to be flooded

Dam	River	Estimated Cost (US\$ million)	Reservoir size (hectares)	Area in conservation units to be flooded (hectares)
São Luiz do Tapajós	Tapajós	9,200	72,225	PARNA Amazônia 9,935 FLONA Itaituba: 78 FLONA Itaituba 2: 20,238 (30,251 ha)
Jatobá	Tapajós	4,000	64,630	FLONA Itaituba 1: 2,753
Chacorão	Tapajós	4,300	61,623	PARNA Juruena: 1,004
Cachoeira do Caí	Jamanxim	1,020	42,000	PARNA Jamanxim: 15,700 FLONA Itaituba 1: 6,081 FLONA Itaituba 2: 468 (22.249 ha)
Jamanxim	Jamanxim	984	7,445	PARNA Jamanxim: 8,516
Cachoeira dos Patos	Jamanxim	751	11.650	PARNA Jamanxim: 9,000 FLONA Jamanxim 3,600 (12.600 ha)
Jardim do Ouro	Jamanxim	500	42,606	FLONA Jamanxim: 14,700 FLONA Altamira: 1,000 (15,700)
TOTAL	--	20,755	302,179 ha	93,073 ha

The largest of the dams, São Luiz do Tapajós, would be located at the São Luiz rapids, an area of remarkable scenic beauty and considerable potential for tourism, approximately 50km upriver from the city of Itaituba. The project design includes a dam wall upstream of the rapids with an adductor canal that would divert part of the river flow from the rapids to a main power house. The main powerhouse was designed for 5,920 MW of installed capacity, and the secondary powerhouse with 213 MW of capacity. The estimated cost to build the São Luiz do Tapajós hydroelectric dam was estimated at USD \$9.6 billion in 2009.²¹ The São Luiz do Tapajós dam would create a reservoir of 72,225 hectares, that would include flooding of 9,935 ha of the Amazônia National Park and 20,316 hectares in the Itaituba I and II National Forests.

Figures 2.7 and 2.8 - Characteristics of the proposed São Luiz do Tapajós Dam Project



Source: Juan Dublas, Movimento Tapajós Vivo (tapajosvivo.org)

Brazilian environmental legislation does not foresee the authorization of studies within conservation units aimed at the construction of hydroelectric dams within their boundaries, much less construction itself. In an attempt to circumvent such obstacles, President Luiz Inácio Lula da Silva signed Decree no. 7.154 on April 9, 2010, allowing for authorizations of technical studies on hydroelectric dam potential within both strictly protected (*proteção integral*) and sustainable use conservation units, as well as construction of dams and power lines within sustainable use areas. Members of the Brazilian Green Party are currently challenging the decree as unconstitutional.²² Given that the Brazilian Constitution prohibits uses of conservation units in ways that undermine the environmental attributes that justify their existence, a tactic used by pro-dam Congressman, allied with Eletrobras and private dam companies, is to introduce legislation in the Brazilian Congress that would reduce conservation units to exclude areas expected to be flooded by planned dams, or decommission protected areas all together.²³ According to Tapajós.vivo, such initiatives could result in the exclusion of 207,559 hectares from conservation units and the Mundurucu indigenous territory (Figure 2.9). Meanwhile, controversial legislation to facilitate exploitation of mineral resources and hydroelectric potential on indigenous lands is being pushed forward.²⁴

²¹ Estudos de Inventário Hidrelétrico das Bacias dos Rios Tapajós e Jamanxim - Centrais Elétricas do Norte do Brasil S. A. – Eletronorte e Construções e Comércio Camargo Corrêa S.A. – CCCC – 2008 – Orçamento padrão Eletrobras – Adendo 23/01/2009

²² <http://mercadoetico.terra.com.br/arquivo/polemico-decreto-facilita-hidreletricas-em-unidades-de-conservacao/>

²³ See for example, the proposed bill in the Brazilian Congress to decommission the Jamanxim National Forest:

http://www.camara.gov.br/internet/sileg/Prop_Detalhe.asp?id=417455

²⁴ See: http://www.camara.gov.br/internet/sileg/Prop_Detalhe.asp?id=16969

Figure 2.9 - Potential areas for exclusion from conservation units and indigenous lands associated with construction of seven dams on the Tapajos and Jamanxim Rivers (Pará)

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: tapajosvivo.org

Platform dams

In an attempt to present the Tapajós Complex as "environmentally friendly", the Brazilian government has launched a propaganda campaign, arguing that the seven planned hydro-projects on the Tapajos and Jamanxim Rivers will adopt a new model of "**platform dams**", based on the concept of offshore oil platforms.²⁵ The government claims that platform dams will avoid problems of migration, deforestation and other socio-environmental impacts that typically accompany large dam construction in the Amazon. According to official propaganda, platform dams will be constructed without roads, workers will be helicoptered in and out of dam sites, and the construction areas will be regenerated after the dams are completed. Ten large "platform dams" are currently planned under PAC 2 in the Tapajos, Araguaia-Rio das Mortes and Madeira river basins.

Figure 2.10: Platform dams planned for the Madeira, Tapajos, Araguaia and River Basins under PAC 2

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

²⁵ see: <http://blog.planalto.gov.br/usinas-plataforma-novo-conceito-na-geracao-de-energia-eletrica/>.

Little is known about the proposed model of platform dams, since details have not been provided by the Ministry of Mines and Energy. However, NGOs, social movements and concerned academics in Brazil are highly skeptical, believing that platform dams are more an attempt at greenwashing than a serious proposal. The use of offshore oil platforms as an analogy for dam-building is highly questionable, given the inherent differences between the two types of projects. For example, an oil rig uses at most about 175 workers, in contrast to around 12,000 people for the construction of just one of the massive projects planned for the Tapajós basin. The idea that dams would be built in the absence of access roads is dubious, given needs for transporting heavy machinery, equipment, concrete and other construction materials. In the case of the Tapajós dams, road access already exists, or is readily available due to the proximity of the Transamazon highway.

Figure 2.11 – "Good Hydroprojects" - Eletrobras propaganda for platform dams

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Source: Eletrobras (s/d) Um Novo Conceito em Hidrelétricas: como o Sistema Eletrobrás usou o modelo de exploração de petróleo em alto-mar para planejar as usinas do Tapajós

In general, the idea that thousands of people could be helicoptered into protected areas to build a dam without impacts to the surrounding forest and local communities seems highly unrealistic. Even if this were the case, large numbers of migrants seeking employment in dam construction and other economic opportunity will contribute to social and environment problems typical to other large dam sites, especially after peak demand for low-skilled labor has passed.

Moreover, in addition to the impacts caused by extensive flooding of protected areas, "platform dams" would still have serious impacts on aquatic and terrestrial ecology, particularly as a result of blocking fish migrations and changing the river's ecology.

Also absent from government propaganda on platform dams as "environmentally friendly" is a discussion of their cumulative impacts among the seven dams, and in relation to other infrastructure projects, especially planned dams on the Teles Pires and Juruena uprivers (section 2.3, below), paving of the BR-163 and BR-230 highways and opening of planned industrial waterways

along the Teles Pires, Juruena and Tapajos Rivers (section 2.3).

Another issue typically neglected is that much of the public investment in the Tapajos Dam Complex would be used to provide subsidized energy for electro-intensive aluminum (bauxite) and iron ore smelters in the region. The implications of such incentives from hydroelectric dams for the expansion of large-scale mining enterprises that possess considerable social and environmental footprints are typically neglected.²⁶

In short, a variety of direct and indirect impacts of the Tapajos Dam Complex, including implications for local populations that depend upon riverine ecosystems for their livelihoods, have not yet been subject to an open and qualified debate in Brazil. As such, more detailed studies and debates are urgently needed to examine the government's proposal and the degree to which it meets criteria of sustainability and the public interest.

2.3 Damming the Teles Pires

In addition to the seven planned dams on the Tapajos and Jamanxim rivers, the Ministry of Mines and Energy plans to construct an additional six large dams along the Teles Pires River. All of the Teles Pires dams would be "conventional", in contrast to the "platform dams" proposed for the Tapajos and Jamanxim rivers in Pará. According to the PDE 2019, the six dams are scheduled to begin operations as early as 2015.

The planning of the Teles Pires dams was based on a inventory study that included an "integrated environmental assessment" carried out by EPE (Energy Research Enterprise, linked to the Ministry of Mines and Energy) for the Teles Pires sub-basin. The study concluded that six hydroelectric dams would be feasible - five on the Teles Pires river and one its tributary, the Apiacás river - totaling 3,697MW of installed capacity.

The adoption of Integrated Environmental Assessments (AAIs) as a planning tool by MME should, in principle, contribute to the integration of hydroprojects with river basin planning and improved analyses of cumulative and synergistic impacts among dams and other investments. However, the first AAIs conducted unilaterally by Ministry of Mines and Energy have been severely criticized for serving purposes of green-washing, without providing effective contributions towards internalization of socio-environmental concerns in dam planning.²⁷

In the case of the Teles Pires sub-basin, EPE contracted the private engineering firms *Leme Engenharia* (part of GDF Suez) and *Concremat Engenharia* to conduct an Integrated Environmental Assessment. Clearly, the results of the study created no limitations on the number of hydroelectric dams proposed for the Teles Pires River. The AAI neglected such key issues as cumulative and synergistic impacts between the six dams on the Teles Pires river, as well as combined impacts with both downstream dams on the Tapajos and Jamanxim rivers and a planned industrial inland Teles Pires-Tapajos waterway (*hidrovia*).²⁸

²⁶ Alcoa's investments in new bauxite operations in Juruti and Vale's planned investments in Marabá are relevant examples in the region.

²⁷ In a recent interview, the president of the National Water Agency (ANA), Mr. Vicente Andreu, warned that the AAIs conducted by MME have demonstrated some progress, but always arrive at the same conclusion that "everything is possible and that there is no type of restriction". This occurs because the AAIs "do not consider environmental criteria," but instead maintain an "exclusive vision of the electricity sector". As such, the ANA president concluded that the AAIs "have not fulfilled their original objective" and need to be revised to effectively incorporate environmental dimensions of development."

²⁸ Moreover, the AAIs typically downplay issues of incompatibility of proposed hydroelectric dams with sustainable uses of resources carried out by local populations in affected territories

Figure 2.12- Planned Dams on the Teles Pires River

Dam (UHE)	River	State	Installed capacity	Guaranteed capacity
Teles Pires	Teles Pires	MT/PA	1,820	1,001
São Manoel	Teles Pires	MT/PA	746	410.40
Foz do Apiacás	Apiacás	MT	275	142.50
Colider	Teles Pires	MT	342	177.70
Sinop	Teles Pires	MT	461	200.20
Magessi	Teles Pires	MT	53	29.20
TOTAL	--	--	3,697	1,961

Currently, the federal government is seeking to fast-track the environmental licensing and auctioning of the Teles Pires dam complex. The Colider, Sinop and Teles Pires dams have been initially prioritized. The Colider dam was auctioned in July 2010. The Sinop and Teles Pires dams were auctioned in December 2010.

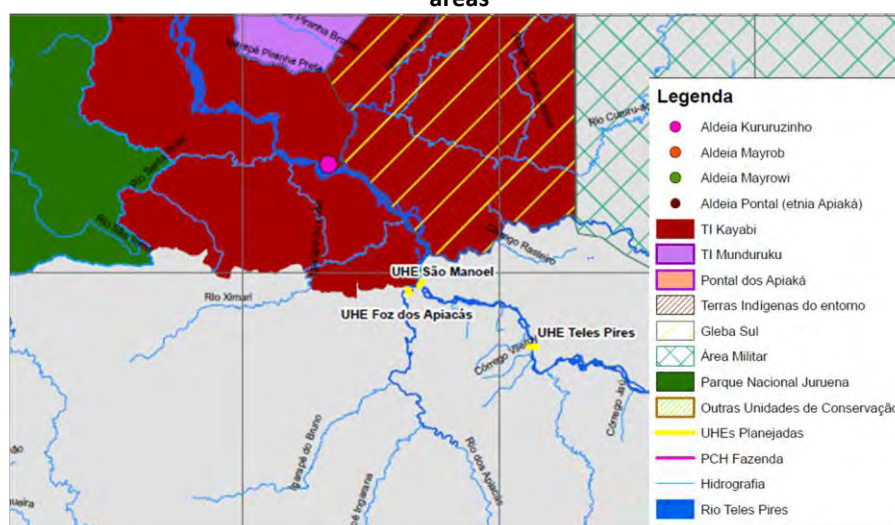
In the case of UHE Teles Pires, a civil action lawsuit was filed by the Federal Public Prosecutor's office (*Ministério Público Federal-MPF*) on November 22, 2010, based on the identification of major flaws in the environmental impact study, including a lack of analysis of cumulative impacts with other dams in the Tapajos Basin. IBAMA proceeded to hastily-issue a first phase license (LP) for the UHE Teles Pires on December 13th. A federal judge in Pará state issued a favorable decision on the MPF civil lawsuit, including a restraining order that suspended the first phase environmental license. However, in a matter of hours, a judge from a regional court in Brasília (TRF1), notorious for yielding to high-level political pressure, used a legal artifice from the period of the military dictatorship (known as "suspensão de segurança") that invokes supposed threats to national security to overturn the restraining order without analyzing the merits of the case, allowing the auction for construction of the Teles Pires dam to take place on December 17th, 2010.²⁹

In Mato Grosso, a State Public Prosecutor questioned the licensing of the Sinop dam by the state environmental agency (SEMA), since licensing of projects along interstate rivers such as the Teles Pires should be under the jurisdiction of IBAMA. Similar to the Teles Pires case, the lawsuit against the state licensing of the Sinop dam received a favorable ruling and restraining order issued by a federal judge, only to be overturned by the president of the regional appeals court (TRF1).

As demonstrated above, the planning and licensing of the initial dams along the Teles Pires River, similar to the case of other mega-hydroelectric projects such as the Madeira and Belo Monte, demonstrates clear problems of under-estimation of socio-ecological impacts, as well as a disregard for relevant human rights and environmental legislation. In particular, it is important to note that neither the UHE Teles, nor the planned São Manoel and Foz de Apiacás dams located practically adjacent to Kayabi indigenous territory, have involved prior consultations with threatened indigenous populations, in violation of article 231 of the Brazilian Constitution, ILO Convention 169 and the 2007 UN Declaration on Indigenous Peoples' Rights.

²⁹ See: <http://telmadmonteiro.blogspot.com/2010/12/licença-prévia-da-usina-teles-pires-é.html>

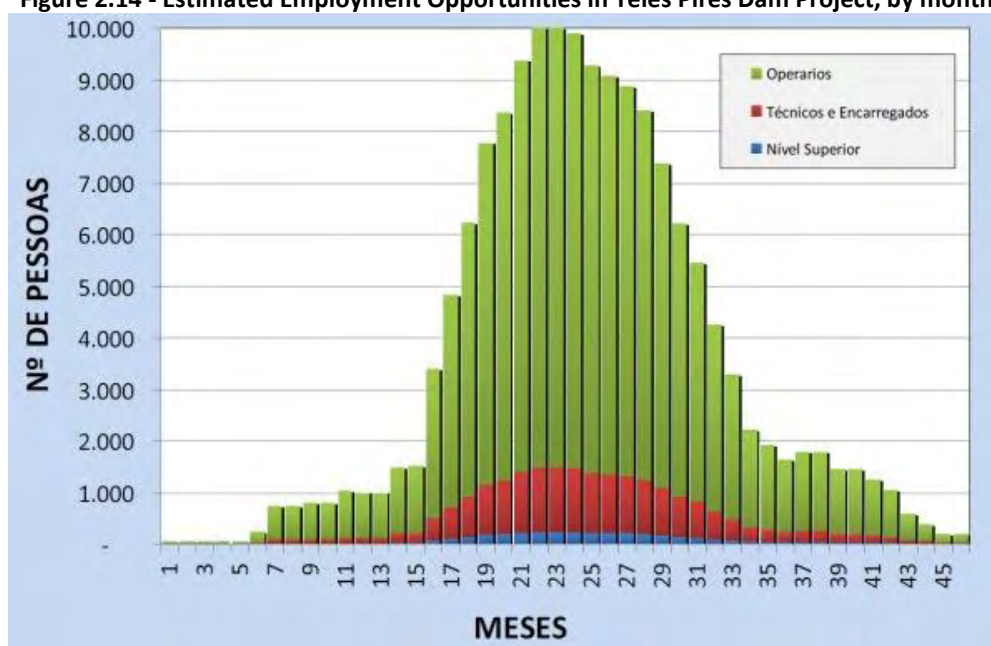
Figure 2.13- Location of the planned Teles Pires, Foz de Apiacás en São Manoel dams in relation to protected areas



Source: Telma Monteiro

In a similar manner to other major dam projects in the Amazon, the proposed hydro-projects on the Teles Pires seriously underestimate the social and environmental problems related to the migration of tens of thousands of people to the region in search of employment and other economic opportunities related to dam construction, within a context in which employment opportunities will be highly ephemeral (see graphic below).

Figure 2.14 - Estimated Employment Opportunities in Teles Pires Dam Project, by month



source: tapajoslivre.org

2.4 Damming the Juruena

Since 2002, private companies controlled by Blairo Maggi, ex-governor and senator from the state of Mato Grosso, have sought to construct nine small hydroelectric dams (PCHs) and two large dams (UHEs) on the Juruena river. In 2007, five projects received hastily-granted environmental licenses by the Mato Grosso state environmental agency (SEMA) and three more were licensed

soonafter. The five initial PCHs, with a total installed capacity of 91,4 MW, received R\$ 360 million (US\$ 213 million) in subsidized loans from the Brazilian National Bank for Economic and Social Development (BNDES). The largest of the dams, Telegráfica, with installed capacity of 30 MW, received a R\$ 120 million (US\$ 71 million) loan from BNDES. The projects are being constructed along a 110 km stretch of the Juruena River, between the municipalities of Sapezal and Campos de Júlio, as part of the Accelerated Growth Program (PAC) of the Brazilian government.

Despite requirements of the Brazilian Constitution and ILO Convention 169, construction of the first five dams on the Juruena River was initiated in 2007 without any prior consultations with five directly-affected indigenous peoples (Paresis, Nambikwara, Menku, Rikbaktsa e Enawene Nawe). Indigenous communities only learned of the projects after environmental licenses had been granted by SEMA and dam construction had begun, when representatives of the Maggi-controlled dam consortium sought out indigenous leaders to negotiate financial compensation (i.e. political support) for the five dams.

In October 2008, approximately 120 members of the Enawene Nawe trip set fire to the construction camp at PCH Telegráfica after removing workers from the premises. At that time, the Enawene Nawe announced that they did not want to hear of any more dams on the Juruena, and were not interested in negotiating financial compensation for their rivers. According to Daliaywacê, a Enawenê Nawê leader, the money from the dam-builders would not replace the fish and water essential for their survival: "The river is a powerful spirit that eats many fish and drinks lots of water in our rituals; we make many sculpture for him to be happy and bless our villages. If there are all these dams on the River, he will get angry and become hungry, and will cause sickness to the people in our village. We are very afraid that this can happen with our River and our village".

The Enawenê Nawê argue that no one has explained to the indigenous peoples that the impacts of the dams will be on their communities – what will happen to the fish, to their farms and forests, and to the people. They have demanded an evaluation of the combined impacts of the series of planned dams on the Juruena river. According to Daliaywacê, "FUNAI should be protecting us but they are only attending the demands of the dam-builders, negotiating money". He also considers that the dam-building companies has tried to fool the Enawenê Nawê people "They said there would be only five dams, but now they want to construct another three ones near our territory... They lied to use and they are going to lie again. We don't want any more talk with the company and no more researchers coming here to study how to build more dams on our river".³⁰

Current legislation in Brazil exempts PCHs (dams with installed capacity of up to 30 MW) from environmental impact assessments (EIA) – which has been legally challenged by the Public Prosecutor's Office (MPF) and NGOs.³¹ In September 2010, the Energy Research Enterprise and private engineering firm CNEC issued an "integrated environmental assessment – AAI" for the Juruena sub-basin, Similar to the case of the AAI conducted for the Teles Pires sub-basin, the study = essentially ignored such critical issues as cumulative impacts of PCHs, while calling for even more dams to be built along the Juruena River. The case of the Juruena River is an example of an explosion of investments in PCH construction that is currently occurring in Brazil, associated with generous credit and fiscal incentives, and even potential access to CDM carbon markets.

As an indigenous people that depend largely upon fish as a staple in their diets, the Enawene Nawe are currently suffering greatly from the lack of this source of protein. In addition to major impacts on nutrition and physical well-being, the lack of fish and clean water in the Juruena River are

³⁰ <http://www.socioambiental.org/nsa/detalhe?id=2788>

³¹ <http://www.socioambiental.org/nsa/detalhe?id=2733>

causing immense social damage, since the identity and rituals of the Enawene Nawe are closely linked to fish. When there are no fish, there are also no rituals that unite them.³²

Figure 2.15: A ritual Enawenê Nawê fishing dam on the Juruena River (2009)

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: Instituto Socioambiental (ISA)³³

2.5 Hidrovias: Inland waterways on the Teles Pires, Juruena and Tapajos rivers

The Ministry of Transportation, through its Administration of Inland Waterways of the Eastern Amazon (AHIMOR) has long-standing plans for the opening of an industrial waterway (hidrovia) along the Teles Pires-Tapajos rivers. The *hidrovia* would extend 1,043 km between Santarém and Cachoeira Rasteira on the Teles Pires River. As mentioned in chapter 1, the Ministry of Transportation's National Plan for Transportation Logistics (PNLT), last updated in 2009, highlights the importance of the Teles Pires-Tapajos hidrovia, and the PAC 2, launched in March 2010, calls for initial investments in the Miritituba - Santarém section of the waterway on the lower Tapajos river, including improved port facilities in the two cities.

A primary objective of plans for the Teles Pires-Tapajos *hidrovia* has been to establish a new corridor with reduced transport costs for barge traffic of export-oriented grains, mainly soybeans, from northern Mato Grosso. Proponents also argue that the hidrovia would reduce pressures on the BR-163 highway, as well as on the BR-364 highway and Madeira waterway to the west. However, the Teles Pires-Tapajos hidrovia is increasingly being considered relevant for other sectors in Pará and Mato Grosso, including biofuels, livestock and mining. The proposed sequence of dams with navigation locks along the Tapajos and Teles Pires rivers is expected to facilitate barge traffic, given the potential of reservoirs to overcome natural barriers where rapids occur.

Figure 2.15 - Sections of the Hidrovia Teles Pires-Tapajos in Pará and Mato Grosso states

³² Personal communication: Juliana Almeida (OPAN-MT) and Fiona Watson (Survival International-UK) (January 2011).

³³ <http://www.socioambiental.org/nsa/detalhe?id=3092>

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: AHIMOR/ MT

As observed in Chapter 1, the *Norte Competitivo* report launched in November 2010 by the National Industrial Council (CNI) defines as a top priority the opening of an industrial waterway along the Juruena-Tapajos rivers to serve as a strategic "axes of integration" in the Brazilian Amazon, especially for export-oriented commodities.³⁴

With the Tapajós-Teles Pires-Juruena and other *hidrovias*, the Brazilian government and private sector actors are developing a system of transportation logistics involving some 20,000 km of projected industrial waterways in the Amazon alone, following a logic of reducing transport costs of agricultural and mining commodities, in order to increase competitiveness and exports.

As noted in Chapter 1, despite potential environmental advantages of *hidrovias*, planning and licensing procedures in Brazil have tended to grossly underestimate their potential social and environmental consequences, including cumulative impacts with other large infrastructure projects and resource-based activities. Similar to the licensing of hydroelectric projects, the planning of industrial waterways has typically excluded the participation of local populations. Of particular cause for concern is the complete lack of consultations and free, prior and informed consent with indigenous peoples. A salient example of this problem is the absence of prior consultations with the Mundurucu, Kayabi and Apiaká indigenous peoples, prior to proposing a Congressional authorization for an industrial waterway on the Teles Pires and Tapajos rivers and hydroelectric dams that would directly affect their territories, in blatant disregard for the Brazilian Constitution (article 231).³⁵

Figure 2.16 - Main projected sections of the Tapajos-Teles Pires-Juruena Hidrovia

³⁴ Projeto Norte Competitivo – Macrológica, <http://www.macrologistica.com.br/9512.html>

³⁵ Projeto de Decreto Legislativo no. 122/99, authored by Senator Blairo Maggi (MT).

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

source: AHIMOR/MT

3. Implications of the report for Netherlands-Brazil relations in in-land waterways and trade

Clearly, there are strong motivations for strengthening ties between Brazil and the Netherlands in the area of infrastructure development, particularly with regard to ports and inland waterways (*hidrovias*). On the one hand, Brazil is seeking to overcome an excessive reliance on highway transportation since the 1960s, involving the development of transportation alternatives with particular attention to inland waterways. On the other, Holland has over 450 years of accumulated experience in the area of inland waterways and port facilities.

In April 2008, the governments of the Netherlands and Brazil signed MOUs in the areas of ports, maritime transport and logistics, as well as a variety of water-related issues. Under these agreements, a variety of activities has been promoted in such areas as cooperation and training in navigation system and port logistics.

Clearly, there is a growing mutual interest in promoting further cooperation between the two countries around the development of inland waterways in Brazil. In August 2010, the co-sponsored "Seminar on Inland Navigation - Technical Cooperation Brazil-Holland" was held in Brasilia to discuss experiences of representatives from the Ministry of Transport (DNIT) and National Agency for Water Transportation (Antaq) that participated in a training course on inland waterways in the Netherlands, promoted under the aforementioned MOU. The seminar brought together the Ambassador of the Netherlands in Brazil, Kees Rade, the Secretary of the National Transportation Policy Ministry of Transport, the General Director of Marine Navigation, and leaders of National Department of Transportation Infrastructure (DNIT), Antaq, and the National Water Agency (ANA).³⁶ The seminar in Brasilia presented a series of proposals intended to guide public policy, technology and the application of planning methods. In general, there is interest among the Brazilians in taking advantage of the Dutch experience with transportation logistics strategies that contributed to its ascendance as a major commercial center in Europe.

The Netherlands is a key trading partner of Brazil. After the U.S., Argentina and China, the

³⁶ Seminário de Navegação Interior Cooperação Técnica Brasil-Holanda – disponível em <http://www.transportes.gov.br/index/conteudo/id/36318> acessado em 08 de janeiro de 2011

Netherlands is the fourth largest export market for Brazil. In 2008, Brazil's six largest exports to the Netherlands were, in order of importance: grains (especially soy and derivatives) cellulose, iron ore, beef, aluminum and machinery, tubing and metal container components. Other important exports include citrus products, coffee, cocoa, tobacco, fresh fruit, leather, manganese, niobium, timber, crude petroleum oils and chemicals. In 2009, Holland was the second largest importer of Brazilian agricultural commodities, surpassed only by China. Apparently, Amazonian ports such as Santarém are playing an increasingly prominent role in trade relations between Brazil and the Netherlands, involving agricultural and mining commodities produced both within and outside of the region.

Rotterdam is the largest port of entry in Europe for Brazilian commodities that often have other countries as their final destination. In 2008, Brazil exported US \$10.4 billion in goods that were subsequently redistributed to other European countries, with the port of Rotterdam serving as a gateway to the regional market. Biofuels (especially sugarcane ethanol) are increasingly playing an important role in bilateral trade relations, especially with the role of Rotterdam as a distribution center for other European countries.

Brazil is a highly significant emerging market for the Netherlands, with a key role as a market for Dutch exports in Latin America. In 2008, Brazilian imports from the Netherlands were an estimated US\$ 1.4 billion, including such products as aviation kerosene, medicines, ammonium sulphate and other chemicals, medical equipment, dredges, and machinery.

Conclusions and recommendations

It may be expected that Dutch-Brazil bilateral relations will increasingly involve cooperation around development of inland waterways (*hidrovias*) that include the Amazon and their links to trade between the two countries. The case study of the Tapajos basin illustrates the complexity of relationships between inland waterways, hydroelectric dams, and commodity production, and related conflicts over access rights to natural resources and chronic "externalization" of social and environmental impacts of economic activities.

Given the observations of this report, it may be concluded that Dutch participation in Amazonian *hidrovias*, in many cases linked to bilateral trade relations, would involve a high degree of risk, and at the same time, potential opportunities for contributing to sustainable development. In this regard, the following conclusions and recommendations seem to be in order:

- 1) Netherlands-Brazil cooperation on *hidrovias* should be based on innovative approaches to planning, including strategic environmental assessments that address key questions as cumulative and synergistic impacts between waterways, hydro-projects and commodity production, related conflicts over territorial rights and natural resources used by traditional populations. A key issue for planning of *hidrovias* should be their articulation with other policy instruments for territorial planning (river basin management plans³⁷, land use zoning, protected areas, etc.).
- 2) The adoption of participatory methods for such assessments, involving local populations, should be a key concern. Moreover, planning processes around *hidrovias* should ensure due attention to the rights of indigenous peoples, including the right to free, prior and informed consent regarding infrastructure projects that impact upon their territories and livelihoods.
- 3) Dialogue between the Netherlands government and the World Bank regarding possibilities

³⁷ The existing Netherlands-Brazil MOU on cooperation around water-management issues could provide a source of support, in that regard.

for joint support for a Strategic Plan for Inland Waterways (*Plano Hidroviário Estratégico*) including the strategic assessments mentioned above, is highly recommended.

- 4) Clearly, specific engineering activities related to the implementation of inland waterways, such as river dredging, should not simply reproduce practices from other regions, in disregard for specific characteristics of Amazonian ecosystems and their populations.
- 5) Discussions on sustainability criteria for trade in agricultural and mining commodities should address the socio-ecological footprint of transportation corridors, with their increasingly frequent connections to hydroelectric dams. For example, responsible trade in mining products, such as aluminum, should be concerned with both direct impacts, including human rights issues, and possible indirect impacts related to hydroelectric dams constructed largely to meet demands for cheap energy.³⁸
- 6) Finally, a key challenge for the Netherlands and Brazil is to ensure that bilateral initiatives related to development of inland waterways and trade are made fully compatible with international agreements on such critical issues as biodiversity, climate change and indigenous peoples' rights.

Literature Cited

Allegretti, M.H. (1990) "Extractive Reserves: an alternative for reconciling development and environmental conservation in Amazônia", in: A.B. Anderson, ed. *Alternatives to Deforestation: Steps Toward Sustainable Use of the Amazon Rain Forest*, New York: Columbia University Press.

Becker, B.K. (1990) *Amazônia*, São Paulo: Atica.

Conselho Nacional da Indústria – CNI (2010), *Projeto Norte Competitivo*, Macrologística.
<http://www.macrologistica.com.br/9512.html>

Eletronorte (2008), *Estudos de Inventário Hidrelétrico das Bacias dos Rios Tapajós e Jamanxim* - Centrais Elétricas do Norte do Brasil S. A. – Eletronorte e Construções e Comércio Camargo Corrêa S.A. – CCCC.

Gasques, J.G. & Yokomizo, C. (1985) *Avaliação dos incentivos fiscais na Amazônia*. Instituto de Pesquisa Econômica Aplicada - IPEA, dezembro de 1985, 53 p.

Hall, A. (1997) *Sustaining Amazônia: grassroots action for productive conservation*. Manchester, UK: Manchester, University Press.

Hecht, S.B. (1985) Environment, Development, and Politics: Capital Accumulation and the Livestock Sector in Eastern Amazonia, *World Development* (13)6: 663-684.

International Rivers, Amigos da Terra Amazônia Brasileira (2011), *Mega-projeto, Mega-riscos: Análise de Riscos para Investidores no Complexo Hidrelétrico Belo Monte* International Rivers, Amigos da Terra – 2011 <http://www.amazonia.org.br/arquivos/374461.pdf>

Ministry of Mines and Energy (MME), *Plano Nacional de Energia – PNE* (2030)

³⁸ See: *Foiling the Aluminum Industry*, <http://www.internationalrivers.org/aluminum/foiling-aluminum-industry-0>

Ministry of Mines and Energy (MME), Empresa de Pesquisa Energética (EPE), *Plano Decenal de Expansão de Energia* (2010-2019) PDE 2019.

Ministry of Transportation (2009) Plano Nacional de Viação <http://www.dnit.gov.br/plano-nacional-de-viacao>

Ministry of Transportation (2009) *Plano Nacional de Logística de Transportes – PNLT*

Ministry of Transportation (2010) *Plano Nacional Hidroviário* <http://www2.transportes.gov.br/Modal/Hidroviario/PNHidroviario.pdf>

Presidência da República, Casa Civil, Programa de Aceleração do Crescimento (PAC), PAC 1 (February 2007) and PAC 2 (March 2010)

Schmink, M. and Wood, C. (1979), *Blaming the Victim: Small Farmer Production in an Amazonian Colonization Project*. Studies of Third World Societies, 9. pp. 77-93.

Schwartzman, S. and M. Allegretti. (1987) *Extractive Reserves: A Sustainable Development Alternative for Amazonia*, World Wildlife Fund, Washington, D.C.

Trancoso, R. et. al (2010) *Deforestation and conservation in major watersheds of the Brazilian Amazon*, Environmental Conservation, pp. 1-12