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# ATLAS of **Pressures** and **Threats** to Indigenous Lands in the Brazilian Amazon



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# SUMMARY

FOREWORD	P.4		
INTRODUCTION	P.5	SETTLEMENTS	
<b>MAP</b> Overview of pressures and threats to Indigenous Lands in the Brazilian Legal Amazon	p.7	<b>Inefficient Agrarian Reform policies generate conflicts with ILs</b>	p.28
		<b>MAP</b> Settlements and Indigenous Lands	p.29
LANDS AND PEOPLES		LAND USE	
The Amazons	p.8	<b>The “cattle-ized” Amazon</b>	p.30
<b>MAP</b> Hydrographic boundaries of the Amazon	p.9	<b>MAP</b> An overview of land use in deforested areas of the Amazon	p.31
		BURNING	
A forest not so well-protected	p.10	<b>Fire is already part of the daily life in the forest</b>	p.32
<b>MAP</b> Protected areas in the Amazon	p.11	<b>MAP</b> Heat spots in 2005	p.33
		MINERAL RESOURCES	
The Indians in Brazil and the Amazon	p.12	MINING	
<b>MAP</b> Indigenous Lands in the Amazon	p.13	<b>Mining and Indigenous Lands</b>	p.34
INFRASTRUCTURE		<b>MAP</b> Mining processes in the Legal Amazon	p.35
HIGHWAYS		<b>Socioenvironmental liabilities of mining in ILs</b>	p.36
<b>The Amazon of roads expands into the Amazon of rivers</b>	p.14	<b>MAP</b> ILs according to pressures and threats from mining activities	p.37
<b>MAP</b> Highways and Indigenous Lands	p.15	PROSPECTING	
PAC AND IIRSA		<b>Prospecting</b>	p.38
<b>On the crosshairs of large infrastructure projects</b>	p.16	<b>MAP</b> Prospecting activity according to micro-basin	p.39
<b>MAP</b> Planned and ongoing projects	p.17	OIL AND NATURAL GAS	
WATERWAYS		<b>Conflicts and impacts oil extraction in the Western Amazon</b>	p.40
<b>ILs and the new geography of electricity generation and distribution</b>	p.18	<b>MAP</b> Oil and natural gas: current exploitation zones and declared interests	p.41
<b>MAP</b> Hydropower projects, affected micro-basins and meso-basins	p.19	LOGGING	
<b>Indigenous People will be affected the most by hydroelectric power plants</b>	p.20	<b>Spearpoint of deforestation</b>	p.42
<b>MAP</b> Classification of Amazon macro-basins according to presence of hydropower projects	p.21	<b>MAP</b> Timber exploitation zones	p.43
<b>Large Amazon rivers are threatened</b>	p.22	URBANIZATION AND SANITATION	
<b>MAP</b> Classification of ILs according to proximity to rivers affected by hydropower projects	p.23	<b>Indigenous people and Amazon cities</b>	p.44
DEFORESTATION		<b>MAP</b> Municipal capitals according to population	p.45
<b>The dynamics of devastation</b>	p.24	AREAS UNDER STRESS	
<b>MAP</b> Accumulated deforestation in the Amazon forest	p.25	<b>A summary of pressures and threats to ILs</b>	p.46
<b>A balance of deforestation in ILs</b>	p.26	<b>MAP</b> Classification of Amazon sub-basins according to pressures and threats	p.47
<b>MAP</b> Classification of ILs according to degree of pressure from deforestation	p.27		

# The spatial address of degradation

The *Atlas of Pressures and Threats to Indigenous Lands in the Brazilian Amazon* presents a complementary and integrated view of different forms of intervention in the Amazon territory and their impacts on indigenous lands. This book aims at contributing to reflection and debate regarding the main socioenvironmental problems faced in these areas by giving readers the spatial address of some of these problems. The goal is also to contribute to actions and strategies of indigenous movements and leaders, researchers, technical experts, militants, non-governmental organizations and various institutions which participate in the struggle for sustainable development of the Amazon and for the rights of its populations.

The texts and maps in the following pages are not intended to provide an exhaustive exposition of each topic which is discussed, but rather to present a general overview of each. Without leaving out strict technical procedures, treatment of cartographic data in this study did not have absolute precision as

its goal, but instead to point out the main vectors of degradation of Amazon ecosystems and establishing the boundaries of the geographic spaces in which they are located, using accessible language to facilitate visualization. We gathered information regarding farming, mining, timber exploitation, infrastructure projects, population and sanitation, among others. They were obtained almost entirely from official institutions, such as the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE), the National Space Research Institute (*Instituto Nacional de Pesquisas Espaciais* – Inpe), the National Electric Power Agency (*Agência Nacional de Energia Elétrica* – Aneel), the National Department of Mineral Production (*Departamento Nacional de Produção Mineral* – DNPM) and the National Oil, Natural Gas and Biofuels Agency (*Agência Nacional de Petróleo, Gás Natural e Biocombustíveis* – ANP).

The goal of this book is to point out current territorial dynamics, as well as discussing scenarios and tendencies. We gathered

and attempted to translate into cartographic language data of activities and agents which provoked, provoke and are likely to continue provoking direct and indirect negative impacts on indigenous lands and the regions in which they are located in the immediate future. In this case, we are referring to pressures which take place, for instance, in the form of invasions, illegal occupation and deforestation, theft of timber, forest fires, mining, dams, presence of farming and mining activities, sawmills, meat packers and urban centers. We also present information regarding interventions which can maintain or expand these impacts in the mid to long run, highlighting what we consider to be threats (or potential pressures): requests for mining, highways, hydroelectric power plants and power transmission lines planned and under study, among others. From this standpoint, in some cases, analysis of these data made it possible to classify specific regions and territories according to the level of current socioenvironmental impacts and vulnerabilities in different timeframes.



## How this Atlas should be read

The inner flap of the book's front cover contains a map with all Legal Amazon indigenous lands and a numbered list with their names in alphabetical order, by state. Specific indigenous lands are mentioned in several texts and treated separately, in cartograms – smaller maps with additional information – found throughout the book. By keeping the flap open, the reader will be able to read the maps in the Atlas while consulting the list to locate and identify the indigenous lands which are mentioned and any others.

- 1 Maps are related to key topics, such as infrastructure, mineral resources and deforestation. These topics are indicated in the top left corner of the page which contains texts and are not presented in order of importance.
- 2 Always above the maps, on the pages preceding them, there are texts with the context of the indigenous lands in the topic under discussion and in the Amazon territory. Several of these contain emblematic examples of regions and indigenous lands most affected by a given activity or agent. With this layout, the

- 3 reader can locate on the main map some information found in the text.
- 4 Also on the text page, to the left, there is a bibliography section, which contains publications, articles, various texts and sites used as sources.
- 5 Directly below the main text are the maps which focus on Amazon indigenous lands facing some new type of harmful action, pressure or socioenvironmental threat. Throughout the entire book there are also tables and charts with figures relevant to the topic at hand.

# Achievements and challenges of indigenous territories in the Amazon

There has been great progress in official recognition of indigenous lands in the past 20 years in Brazil, especially in the Amazon, despite unresolved historic issues. Demarcation of extensive territories, formation of mosaics of protected areas and large sociobiodiversity corridors have changed the region's spatial layout.

These achievements shift concerns and claims by indigenous people from the historical struggle for land. Rising in importance is the challenge of management and protection of these vast areas, which have no structures for institutional governance or political representation at the national level, or economic and tax collection instruments capable of meeting the increasingly diversified

demands which increase in scale. Even in cases in which land demarcation strictly contemplates the Constitution and expectations of occupants, it has become a sort of historical confinement: it becomes necessary for these communities to meet their needs within those boundaries, in the present and in the future, whatever their population dynamics, growing demand for consumption and availability of natural resources.

On the other hand (from the outside), areas which were isolated 20 or 30 years ago, and nearly inaccessible, are now increasingly inter-connected by the infrastructure of transportation and communication networks. There has been a leap in relations established among indigenous peoples

and their neighbors, towns and government organizations. At the same time, territory occupation policies have surpassed national frontiers, turning what was once the "end of the world" into passage routes between different worlds.

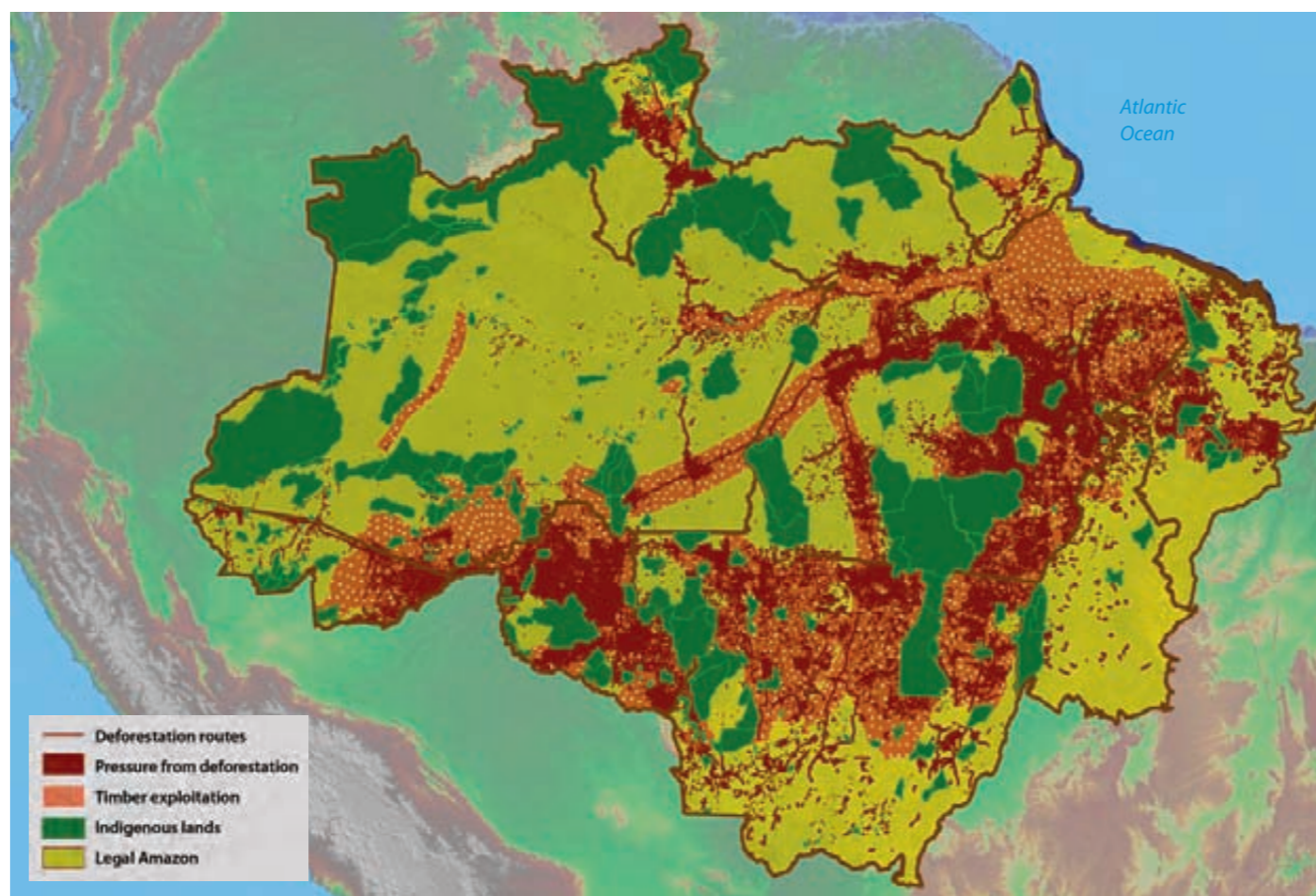
Albeit extensive, indigenous lands are surrounded. The future of indigenous communities – as well as the integrity of forests and natural resources in them – will increasingly depend on the territorial, social, economic and cultural context in which these communities are inserted, as well as on their capacity to manage their various relations with Brazilian society.

## A wave of projects and interests

As these relations become more intense, conflicts arise and threats to indigenous lands and the set of rights granted by the Constitution appear. In the past years, more conservative segments of government and press, agribusiness leaders, hydroelectric and mineral entrepreneurs and congressmen of varying ideologies have worked toward creating an image for society by which creation of protected areas is a threat to growth of agricultural production, and that deadlines, studies and consultations included in the environmental legislation are unnecessary bureaucracy. The goal is to create a false opposition between the interests of traditional populations and so-called "progress". Indigenous people and those who stand up for their rights become villains opposed to "development" and agents who "delay" this progress.

The maps on the following pages, however, allow us to see that the forest is not an obstacle to productive activities, although environmental laws, Conservation Units and indigenous lands hinder deforestation. On the contrary, the Atlas of Pressures and Threats to Indigenous Lands in the Brazilian Amazon shows a horde of infrastructure projects,

NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.



## INTRODUCTION

businesses and economic interests which have the following consequences for a large part of the Amazon population: illegal occupation of lands, plunder of natural resources, degradation of ecosystems, concentration of wealth, insecurity, violence.

The maps included in this presentation show, in only three images, the Amazon indigenous lands and a group of agents and activities which are portrayed in further detail throughout this book. The larger map, on page 7, illustrates the juxtaposition of interests from agricultural, timber, large and small-scale mining, oil, infrastructure and energy sectors, resulting in socienvironmental pressures. Combined into a single map, detailed reading of these pressures is nearly impossible, while, at the same time, presenting an overview of the announced chaos from pressures which go beyond deforestation, with consequences which are yet unknown.

The smaller maps, originated from the first, make possible a more organized view of these pressures, now grouped according to an affinity of origin. In the map on the previous page, information regarding highways and deforestation in the past three years was included, overlapping a sketch of the pressure from timber extraction. On the map on this page pressures from mining and planned hydroelectric dams were combined.

In addition to the well-known critical situation of the set of indigenous lands located in the so-called “deforestation arc”, in the southern part of the Amazon, the movement of agents and economic activities comes to attention on the stretch from Acre to Amapá, going through Rondônia, Southern Amazonas and central Pará (along the Amazonas River). According to these images, it is no longer possible to speak of an agricultural frontier which gradually expands

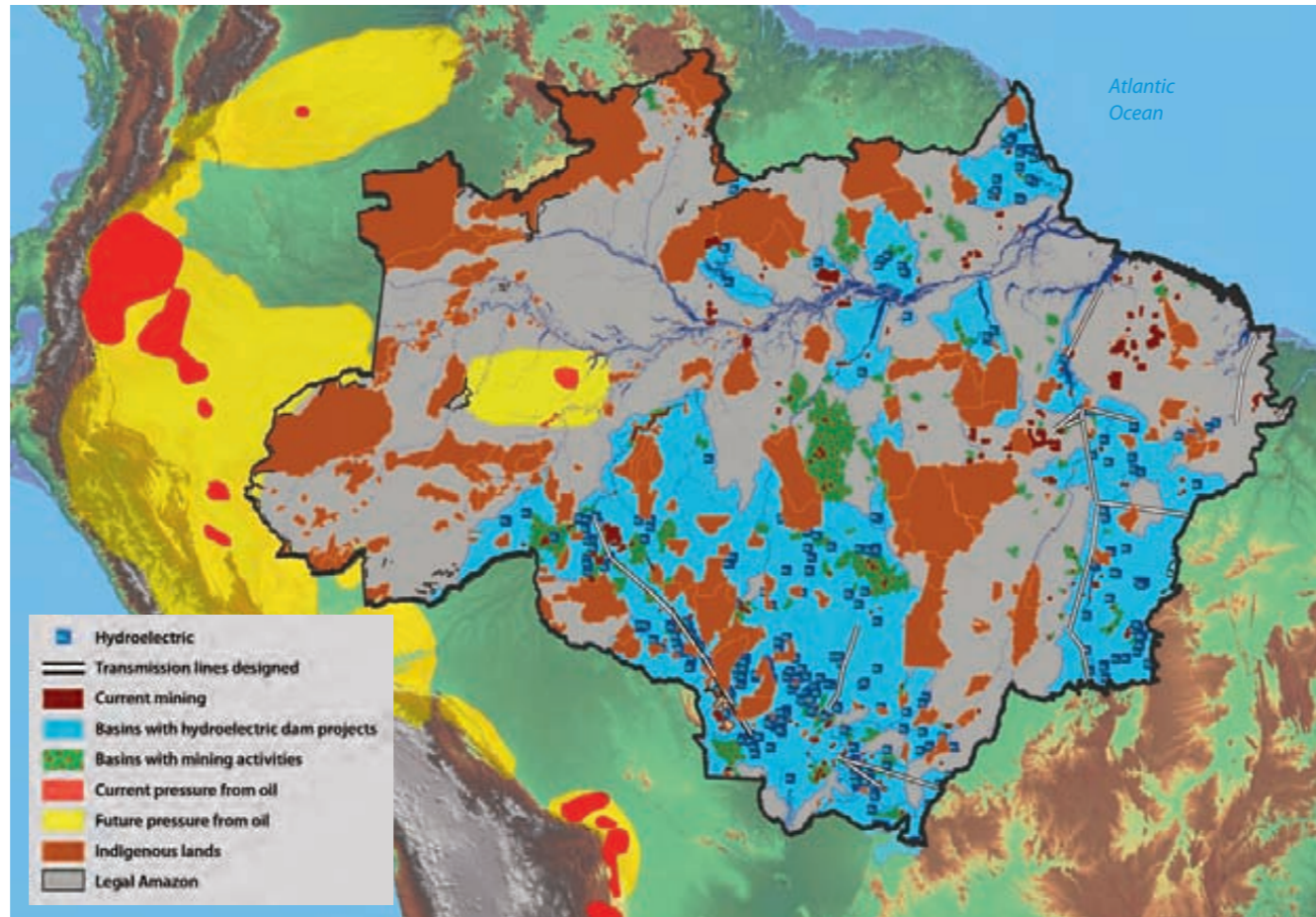
into the Amazon territory from a perimeter with a well-established outline. There are now ramifications in several directions reaching areas which were, until recently, considered isolated and preserved. This part of the Amazon biome, regarded by some as the “development arc”, is in its consolidation stages, generating new energy and economic demands.

### Schizophrenic State

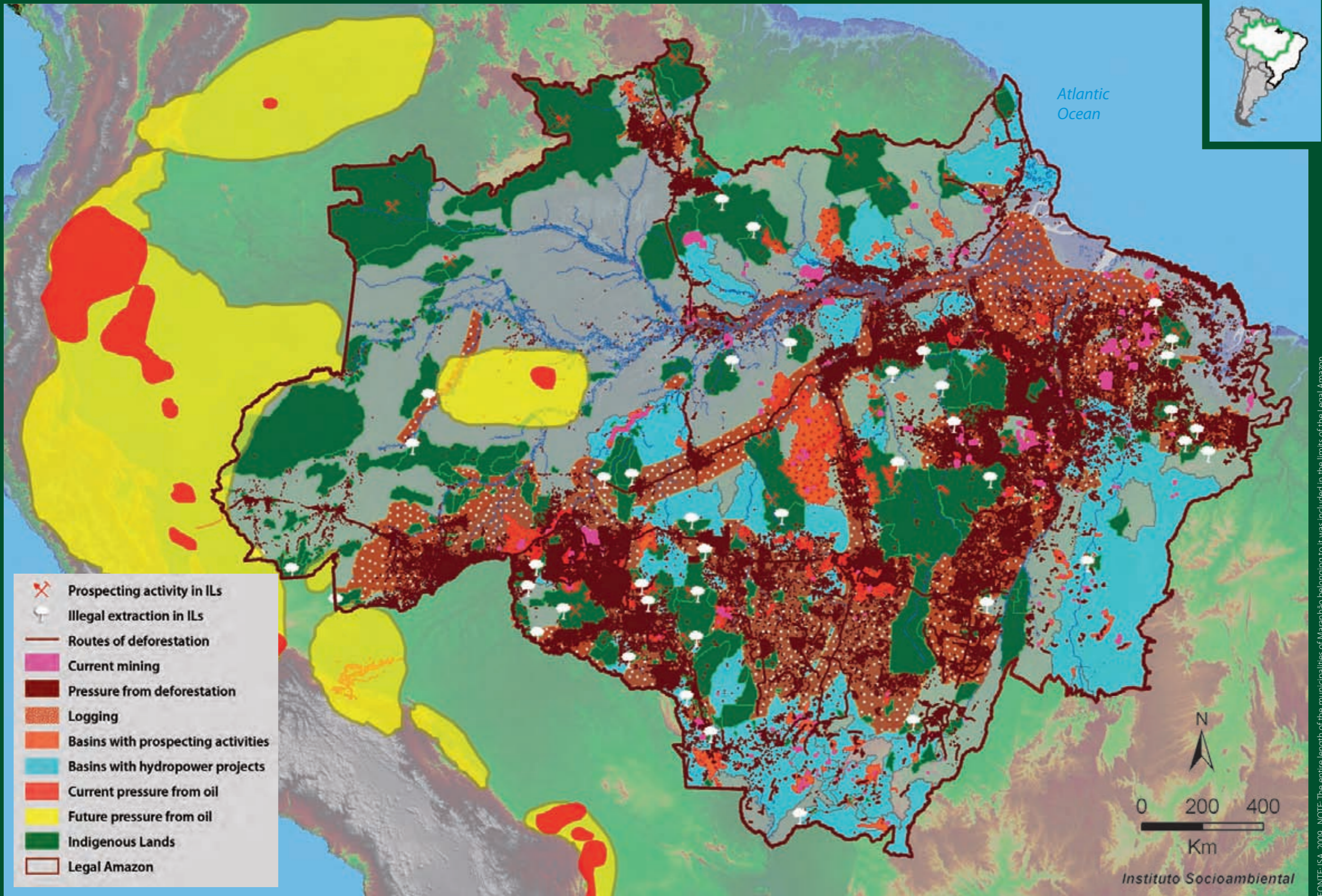
The reasons for this reality are not limited to a lack of public policy, as many have often stated. As shown by the following maps and texts, the territorial dynamics of devastation are induced by specific vectors, mostly originating from government actions. The State is present in the Amazon, but in a schizophrenic form: while it tries at a great cost to put into effect actions to control deforestation which are at their early stages, it finances – by means of institutions such as the National Bank for Economic and Social Development (Banco Nacional de Desenvolvimento Econômico e Social – BNDES) and other regional and state banks – activities which are destroying the planet’s largest tropical rainforest. As pointed out by the texts in this Atlas, several infrastructure and agriculture undertakings which have financial support from public funds are responsible for a large part of the deforestation in the Amazon.

By calling attention to this situation, it is not the intention of this book to “demonize” any economic segment or activity. Avoiding from generalizations, the objective is to provide a comprehensive view of how indigenous territories are being or will be impacted by infrastructure works, expanding agricultural frontiers and many other forms of natural resource exploitation. If, by reading this book, an objective view of the challenges faced by conservation of cultural and biologic diversity in indigenous lands is made possible, enhancing the debate for more sustainable economic alternatives for the Amazon, our goal will have been reached.

NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.



# Overview of pressures and threats to Indigenous Lands in the Brazilian Legal Amazon





# The Amazons

There are many ways to define the Amazon. The Amazon Water Basin is composed of all tributaries and rivers which form the Amazonas River. It drains seven countries and has an area of 5.9 million square kilometers (or 40% of South America). Brazil holds 65% of the Basin; Peru, 16%; Bolivia 12%; and Colombia 5.7%. The Amazon Basin is the largest superficial fresh water deposit in the planet, with approximately 15% of the entire stock of this resource.<sup>1</sup>

The Amazon Biome, Amazon Ecological Domain or Amazon Biogeographical Domain is the set of forest ecosystems in the Amazon Basin. It covers 6.9 million square kilometers, distributed over nine countries: Bolivia, Brazil, Colombia, Ecuador, Guiana, French Guiana, Peru, Surinam and Venezuela.<sup>2</sup>

In Brazil, including transition areas and parts of other plant formations, the Amazon Biome has 4.2 million square kilometers. In the 1950s, in an attempt to develop and integrate the region by means of tax incentives, the Brazilian government created the concept of Legal Amazon, which covers an area of just over 5 million square kilometers (two thirds of the country). This territory includes the states of Amazonas, Pará, Roraima, Rondônia, Acre, Amapá, Tocantins, Mato Grosso and the greater part of Maranhão. The Brazilian Legal Amazon is characterized by a mosaic of habitats with a large variety both in occurrence and number of species. In addition to the

Amazon Forest, it encompasses 37% of the Cerrado Biome, 40% of the Pantanal Biome, small stretches of prairieland, marshland and floodplains, among others.<sup>3</sup>

The Amazon Biome is the region with the greatest wealth of biodiversity in the world. It is estimated to be home to between 25% and 30% of all existing species.<sup>4</sup> In Brazil, it contains over 30 thousand species of plants, 1.8 thousand continental fish, 1.3 thousand bird, 311 mammal and 163 amphibian species. Explanations for this outstanding variety of species and ecosystems point to climate variations (current and past), as well as variations in geology, geography, forms of occupation and use of natural resources in the biome.<sup>5</sup>

Due to its large extension of continuous forests, the Amazon is of extreme importance to the stability of the regional climate. It propels large amounts of water vapor originated

from the Atlantic Ocean, transporting it throughout South America, which ensures regulation of the rainfall patterns in places such as Argentina, Paraguay and Brazil's Center-South. Evaporation and transpiration from Amazon plant life, which is made up of trees up to 50 meters in height, is estimated to free approximately seven trillion tons of water each year into the atmosphere.<sup>6</sup>

The Amazon also houses immense sociocultural diversity. Considering its political boundaries in each country, it has 33 million inhabitants, including 1.6 million indigenous people from 370 different groups, scattered across 2.2 thousand territories (not including isolated or urban communities).<sup>7</sup> These groups hold, use and protect a wide range of genetic resources and traditional knowledge associated with biodiversity. Amazon indigenous populations are estimated to manipulate around 1.6 thousand species of medicinal plants.<sup>8</sup> In the Brazilian Amazon, there are also 357 communities of former slaves and hundreds of other rubber-tapper, nut and palmtree collector and riparian communities.<sup>9</sup>

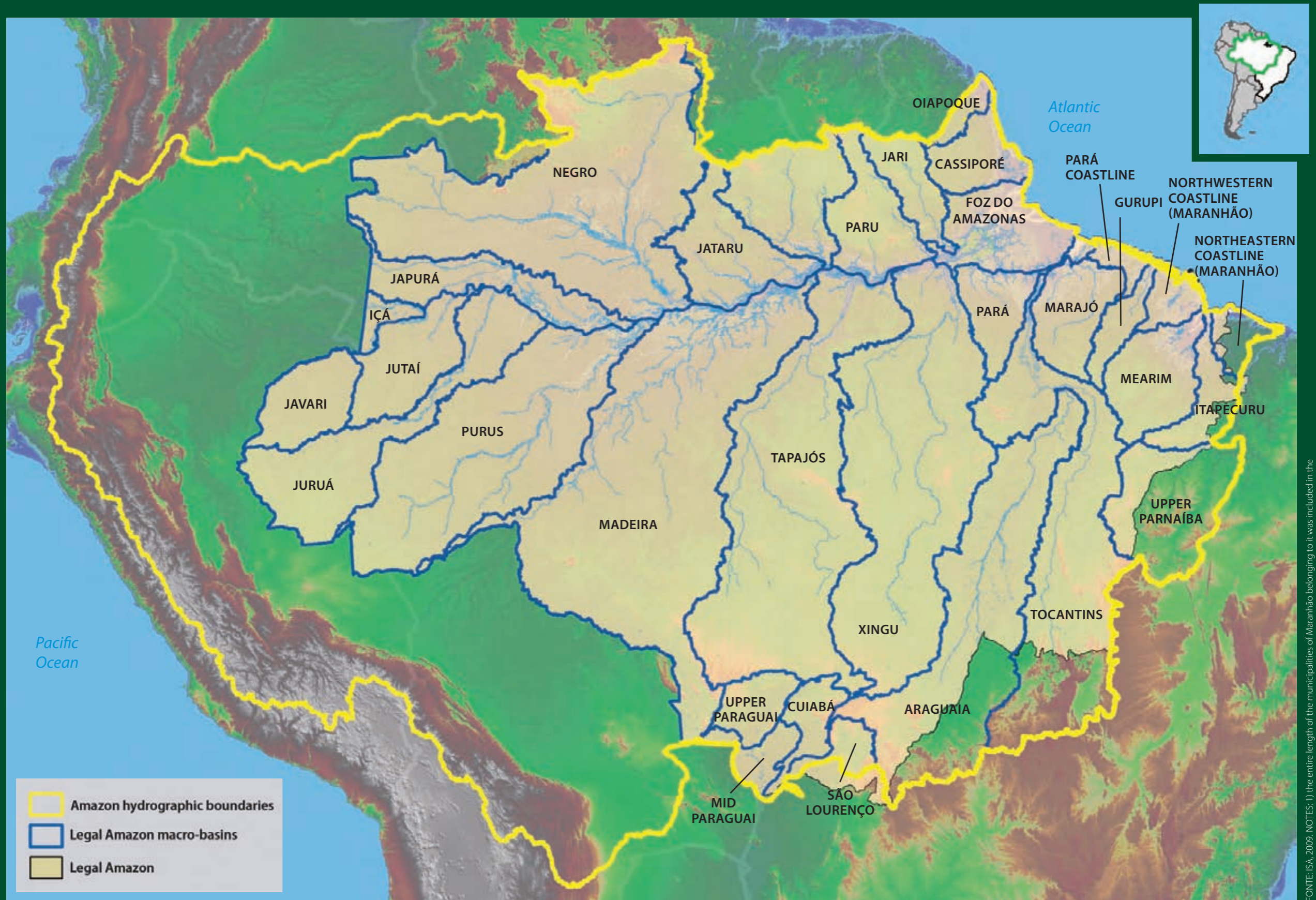
Despite all of this socioenvironmental wealth, according to the National Institute of Spatial Research (*Instituto Nacional de Pesquisas Espaciais – INPE*), over 586 thousand square kilometers of forests have been destroyed in the Brazilian Amazon – an area the size of the state of Minas Gerais! Among Amazon countries, Brazil has the largest number of extinct species.<sup>10</sup> We are losing a heritage of hundreds and perhaps thousands of species of animals, plants and micro-organisms before knowing about them.



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# Hydrographic boundaries of the Amazon



FONTE: ISA, 2009. NOTES: 1) the entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon; 2) including the hydrographic boundaries of watersheds partially in the Legal Amazon.

# A forest not so well-protected

Currently, 2.1 million square kilometers or just over 43% of the Legal Amazon are in protected areas. Conservation Units (CUs) account for 22% of the Amazon territory and Indigenous Lands (ILs) to 21% (considering only continental areas and disregarding overlapping CUs and ILs). Approximately half of these CUs is run by the federal government and the other half by the states.<sup>1</sup>

The level of implementation of protected areas varies greatly, especially CUs. Although set forth in laws, many are not monitored and lack sufficient infrastructure and employees. Therefore, the figure of nearly half of the Amazon under protection covers up a not so favorable reality. The country did not manage to safeguard 30% of the Amazon Biome by means of CUs, a goal which was established in the guidelines of the Convention on Biological Diversity (CBD), an international treaty signed by Brazil. Furthermore, the distribution of CUs and ILs by state is uneven and shows critical regions which are in need of greater protection.<sup>2</sup>

## What are CUs?

According to the National System of Nature Conservation Units (*Sistema Nacional de Unidades de Conservação da Natureza – SNUC*), a CU is a part of the territory under a special administrative regime to which special guarantees for protection apply due to the presence of relevant natural characteristics. CUs may be of “integral protection” or “sustainable use”. In the former case, direct use of natural resources and the presence of local inhabitants is not allowed. Examples include Ecological Stations (*Estações Ecológicas – Esecs*), Biological Reservations (*Reservas Biológicas – Rebios*) and National Parks (*Parques Nacionais – Parnas*). Sustainable use CUs aim at combining conservation and management of natural resources. Examples which fall into this category include Extractive Reserves (*Reservas Extrativistas – Resex*), National Forests (*Florestas Nacionais – Flonas*)

and Sustainable Development Reserves (*Reservas de Desenvolvimento Sustentável – RDS*), among others.

## Corridors and mosaics

Protected areas are fundamental for conservation of biodiversity. Although under severe threats in some places, over 98% of the plant cover in these areas in the Amazon is intact. In addition to sheltering traditional communities which depend on their resources for survival, they are responsible for a number of environmental services, such as climate regulation and water supply. In summary, they ensure that countless populations have quality of life.<sup>3</sup>

If their geographic position is defined appropriately, creation of interconnected ILs and CUs, in the form of corridors and mosaics, may leverage these functions and serve as true barriers against expanding deforestation. This type of connection among isolated areas or areas which protect habitats in an insufficient manner facilitates animal transit, dispersion of seeds and genetic exchanges. Thus, the capacity for survival of species and ecosystems is increased.

CU mosaics and ecological corridors of protected areas are

set forth in Brazilian legislation as a means to conserve natural resources in large areas, but experiences with this type of instrument are few and far between. There are no consistent public policies as of yet to facilitate implementation and management. The challenge is being able to control an extensive set of lands with different purposes and under the responsibility of different government agencies, where several stakeholders may co-exist (traditional communities, farmers, local governments etc.), against a background of budget restrictions and lack of political and administrative coordination on the part of the State. Maintenance of large blocks of protected areas may be a comparative advantage for Brazil in international negotiations regarding climate change, since mechanisms to compensate for (financially or otherwise) countries which avoid deforestation are being discussed or implemented.

In the northern part of the Amazon, stretching from East to West – from Amapá, going through Northern Pará, a small stretch of Southern Roraima and the large central part of Amazonas, reaching the border with Peru – there is a corridor of continuous protected areas which is likely to be the largest in the world, with 588.7 thousand square kilometers (nearly 12% of the Legal Amazon). It contains 244 thousand

square kilometers of ILs, 146.4 thousand square kilometers of integral protection CUs and almost 200 thousand square kilometers of sustainable use CUs<sup>4</sup>. Another important “biodiversity corridor” is located along the Xingu River Valley, from Northeastern Mato Grosso to Central Pará, encompassing 264.7 thousand square kilometers (73% made up of ILs and nearly 25% of federal CUs). In addition to housing a population of approximately 12 thousand people, including 25 indigenous ethnic groups, it plays a strategic role in conservation since it is a link between the two largest national biomes: the Amazon and the Cerrado

## PHOTOGRAPH

Anavilhanas Archipelago on the Negro River, between Manaus and Barcelos (Amazonas). The Anavilhanas National Park is one of the CUs in the large corridor of protected areas in the Central Amazon.

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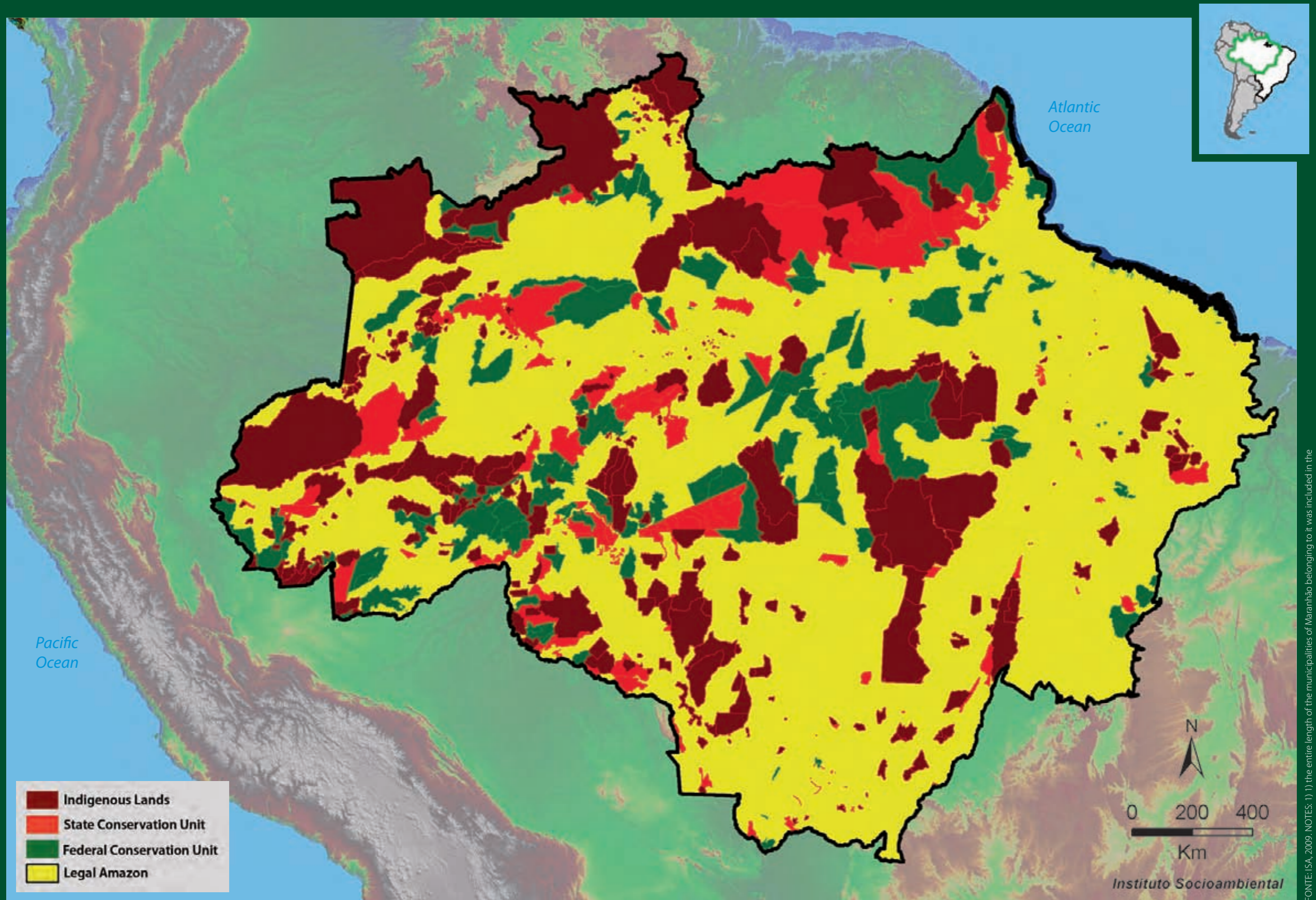
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ROBERTO LINKEB/TERRA VIVEM

# Protected areas in the Amazon



FONTE: ISA, 2009. NOTAS: 1) a totalidade dos municípios do Maranhão pertencente a ele não está incluída nos limites do Legal Amazon; 2) NOTA: Unidades de Proteção Ambiental (APA) não estão incluídas.

# The Indians in Brazil and the Amazon

There are 227 indigenous groups in Brazil, which speak 180 languages originating from two main mother-languages (Tupi and Macro-Jê) and several linguistic families. Only half of these languages is scientifically recorded<sup>1</sup>. In the entire country, there are 643 Indigenous Lands (ILs) in different stages of identification and regularization, with areas that add up to 1,103,965 square kilometers, or approximately 13% of the national territory.<sup>2</sup>

A specific indigenous Census has never been performed for the entire country, but in the last Census of the Brazilian population carried out by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – *IBGE*), in 2000, over 734 thousand people claimed to be indigenous.<sup>3</sup> Calculations made by ISA based on IL populations estimate that there are approximately 450 thousand Brazilian Indians.

173 groups live in the Legal Amazon, in 405 ILs, which cover an area of 1,085,890 square kilometers, or 21.7% of the region. Also according to ISA data, approximately 300 thousand Brazilian Indians live in these areas (1.15% of the Amazon population). Indigenous territories in the Amazon account for 98% of all indigenous territories in Brazil. There are also references to 46 “isolated” indigenous groups, which have had no official contact with the State or society around them, and about whom there is no precise information regarding location or ethnicity.<sup>4</sup>

Every so often, segments which are against indigenous rights try to confuse society by diffusing the idea that there is “too much land for too few Indians” or that demarcation of ILs, especially on areas near national borders, would be a risk to national security. Reality, however, is different. Regularization of these areas is intended to put an end to land tenure conflicts and ensures the integrity of the Brazilian territory, since, according to the Federal Constitution, they are assets of the State. Creation of ILs does not reduce the amount of

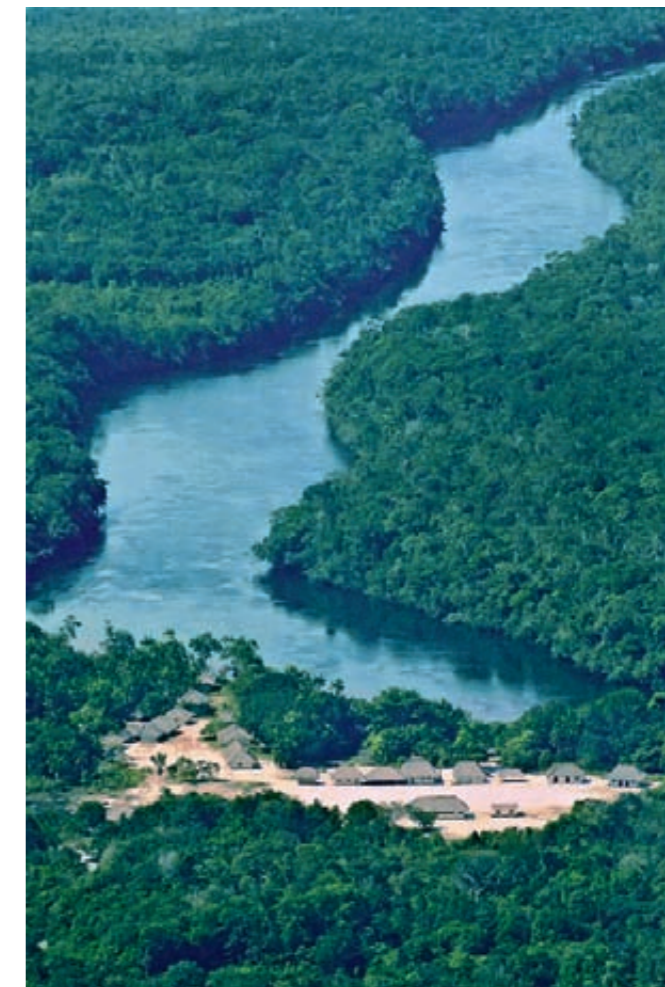
land available for farming, which is more than enough for its expansion in the country. Government and rural leaders admit that recovery of degraded or abandoned areas can multiply the current national agricultural production without the need for further deforestation.

According to a poll ISA requested Ibope to perform, in 2000, most Brazilians (68%) support demarcation and the current size of ILs. Interviewees stated that the three greatest problems faced by Brazilian Indians are: invasion of their lands (57%), disrespect for their culture (41%) and diseases brought by whites (28%).<sup>5</sup>

## Rights of Indigenous People in the Constitution

The Federal Constitution established the “right of origin” of indigenous people over their lands: it acknowledges that they lived there before creation of the National State, and, therefore, this right should prevail above all others. (Indigenous occupation of the Amazon dates back at least 10 thousand years)<sup>6</sup>. The Constitution grants indigenous people permanent ownership and use of the wealth originating from the soil, rivers and lakes in ILs. According to Paragraph 1 of Article 231, lands which are traditionally occupied by indigenous people are defined as those which “are inhabited by them on a permanent basis, used for productive activities, essential for preservation of the environmental resources necessary for their well-being and physical and cultural reproduction, in accordance with their uses, customs and traditions.”

Also according to the Constitution, government has the obligation, through the National Indigenous Peoples Foundation (*Fundação Nacional do Índio – Funai*), to promote recognition of ILS by means of declarations which make public their boundaries, guarantee protection and prevent occupation by third parties. The process of formal recognition of these areas occurs in stages in accordance



BETO RICARDO/ISA

with administrative procedures originally established by the Indigenous Peoples Statute, in 1973, and later altered and currently set forth in Decree 1775/96.

ILs are of fundamental importance both for protection of indigenous peoples' rights and culture and for conservation of the forest. Furthermore, they supply countless towns with products of all types. Many indigenous territories, however, have been invaded by land grabbers, lumberjacks, farmers, miners, fishers and hunters in search of the natural resources which are preserved there. The following pages show how many of these and other pressures and threats to indigenous people are present in the Amazon territory.

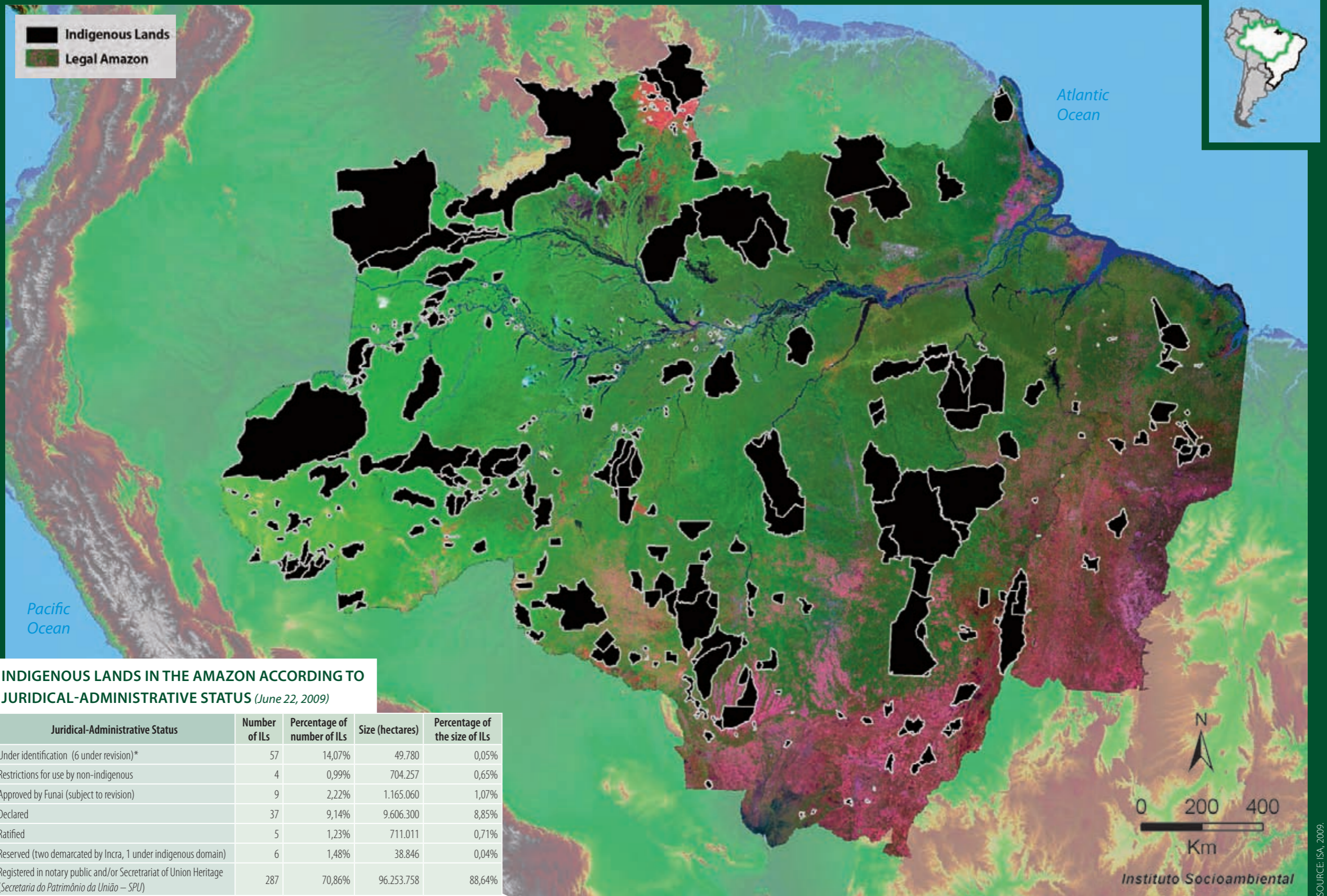
### PHOTOGRAPH

Aerial view of the Baniwa and Coripaco Indigenous School (EIBC -Pamáali), Upper Negro River Indigenous Land, São Gabriel da Cachoeira, Amazonas.

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# Indigenous Lands in the Legal Amazon



NOTE: \*The size of this group refers only to the six under revision, i.e. which have prior definition of boundaries. The other lands in this category have not had their boundaries established yet.  
 SOURCE: Amazônia Brasileira 2009. Instituto Socioambiental (ISA), 2009.

INFRASTRUCTURE  
HIGHWAYS

# The Amazon of roads expands into the Amazon of rivers

**PHOTOGRAPH**

BR-163 highway, which connects Cuiabá (Mato Grosso) to Santarém (Pará), opened in the 1970s as yet another of a set of large infrastructure projects implemented by the military regime under the pretense of integrating the Amazon in the national economy. Pavement of the highway has not yet been completed.

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Roads have opened up access to theft of timber, creation of mining areas and land grabbing in ILs in the Amazon. There are countless examples of losses and tragedies among indigenous populations caused by road building.

As the **MAP** indicates, Rondônia, Roraima and Western Mato Grosso are regions in which illegal roads expand with the greatest intensity over indigenous territories. The same happens in Center-South Pará, where estimates indicate that informal roads – most of which were opened illegally by logging companies – are increasing in number at alarming speeds and have become the majority in the local network of roads and highways.<sup>1</sup>

The Cachoeira Seca IL, inhabited by the Arara people, is located in that region. There is information that nearly one fourth of the territory is taken by invaders. Starting on the Transamazônica highway (BR-230), approximately 735 kilometers of smaller roads appear to have been opened in the area, which covers 734 thousand hectares (4% of which have already been deforested). Invasions hinder the process of regularization, which has already taken over 20 years. At the start of the 1980s, settlers were placed in the location by government. Later, others occupied the area, using the situation as an opportunity to invade the lands.<sup>2</sup>

Nearby, another large highway threatens indigenous populations. Over 32 thousand Brazilian Indians, from 37 different ethnic groups, may suffer the impacts of pavement of BR-163 (Cuiabá to Santarém). They live in the road's area of influence, between Mato Grosso, Pará and Amazonas. Among the consequences are uncontrolled populational growth and intensification of land tenure conflicts and conflicts over other natural resources.<sup>3</sup> All 33 ILs located in this region already suffer increasing harassment from logging companies and land grabbers. When the highway was opened, in the 1970s, the Panará Indians, who lived in Northern Mato Grosso

were led to near extinction, due to diseases and conflicts. For years, there have been requests for completion of the pavement works for the remaining 950 kilometers of the unpaved BR-163 as a means to facilitate transportation of grains and meat produced in the Center-West and meeting the demand for basic services for the local population. In 2002, the federal government announced pavement of this stretch, which made the rate of deforestation in the region surge. Practically all of the work and plan developed by government and civil society to mitigate and compensate for negative impacts remains on hold.

## Changes in the landscape of the biome

Construction of large highways by the military government, starting in the 1960s, interiorized non-indigenous occupation, which until then was concentrated along the main rivers, changing the face of the Amazon Biome. Upon opening BR-153 (Belém-Brasília), BR-364 (Cuiabá-Porto Velho), the Transamazônica (North-Northeast) and BR-163, the “deforestation arc” was configured, which is the large band on the margins of the central part of the Northern region, where the highest rates of deforestation occur and the agricultural frontier expands from Eastern Pará, Northern Tocantins, Mato Grosso and Rondônia into the heart of the Amazon Forest.

In 1975, the Brazilian Amazon had 29.4 thousand kilometers of roads, 5.2 thousand of which were paved. In 2004, the size of the network of roads and highways increased nearly tenfold and reached 268.9 thousand kilometers (less than 10% of which were paved).<sup>4</sup> A significant part of these roads is built irregularly, without environmental impact assessments and licenses required by law, on public lands and protected areas.

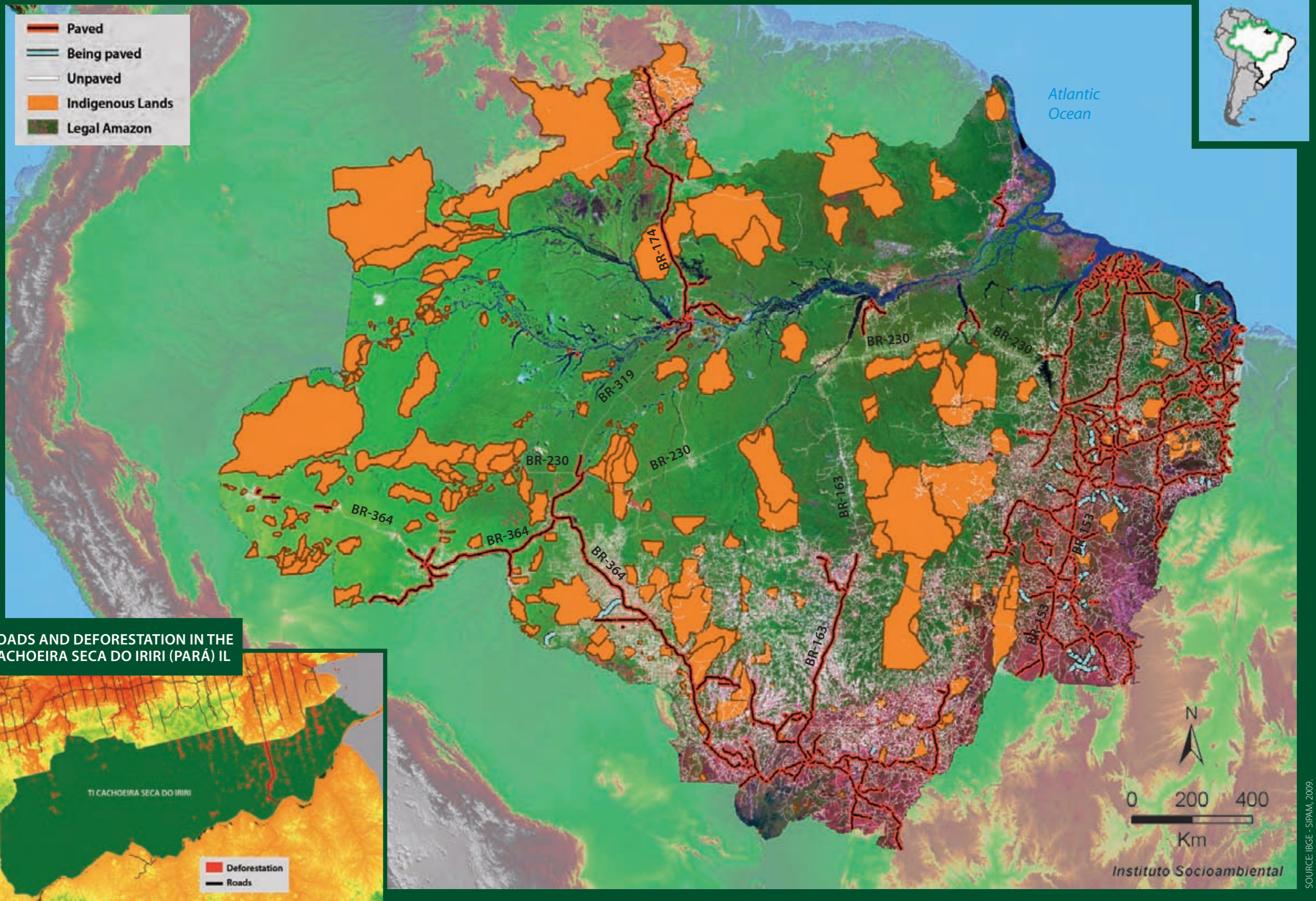
As other infrastructure projects, highways are important to stimulate the economy, integrate distant locations and



provide access to public services, such as schools and hospitals. When they do not come hand-in-hand with sustainable development policies, however, they may be sources of devastation, as has been the case with ILs.

In the Amazon, no other type of infrastructure project is as responsible for deforestation: 75% takes place on a strip of up to 100 kilometers around the highways, according to Inpe.<sup>5</sup> A study calculated that deforestation associated with the road network planned for the region, in 2000, could be up to 180 thousand square kilometers in the next 25 or 35 years. Paving these roads also increases the risk of forest fires.<sup>6</sup>

# Highways and Indigenous Lands





# On the crosshairs of large infrastructure projects

The immense amount of minerals, wood, land and water has always made people regard the Amazon as a large deposit of natural resources, a platform for exporting to the rest of Brazil and the world. Public policies sought to meet external demands and not those of the Amazon population. It is not surprising that implementation of large infrastructure projects has been a priority of regional governments for decades.

One example is the Initiative for Integration of the Regional South American Infrastructure (*Iniciativa para Integração da Infraestrutura Regional Sul-americana – IIRSA*), created in 2000 by the 12 South American countries. It is the largest program for construction and integration of hydroelectric power plants, railways, oil pipelines, gas pipelines, telecommunications and mainly highways ever to take place in the subcontinent. Until now, US\$21 billion have been invested, mostly from national governments, but with some contribution from the private sector and multilateral agencies, such as the Inter-American Development

Bank (IDB) and the Andean Development Corporation (*Corporación Andina de Fomento – CAF*). The National Bank for Economic and Social Development (*Banco Nacional de Desenvolvimento Econômico e Social – BNDES*) has stood out in financing of projects in Brazil and abroad, particularly hydroelectric power plants.<sup>1</sup>

The Growth Acceleration Plan (*Plano de Aceleração do Crescimento – PAC*) is a sort of national counterpart to the IIRSA. Although it may be considered a repetition in new guise of programs by previous governments, such as *Avança Brasil*, it was announced in 2007 by the Luís Inácio Lula da Silva government as a set of investments allegedly capable of producing lasting growth rates for the country. The promise is to employ R\$503.9 billion all over Brazil, up to 2010. In the Legal Amazon, for the same period, there are planned investments of R\$35.2 billion for electricity generation and transmission and R\$10.6 billion for transportation logistics (not including regional expenses in Mato Grosso and Maranhão).<sup>2</sup>

Investments, official subsidies, prospects for economic growth and the dispute over access, use and control of natural resources explain the interest on the part of companies, governments and politicians in the construction works. Thus the pressure to reduce restrictions to their execution and, if necessary, changes in environmental legislation and limitations on the rights of populations located in the projects' areas of influence.

The socioenvironmental impacts of large infrastructure projects last a long time and spread throughout the territory. In the Amazon, construction sites often lead to creation of makeshift urban centers, which, generally, cannot meet the demand for sanitation, health and education. The perspective of improved supply of electricity and conditions for access drives up the price of land, encouraging land-grabbing and deforestation. An evaluation of implementation in the Amazon of a program similar to the PAC estimated among its consequences the loss of up to 506 thousand hectares of forest each year, an area the size of the Federal District (Brasília).<sup>3</sup>

One of the most important projects included in the PAC and IIRSA is pavement of the BR-319 highway (Manaus to Porto Velho), estimated at R\$390.1 million. The 877 Km highway was opened in 1973, but part of it was left unpaved. The project is controversial because it crosses one of the best preserved areas of the Amazon. A recent assessment indicates that it may cause deforestation of up to 39 million hectares until 2050, and that, considering its connections with other highways, it may affect up to 50 ILs, with a total population of nearly six thousand people. Also under the area of influence of the highway are 11 indigenous territories which need to be identified and four isolated groups, communities which are constantly the target of gunmen, lumberjacks and land grabbers. Invasions may increase conflicts and hinder regularization of some of these areas.<sup>4</sup>

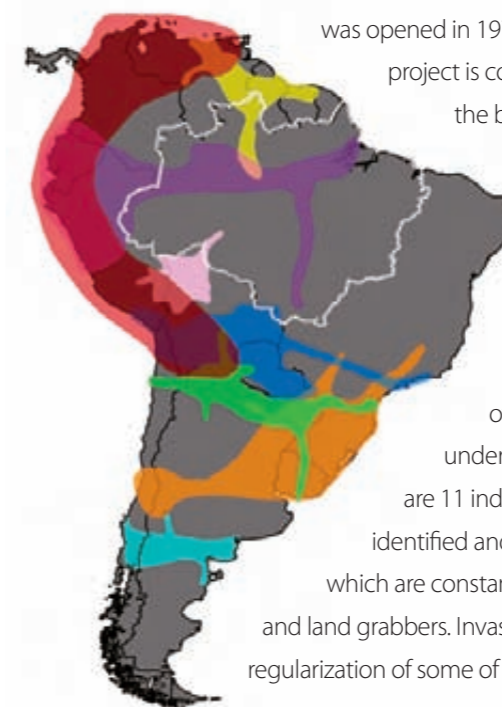
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## IIRSA PLANNED INVESTMENTS (2005-2010)<sup>5</sup>

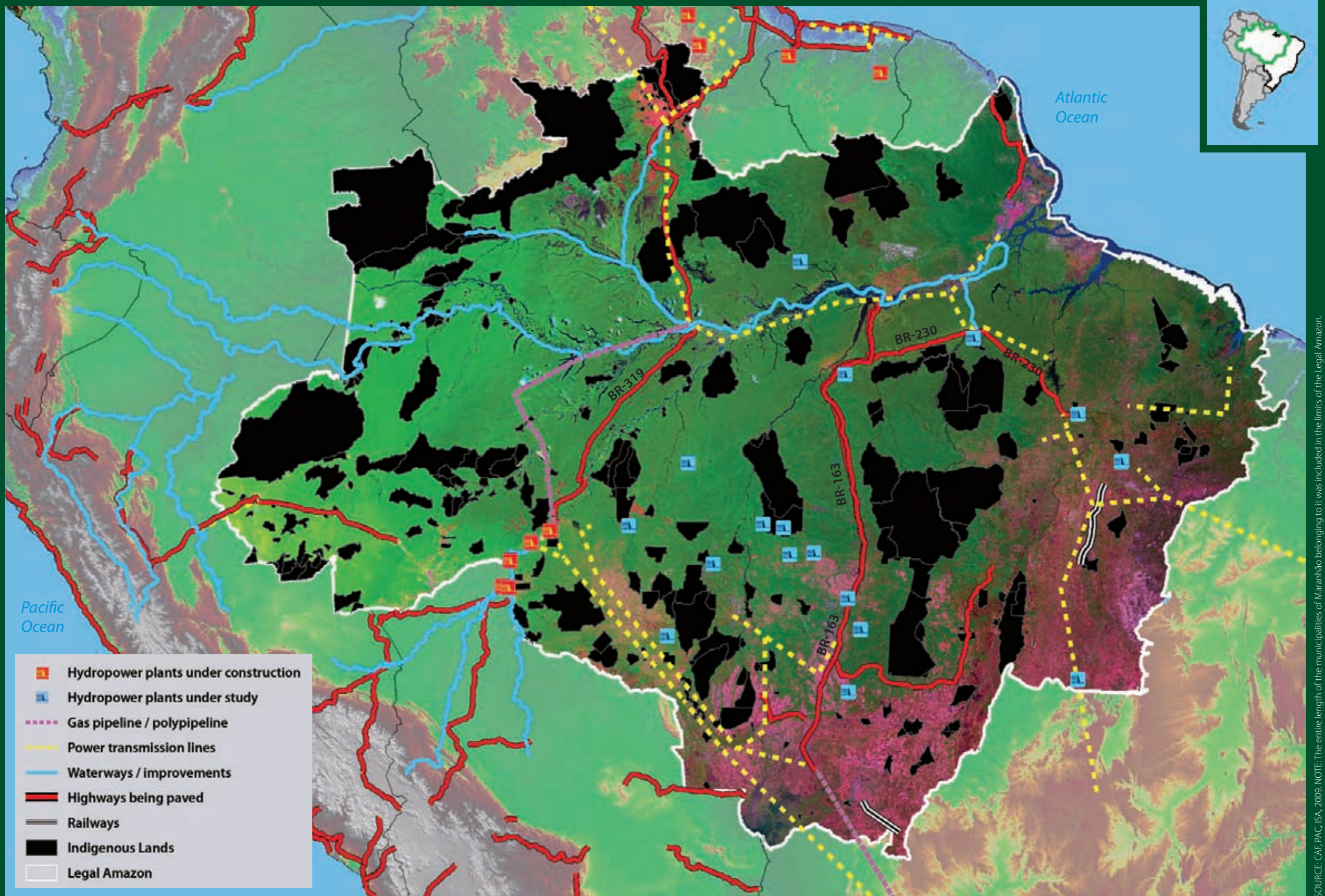
Areas of Integration and Development	Objectives	Number of projects	Estimated investment (in millions of US\$)	Priority financing (in millions of US\$)
Amazonas*	Pavement of highways for transportation of products from central continent regions	91	8.027	1.215
Peru-Brazil-Bolivia*	Construction of hydroelectric power plants, transmission lines, networks of highways and rivers for transportation of Amazon and mineral products via Pacific Ocean	21	12.000	1.067
Guiana Shield*	Use of natural resources (iron ore, bauxite, gold and forest products) and hydroelectric potential	44	1.072	121
Andean*	Interconnection of networks of highways, main ports and airports, transmission lines and telecommunications networks among Bolivia, Colombia, Ecuador, Peru and Venezuela	92	8.400	117
Mercosur-Chile	Improvement of the network of highways, facilitation of transportation on the Paraguai and Uruguai Rivers and connection of the electricity networks from Brazil, Uruguay, Argentina and Chile	70	13.197	2.895
Central Interoceanic	Interconnection of industrial poles of Belo Horizonte, Rio de Janeiro and São Paulo with Mato Grosso do Sul, Mato Grosso, regions producing oil, natural gas and soy in Bolivia and the Pacific Ocean	54	7.210	921,5
Capricorn	Improvement of the network of highways and railways and interconnection with the Paraná-Paraguai waterway	27	2.702	65
Paraguai-Paraná Waterway	Reducing transportation costs for grain and mineral exports	3	1.000	1
<b>Total</b>		<b>402</b>	<b>53.608</b>	<b>6.402,5</b>

NOTE: 1) South and South-Andean areas not included, since they do not cover Brazil and the Amazon; 2) modified from originals.  
\* Regions with projects planned for the Pan-Amazon territory.



Map of South America showing infrastructure project areas highlighted in various colors (red, purple, yellow, blue, green, orange).

# Planned and ongoing projects



SOURCE: CAF, PAC, ISA, 2009. NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.

# ILs and the new geography of electricity generation and distribution

## INFRASTRUCTURE WATERWAYS

### PHOTOGRAPH

Tucuruí Hydropower Complex on the Tocantins River (Pará).

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According to the information presented in the **MAP** 16 hydroelectric (UHE) are operating today in the Amazon and 67 small Hydropower (PCH), with up to 30 megawatts (MW) of installed capacity. There are 5 hydroelectric (UHE) and 21 small hydropower (PCH) under construction. Other 177 Hydroelectric and 70 hydropower (PCH) planned. To the Amazon the PAC intends to invest U.S. \$ 24.3 billion in ten hydroelectric (UHE) and six small hydro plants (PCH), and \$ 5.4 billion on 4.7 thousand kilometers of transmission lines till 2010.<sup>1</sup>

A large part of the hydroelectric potential of the country's Center-South has been harnessed. Meanwhile, the Amazonas basin houses most of the unused potential and has its own potential virtually unexplored (*see table*). According to government plans, 66% of the expansion of hydroelectric power generation planned for Brazil up to 2020 – to 43,787 MW – should take place in the Amazon region.<sup>2</sup>

Data show a new geography of electricity generation and distribution, which, in turn, redefines the relations between Brazil and the Amazon. As shown in the map to the right, connecting the region to the National Interconnected

System by means of new power lines paves the way to consolidate the region as a major exporter of electricity to Brazilian urban centers, the industrial and mineral sectors..

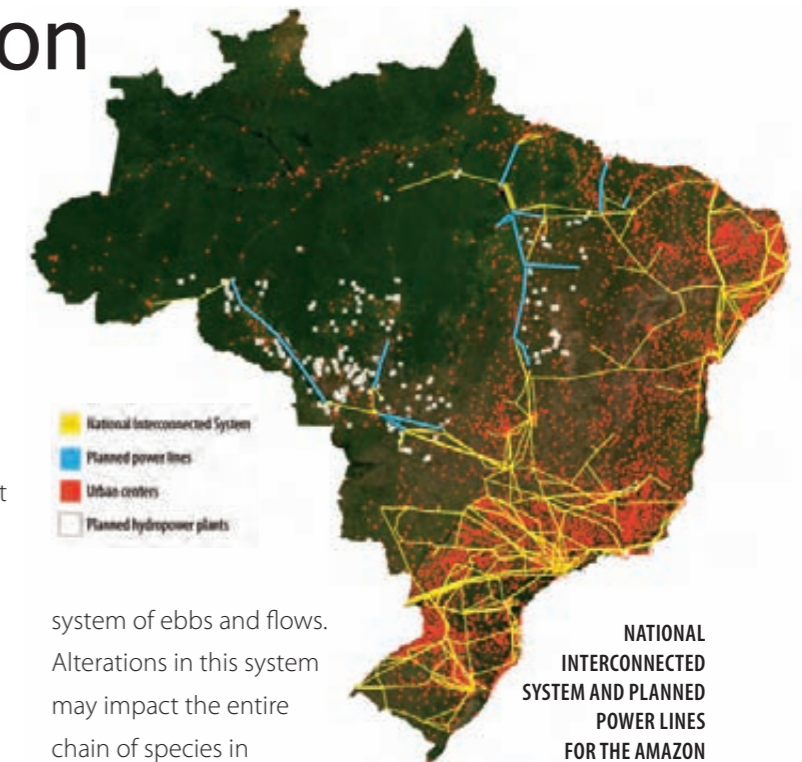
### Impacts on large territories

There are no systematic data regarding the number of people affected by hydroelectric projects in the country, but according to the Movement of People Affected by Dams (*Movimento dos Atingidos por Barragens – MAB*) they are 1 million. Representatives of government and companies use a figure of up to 300 thousand.<sup>3</sup>

Flooding of areas, dislocation and resettlement of inhabitants alone is the cause of a series of problems and conflicts. But, contrary to what many believe, these are not the only consequences of building a dam. They go even further than polluting the dammed river or reduced or extinct fish in the diet of riparian communities. The nature and outreach of these consequences may vary greatly, depending on the location and size of the project. In addition to aquatic and terrestrial ecosystems, climate, the water cycle, economy, form of land occupation, distribution and growth of the population and patterns and

dissemination of diseases can also be impacted. This is not limited to one region, but spills over to large territories.

According to specialists, construction of dams in the Amazon creates problems at a different scale than in the rest of the country. The degree of specialization and adaptation of animals and plants is very large. Like nowhere else, the balance of life cycles depends on the



system of ebbs and flows. Alterations in this system may impact the entire chain of species in floodplains and wetlands, with further effects which are still little known also on agriculture, timber extraction, cattle raising and fish cultivation. There are estimates that traditional fishing alone employs 70 thousand people in the Amazon region, sustaining another 250 thousand and generating between US\$100 million and US\$200 million every year.<sup>4</sup>

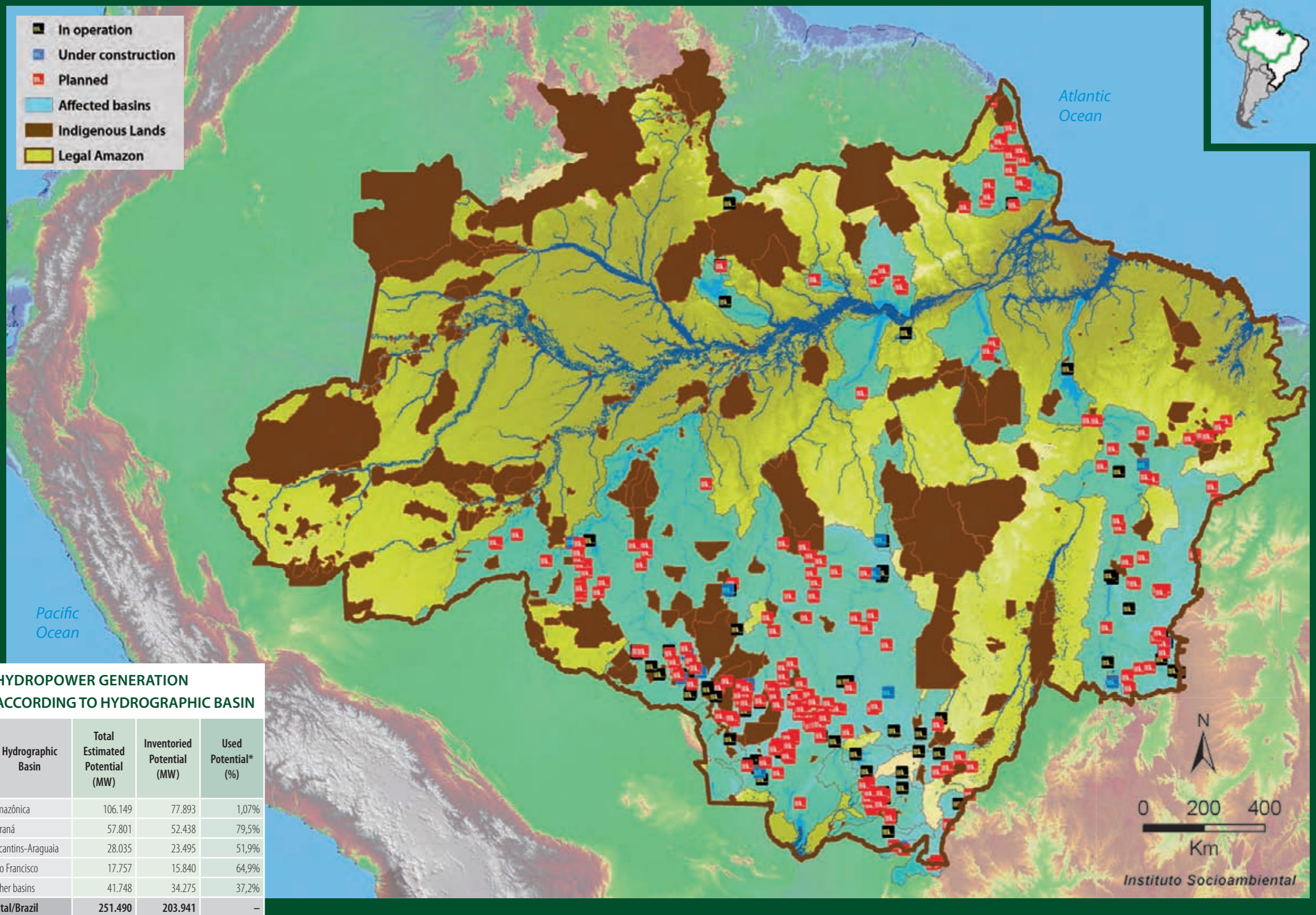
The Amazon has some of the worst examples of cost-benefit relations in hydroelectric plants (*learn more about this on page 36*). A study by the World Commission on Dams estimates that formation of the reservoir 3 thousand square kilometers in area in the Tucuruí (Pará) plant dislocated between 25 thousand and 35 thousand people. The Parakanã, Assurini and Gavião indigenous groups were directly affected.<sup>5</sup>

The mining and metalworking sector consumes approximately half of the installed capacity for electricity in the Northern region<sup>6</sup>. Approximately 20% of the electricity produced in Brazil today is employed in products for export, particularly aluminum<sup>7</sup>. The detail is that companies in this business already have lower tax rates and Tucuruí, for instance, granted subsidies in the neighborhood of US\$2 billion.<sup>8</sup>



DANIEL BELTRÃO/GREENPEACE

# Hydropower projects, affected micro-basins and meso-basins



NOTE: modified from original. Source: 2030 National Energy Plan. Empresa de Pesquisa Energética (EPE)/MME. 2007.  
\*Of inventoried potential

SOURCE: ISA, ANA e ANEEL, 2009. NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.

# Indigenous People will be affected the most by hydroelectric power plants

The **MAP** classifies Amazon sub-basins according to presence of hydropower projects and planned installed capacity. Highlighted in red, the Tapajós, Madeira and Tocantins sub-basins contain an enormous number of projects. Amapá also has a significant number of planned units, mostly to supply mining companies. The Xingu sub-basin, shown in orange, has fewer projects, among which, however, is the one which could be the second largest in Brazil, Belo Monte, with 12,000 MW of planned installed capacity.

These regions account for 80% of the hydroelectric potential in the Amazon, while at the same time housing a large number of ILs and other protected areas, which government technical experts label as “socioenvironmental restrictions” to hydropower use (see table 1). As shown on the map, the probability of conflicts and negative impacts on indigenous populations caused by power plants is high.

According to the Energy Research Company (*Empresa de Pesquisa Energética – EPE*), using 44% of the hydropower potential in the Amazon Basin and Araguaia and Tocantins sub-basins (only partly in the Amazon) will have some type of consequence on ILs (see Table 2).<sup>1</sup> There is no doubt, therefore, that indigenous populations stand to be affected the most by hydropower projects planned for the Amazon. Calculations based on information from 27 projects planned for these basins estimate that at least 44 thousand people may be affected.<sup>2</sup>

Figures regarding this issue are not precise, and often underestimated: most Environmental Impact Studies (Estudos de Impacto Ambiental – EIA) neglect socioenvironmental costs and consequences of dams. A significant share of these studies simply does not contain any information regarding inhabitants who will be relocated.<sup>3</sup> In the case of indigenous populations,

in addition to flooding territories, dams compromise the supply of fish, their main source of protein and an important element in several cultural practices. Indigenous communities are extremely adapted to and dependent on the regular function of the ecosystems in which they live in order to survive.<sup>4</sup> Forced abandonment of their traditional homes and livelihoods has disastrous effects. Generally, EIAs do not mention serious problems such as alcoholism, begging, prostitution and child undernourishment, either, all of which tend to increase with construction projects in indigenous territories and proximities.

## Hydropower dams and the Constitution

Despite the number of plants in planning stages or under construction in the Amazon, the Constitution sets forth that any projects affecting ILs need authorization from Congress, prior consultations with the affected populations, appropriate inventory and socioenvironmental impact studies and a specific law regulating the matter. Although no such law is in

**Table 1. SOCIOENVIRONMENTAL RESTRICTIONS TO THE HYDROPOWER POTENTIAL IN THE AMAZON**

Macro-basin	Potential (MW)	Potential with restrictions (MW)	Potential with restrictions (%)
Tapajós	24.626	17.841	72,4%
Xingu	22.795	17.114	75%
Madeira	14.700	1.556	10,5%
Tocantins	8.019	7.109	88,6
Trombetas	6.236	4.745	76%
Negro	4.184	4.184	100%
Araguaia	3.095	3.095	100%
Jari	1.691	1.373	81,1%
Branco	1.079	660	61,1%
Paru	938	118	12,5%
Oiapoque	250	250	100%
Purus	213	213	100%
Maecuru	161	161	100%
Nhamundá	110	110	100%
Uatumã	75	0	0%
<b>Total</b>	<b>88.172</b>	<b>58.529</b>	<b>66,3%</b>

SOURCE: Plano Nacional de Energia 2030. Empresa de Pesquisa Energética (EPE)/MME. 2007. NOTE: modified.

existence, the project authorizing implementation of the Belo Monte (PA) plant, on the Xingu River, was approved by congressmen in 2005, without consultation of the interested communities and in less than one week.

There are currently four bills in Congress for authorization of construction of plants which may affect ILs (three in Roraima and one in Paraná). Convention 169 of the International Labor Organization, signed by Brazil, also sets forth that economic activities affecting indigenous people, such as hydropower dams, need free, prior and informed consent from these people. On this regard, both the Constitution and international agreements signed by the country have been systematically disregarded.

## PHOTOGRAPH

Indigenous people protesting against hydropower plants during the Xingu Vivo para Sempre Meeting in Altamira, Pará, in 2008.

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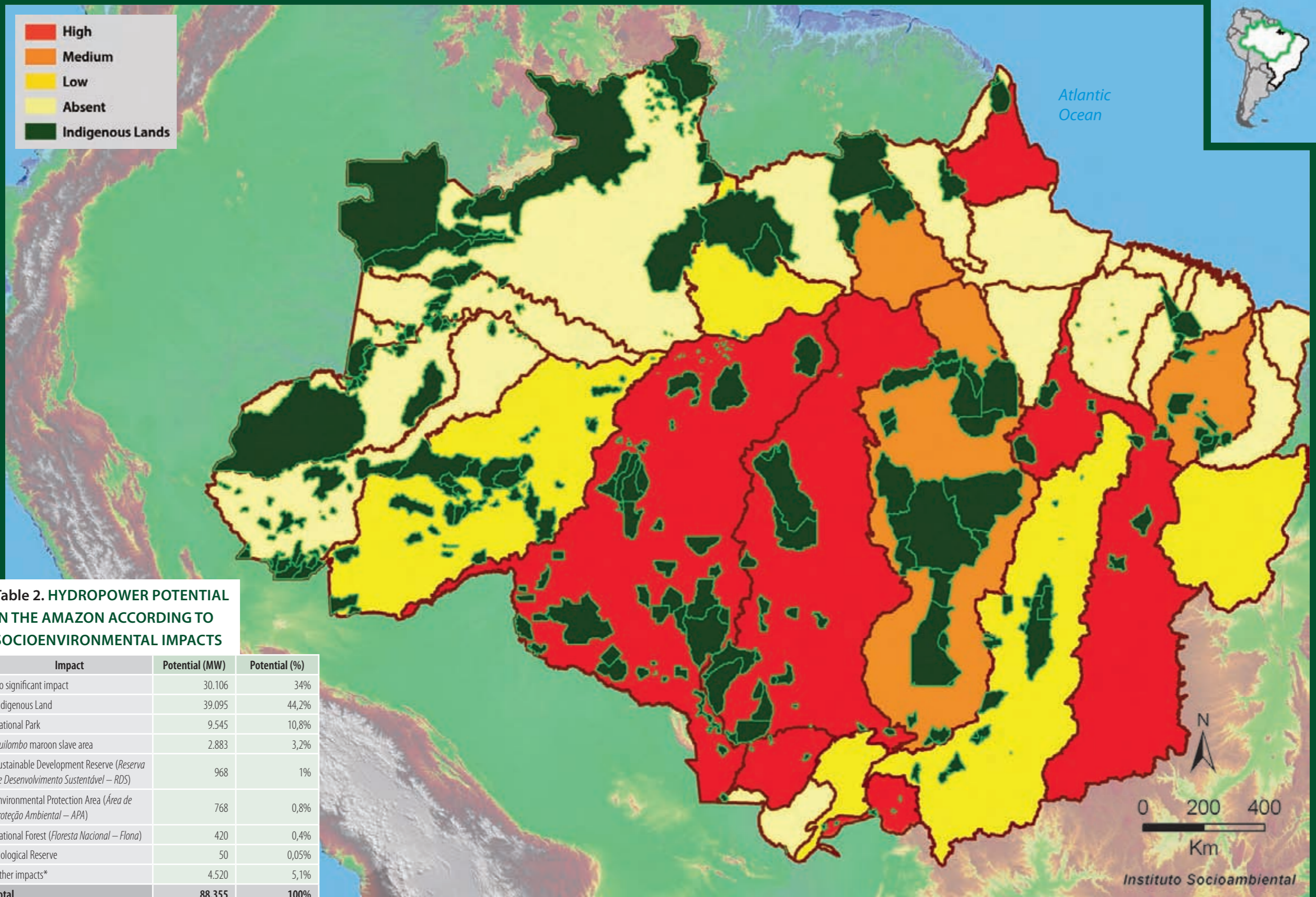
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# Classification of Amazon macro-basins according to presence of hydropower projects



**Table 2. HYDROPOWER POTENTIAL IN THE AMAZON ACCORDING TO SOCIOENVIRONMENTAL IMPACTS**

Impact	Potential (MW)	Potential (%)
No significant impact	30.106	34%
Indigenous Land	39.095	44,2%
National Park	9.545	10,8%
Quilombo maroon slave area	2.883	3,2%
Sustainable Development Reserve ( <i>Reserva de Desenvolvimento Sustentável – RDS</i> )	968	1%
Environmental Protection Area ( <i>Área de Proteção Ambiental – APA</i> )	768	0,8%
National Forest ( <i>Floresta Nacional – Flona</i> )	420	0,4%
Biological Reserve	50	0,05%
Other impacts*	4.520	5,1%
<b>Total</b>	<b>88.355</b>	<b>100%</b>

\* Cities, densely populated areas, virgin rivers, flooded areas, cost of land and presence of infrastructure of significant importance.  
 NOTE: modified from original. SOURCE: Plano Nacional de Energia 2030. Empresa de Pesquisa Energética (EPE)/MME. 2007.

SOURCE: ISA, 2009. NOTE: includes hydrographic boundaries of the Araguaia and Tocantins basins, which are considered to be partly in the Amazon.

INFRASTRUCTURE  
HYDROPOWER DAMS

## PHOTOGRAPH

According to the Enawenê-nawê, the slump in the number of fish in their territory, in Northern Mato Grosso, is caused by construction of plants on the Juruena River, which forms the Tapajós.

Every year the Enawenê-nawê build traditional fishing dams. Fish accounts for nearly their entire diet and is a central figure in their rituals.

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# Large Amazon rivers are threatened

The **MAP** contains a classification of ILs according to the presence of hydropower projects in the micro and mid-sized basins in which they are located. ILs shown in red are located in regions where there is a large concentration of planned projects (potential pressure). Those shown in orange and yellow are in basins where there are projects under construction (future pressure) and in operation (current pressure), respectively. Find out more about the main hydropower projects which threaten indigenous territories in the Amazon next.

## Belo Monte

Among the many regions which may be affected by hydropower plants, the Xingu Basin houses one of the most important sets of protected areas in Brazil and the world (see page 10). Approximately 16 thousand people are estimated to be dislocated on account of construction of the Belo Monte plant, on the Xingu River, in Altamira, Pará. In case it is constructed, calculations suggest that in dry months, just under the dam, where the Paquiçamba and Arara da Volta Grande ILs are located, the river may reach less than half of

the lowest levels registered. Among other impacts, reduced numbers and possible extinction of fish are expected, in addition to pollution, emission of greenhouse effect gases due to decomposition of submerged plant life and mercury contamination of fish and people (waste materials from mining activities).<sup>1</sup> Communities which stand to be affected were not properly consulted regarding the project, and steps toward implementation continue to advance. Since the 1980s, indigenous populations and social movements have struggled to prevent dams on the Xingu River. Electric companies calculate that the project will cost between R\$20 billion and R\$25 billion,<sup>2</sup> not including the costs of two thousand kilometers of power lines, estimated at over R\$10 billion.<sup>3</sup> The plant may run at less than half of the planned installed capacity of 12,000 MW during several months each year. Most of the power generated is meant for mining and steel companies.

## Madeira River

Another large Amazon river under threat from hydropower dams is the Madeira. It is responsible for half of the sediment

load in the Amazonas River and is its most important tributary. This did not prevent the government from authorizing and financing, through BNDES, large parts of the construction of the Santo Antônio and Jirau plants, in Porto Velho, Rondônia, with installed capacities of 3,150 MW and 3,300 MW, respectively. The construction jobs are estimated to cost approximately R\$ 25 billion. There are also 2.4 thousand kilometers of power lines, estimated at up to R\$15 billion.<sup>4</sup> Social movements and non-governmental organizations

have mobilized countless times against these dams. The story repeats itself: local communities and indigenous populations were not heard, but construction of both plants progressed. Independent evaluations showed that the EIA for the hydropower complex on the Madeira is inconsistent. Erosion and pollution processes were disregarded. The size of the reservoirs may be twice what was foreseen. Contrary to what the study states, Bolivian territory located upstream of the reservoirs will be flooded. Hundreds of fish species are at risk of extinction.<sup>5</sup> The Karitiana, Karipuna, Uru-Eu-Wau-Wau, Kaxarari and isolated indigenous groups stand to be affected.<sup>6</sup>

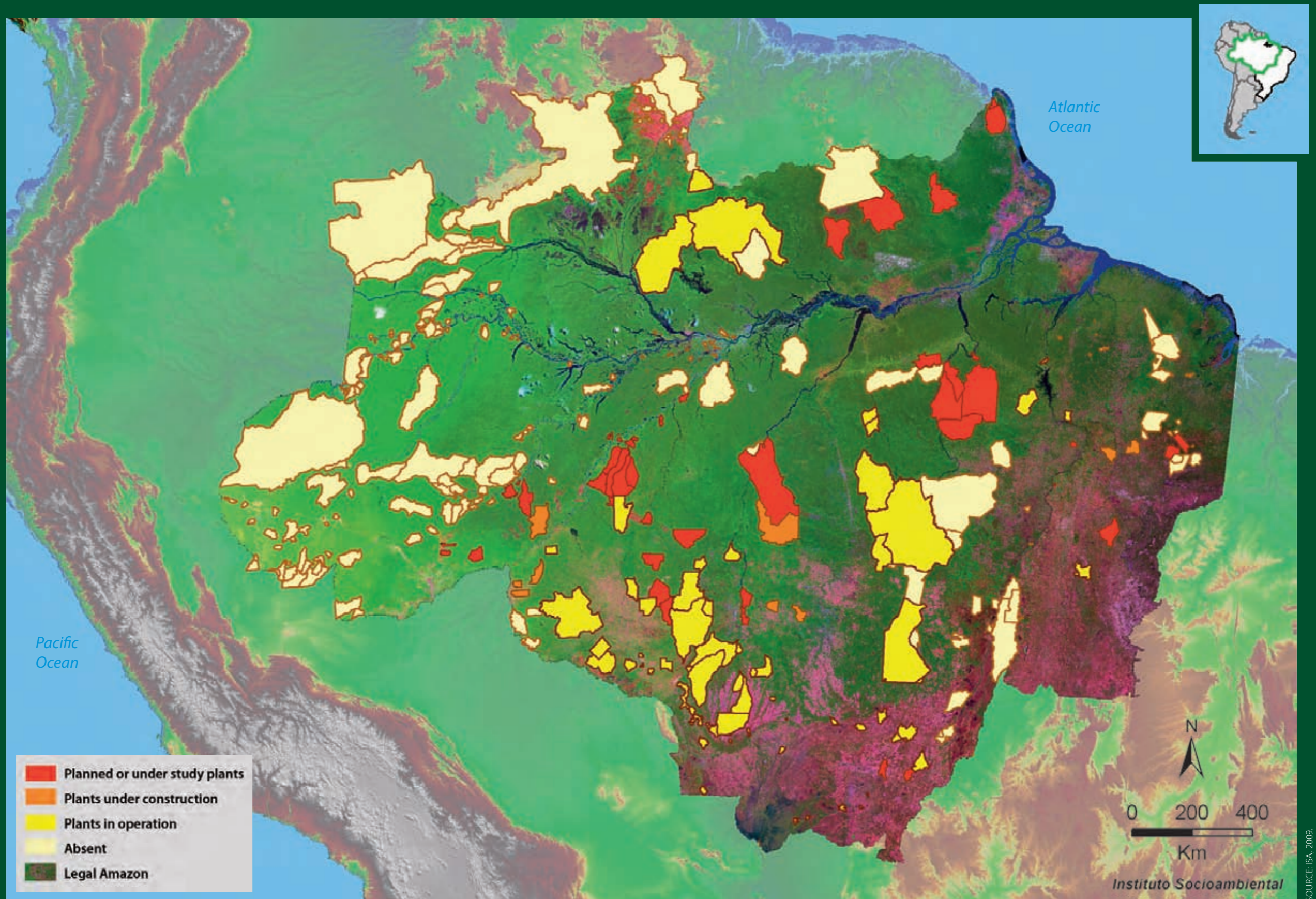
## Tapajós Basin

Damming the Madeira may have a chain of impacts reaching other regions. The PAC plans investments of R\$4.2 billion for construction of power lines up to 2010, which will distribute electricity to Mato Grosso and Rondônia and increase connection of both states to the national power grid.<sup>7</sup> These lines will make possible the myriad plants in planning and under study between Western Mato Grosso and Southern Rondônia and encourage construction of new ones (see maps on pages 18 and 19). This corridor of electricity generation and transmission should impact some of the main rivers forming tributaries on the right margin of the Amazonas River, affecting a large part of the Southern Amazon. According to an inventory study, the Tapajós River may house up to three hydropower dams and the Jamanxim River, its main tributary, four more, for a total of 14,245 MW of installed capacity. There is information that the government intends to speed up procedures to get at least five of these started, at a cost in the neighborhood of R\$30 billion.<sup>8</sup> The inventory of the Teles-Pires, another river responsible for forming the Tapajós, indicated the possibility of six dams. The Juruena, in the same basin, has 10 SHPs in operation, nine under construction and 54 others planned, in addition to 17 HPPs planned. Protected areas cover just over 60% of the Tapajós Basin. There are 19 ILs in the region, housing over 10 thousand people.



VINCENT CARELLI

# Classification of ILs according to proximity to rivers affected by hydropower projects





## DEFORESTATION

# The dynamics of devastation

The weight of each of the causes of deforestation and the manner in which they come together may vary in the Amazon, but, generally, they are the same: farming and ranching, timber extraction, land grabbing and infrastructure projects. The devastation follows a known pattern: 1) timber companies clear roads branching off highways toward locations with valuable trees, often in protected areas or riparian communities; 2) these companies exhaust the supply of noble wood and move toward new fronts; 3) using the newly opened roads, land grabbers and ranchers provide funds for conversion of forest into pastures, selling any remaining wood; 4) extensive, low-production cattle raising is consolidated.

Due to the surge and collapse in the level of economic activity caused by this process, researchers from the Amazon Institute of Man and Environment (*Instituto do Homem e Meio Ambiente da Amazônia – Imazon*) nicknamed it “boom-collapse”. According to them, the initial benefits of deforestation, such as income and employment, are restricted to few sectors of society and last no longer than 15 years. The balance left behind is economic stagnation, poverty, land tenure conflicts, ruined forest and soil.<sup>1</sup> In 2004, only 21% of the economically active population in the Legal Amazon had a formal job. Pará, Amazonas, Acre, Tocantins and Maranhão are among the states with the worst social and income concentration indicators. The municipalities with the most deforestation also have more murders than the national average.<sup>2</sup>

Since 1988, Inpe has estimated yearly deforestation rates by means of the Program for Calculation of Deforestation in the Amazon (*Programa de Cálculo do Desflorestamento na Amazônia – Prodes*). In 2003, the agency created the System for Real-Time Detection of Deforestation (*Sistema de Detecção de Desmatamento em Tempo Real – Deter*), which uses lower-quality satellite images which can nevertheless be obtained in just a few weeks. Deter has been used to

support initiatives for combating deforestation on the ground. In 2008, Inpe started the Mapping of Forest Degradation in the Brazilian Amazon (*Mapeamento de Degradação Florestal na Amazônia Brasileira – Degrad*), which is capable of identifying areas which underwent selective extraction of timber. This new system filled an important gap in information: studies show that an area the size of that already cleared may have been affected by varying levels of degradation in the Amazon region.<sup>3</sup>

## FHC and Lula

According to Inpe, 14% of the 4.2 million square kilometers of Amazon Forest in Brazil have been cleared. During the government of Fernando Henrique Cardoso (1995-2002), 19,125 square kilometers of forest, on average, were destroyed each year. Up to 2008, the Lula government has reached figures which are not much better: 18,487 square kilometers per year. Estimates show that participation of deforestation in emission of greenhouse gases in Brazil is falling, but still accounts for more than half of the total.<sup>4</sup>

In the past 20 years, Mato Grosso was responsible for 35.6% of the deforestation in the region; Pará for 32.5% and Rondônia for 13.8% of the total. In the past three years, Pará has become the leading state in the list of greatest deforesters. Between 2005 and 2008, a trend of declining general rates of deforestation in the Amazon was observed in the main deforestation frontiers (Rondônia, Northern Mato Grosso and Northeastern Pará). The Center-South of Pará, another important frontier, followed the trend, although its rates remained comparatively high, with Altamira, for example, at the top of the list of deforester municipalities. A new frontier of importance came up in Lábrea, in Southern Amazonas, a region which is being accessed by timber extraction companies by means of highways on Northern Mato Grosso.

## PHOTOGRAPHS

Forest areas in different stages: (from top to bottom) conserved, highly degraded and with shallow clearing.

A. São Félix do Xingu (PA), 2002.

B. Deforestation on the margins of the Iriri River, Terra do Meio, Pará, 2002.

C. Farm in Mato Grosso, 2008.

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PEDRO MARTINELLI/ISA



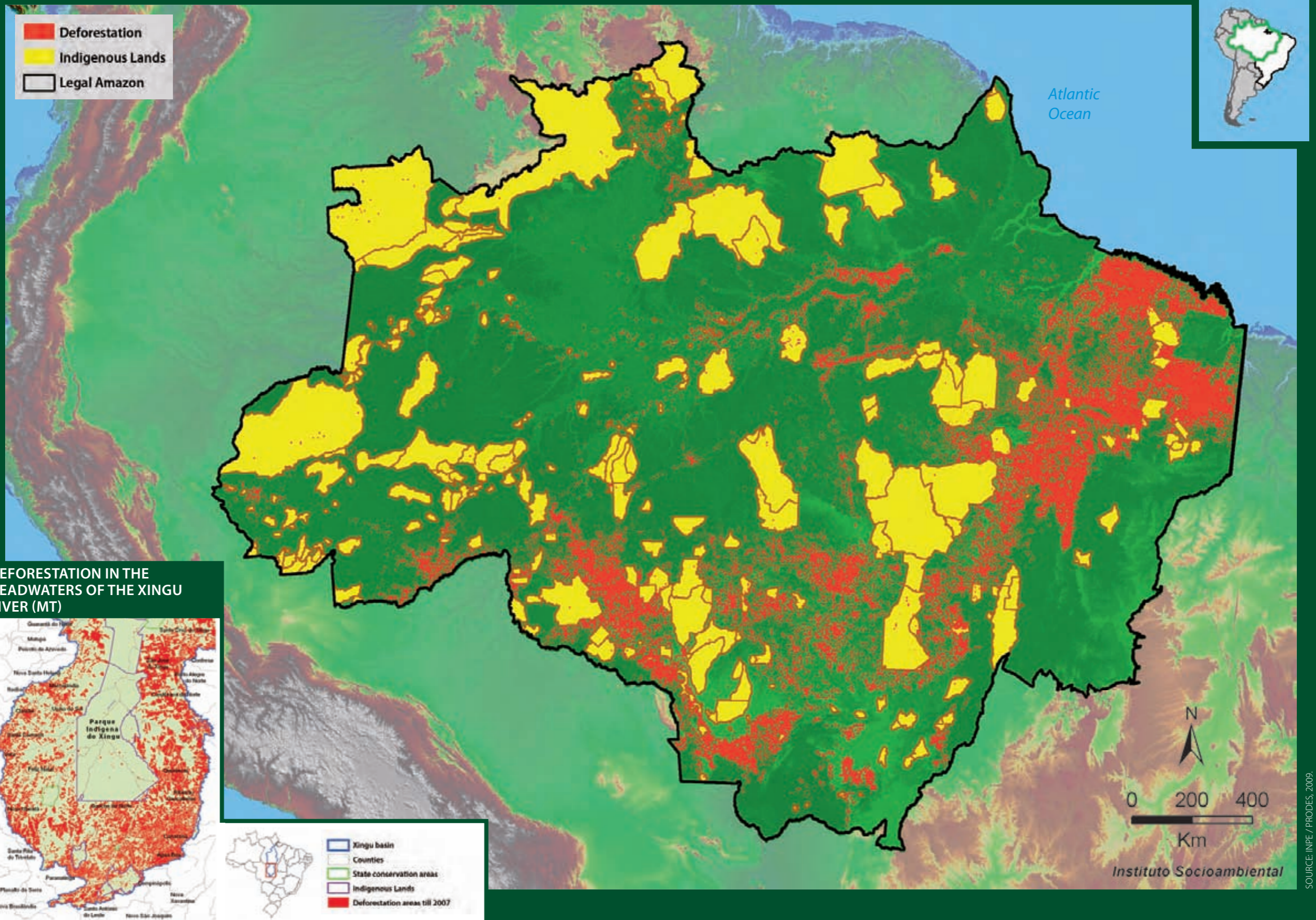
ANDRÉ MULLAS-ROSA/ISA



DANIEL BEBTRM/GREENPEACE

# DEFORESTATION

## Accumulated deforestation in the Amazon forest



DEFORESTATION

# A balance of deforestation in ILs

ILs have played a fundamental role in conservation: 98.4% of their total area in the Amazon is preserved. Deforestation in these territories corresponds to only 1.3% of all Amazon deforestation. The protection is as efficient or more so than in CUs. Estimates show that, in regions of Mato Grosso and Rondônia, deforestation may be up to 10 times larger outside legally protected areas than inside. This ratio leaps to 20 times in Pará.<sup>1</sup>

As the **MAP** indicates, however, there are many critical regions where the rate of deforestation in ILs is alarming. They are more vulnerable wherever access is facilitated. The wall of containment against deforestation which is made up of ILs and CUs in locations which are well preserved so far may start to crumble if there is no supervision and measures to slow down the devastation for an extended period of time outside these areas. Over 93% of deforestation identified in ILs is of external origin. (In order to calculate this figure, an analysis of satellite images of deforestation was done, taking into account the geometric shape and continuity with other cleared areas, roads, settlements and properties). Color coding in the map below

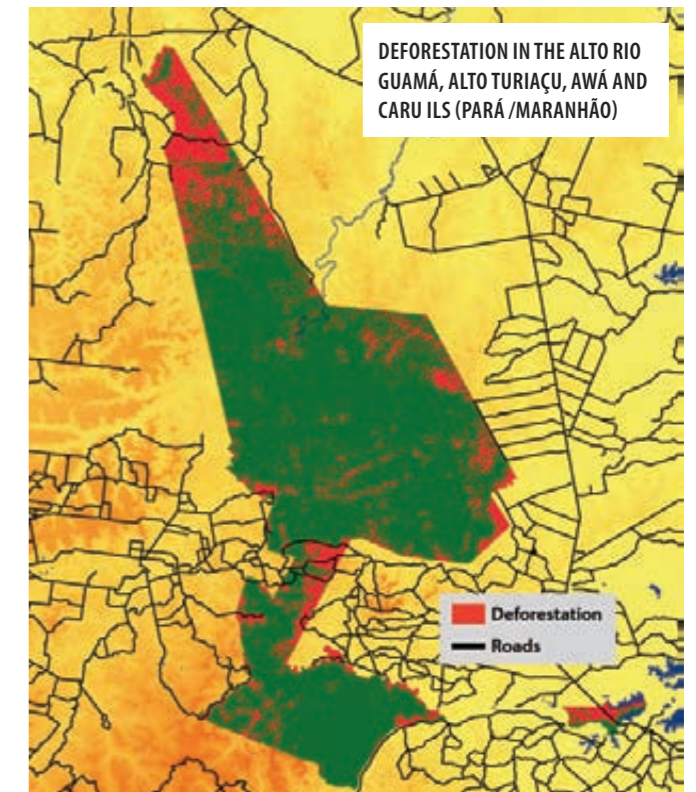
took into consideration: 1) continuous ILs or those closest to deforestation which took place in the past three years and which are located in the municipalities which deforested the most; 2) ILs which are part of the “deforestation arc”, where deforestation is theoretically consolidated; 3) ILs which do not meet the previous criteria were considered under lower threat.

According to this classification, ILs shown in red have the greatest amount of pressure related to deforestation. Those located in areas where the agricultural frontier expands with most force are in this situation: throughout the strip of land which extends from Southern Amazonas, through Rondônia, Western and Northern Mato Grosso, reaching Pará (especially along the Xingu Basin) and Maranhão.

The Alto Rio Guamá, Alto Turiaçu, Awá and Caru ILs are in this situation. They are located amidst one of the most traditional timber extraction poles in the Amazon, between Maranhão and Pará. They are continuous and comprise an area of approximately 1.1 million hectares. Of these, more than 18% have been cleared. According to Funai

information and media reports, thousands of cubic meters of wood were illegally removed from these areas in the past years. Logging is responsible for uncontrolled growth of nearby towns, which should increase the pressure over land, employment and new roads.<sup>2</sup> The Rio Pindaré and Krikati ILs, located in the same region, are in a similar situation: 19% and 58% have been cleared, respectively.

The Apyterewa IL is a slightly different case, although equally emblematic of a territory under pressure. It is located in São Félix do Xingu, Pará, which has also been at the top of the list of municipalities which deforest the most for the past 12 years. According to an



assessment carried out by Funai between 2006 and 2008, there are 1159 occupied areas in Apyterewa.<sup>3</sup> Inpe data show that 8% of the 773.4 thousand hectares of the IL have been cleared, most of it recently.

ILs shown in orange are at mid-level risk, They are those located in consolidated areas of the agricultural frontier (Tocantins, Central Maranhão, far-western Mato Grosso and Rondônia) or which are under different types of pressure. This is the case of the Yanomami (Roraima, Amazonas), Vale do Javari (Amazonas) and other ILs located in the far western part of Amazonas and in Acre, in addition to Munducuru, on the border between Pará and Mato Grosso. The main pressures and threats on these territories are illegal timber extraction and mining. ILs shown in yellow are at lower risk levels.

PHOTOGRAPH

Clandestine timber company supplied with logs stolen from the Alto Rio Guamá IL, Pará.

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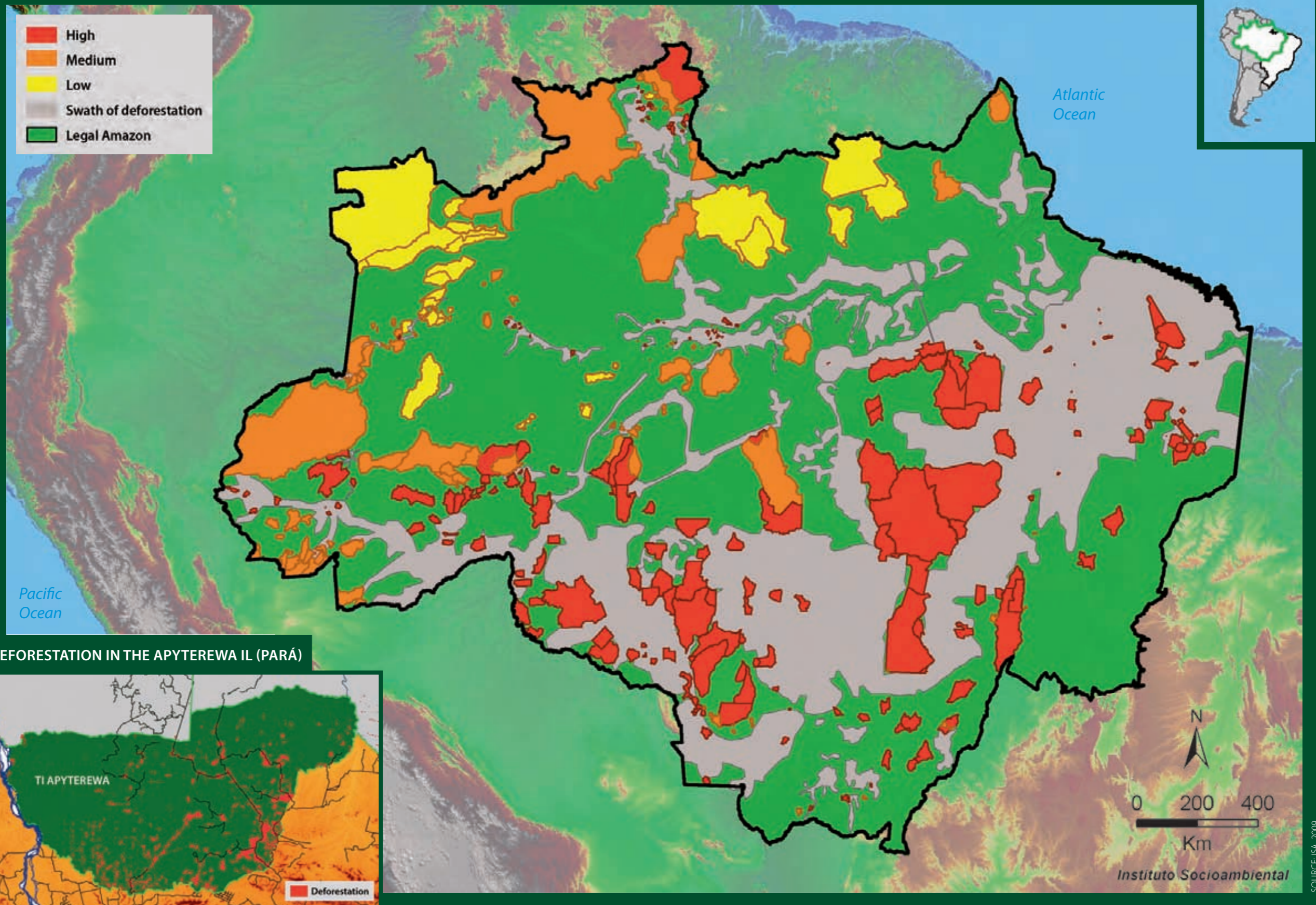
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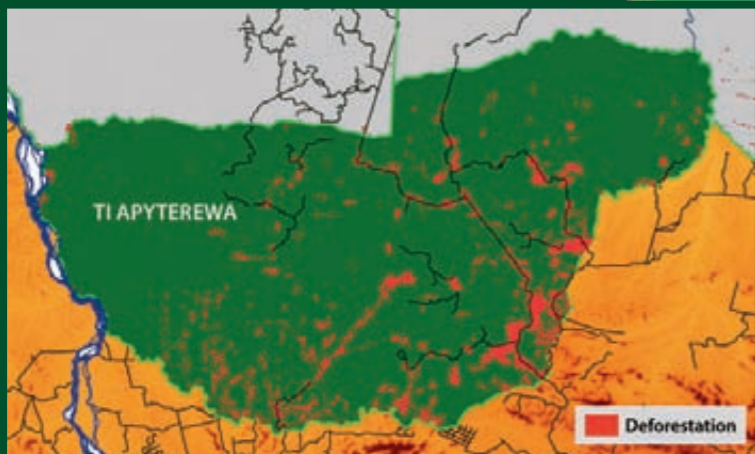


# DEFORESTATION

## Classification of ILs according to degree of pressure from deforestation



DEFORESTATION IN THE APYTEREWA IL (PARÁ)



# Inefficient Agrarian Reform policies generate conflicts with ILs

The abandonment which many Agrarian Reform projects face in the Amazon and the lack of coordination among land tenure agencies and Funai have transformed some of these areas into zones of conflict with indigenous communities. In Rondônia, large properties were created in the Uru-Eu-Wau-Wau IL by means of purchases of lots implemented in the 1970s by the National Institute of Colonization and Agrarian Reform (*Instituto Nacional de Colonização e Reforma Agrária – Incra*). At the time, the agency disregarded indications of indigenous presence.<sup>1</sup> Funai took the case to court and the occupied lands remained closed, under litigation, for years. In spite of this, invaders continued to tear down the woods and sell timber in order to plant pastures. In 2005, possession was reinstated for the indigenous group. There are reports that farms are still in operation and that land grabbers, miners and timber companies operate in other sites of the IL.<sup>2</sup> Of the 1.8 million hectares, 18 thousand have been cleared.

## Unfair comparison

Although they are not the most responsible for deforestation in the Amazon, settlements contribute largely to it. In the case of Incra projects, this contribution stands at 116.8 thousand square kilometers, or 20% of the total (an area the size of Pernambuco), according to Inpe data. In 2008, settlements in Mato Grosso had the top positions on the Ministry of Environment (*Ministério do Meio Ambiente – MMA*) list of greatest deforesters. Other calculations indicate that less than 10% of the Agrarian Reform lots in the country have environmental permits and that in the Amazon they have average figures of nearly half of the cleared area.<sup>3</sup> Nevertheless, the rate of deforestation has been decreasing in Incra settlements of the region.

The comparison with mid-sized and large properties is unfair since the ratio of deforestation per number of occupants is far lower in settlements. Furthermore, in the

Amazon, many were created in locations which were already cleared or degraded, with no technical or financial support, infrastructure, basic sanitation, schools or health posts. In these situations, with little or no knowledge of environmental legislation, what remains for many settlers to do is remove timber from their lots or even selling them, sometimes to land grabbers.<sup>4</sup> Thus, settlers often become reserve labor and expansion fronts for farming and timber extraction, paving the way for creation of large farms and ranches.<sup>5</sup>

Therefore, the considerable presence of Agrarian Reform projects on lands neighboring ILs, as shown in the **MAP**, reveals a need for stronger monitoring and policies in support of settlers in these regions, or else existing conflicts may be amplified or new ones created. In addition to Rondônia, there is a large number of Agrarian Reform areas in Pará's Center-West and on the strip of land extending along Northern Mato Grosso, on the border between Tocantins and Pará (where the Kayapó, Xikrin do Cateté and Parakanã ILs are located), and reaching the region known

as "Parrot's Beak" (*"Bico do Papagaio"*), in Southeastern Pará, Northern Tocantins and Western Maranhão. There is also a large concentration of settlements in Western Amazonas (to the south and north of the Rio Biá IL and among the Inauini-Teuni, Deni and Kanamari do Rio Juruá ILs); and in Roraima (next to the Yanomami, Trombetas-Mapuera, Waimiri Atroari and Wai-Wai ILs).

## Pressure release valve

The Amazon was turned into a pressure release valve for land tenure conflicts in the other parts of the country. Starting in the 1970s, instead of carrying out Agrarian Reform in the site of these conflicts, the government chose to do it in this less-populated region with vast public lands. Between 1970 and 1994, approximately 266 thousand families received lots in settlements and colonization projects in the Amazon.<sup>6</sup>

The Fernando Henrique Cardoso, and, especially, Luís Inácio Lula da Silva governments intensified this tendency.

Approximately 66% of the lots granted by Incra across the country, between 2003 and 2008, are in the Amazon. Currently, of the 55 million hectares of settlements in Brazil, 83% are in this region (which houses little over 23% of Brazil's rural population). Settlements represent over a third of lands in use and 74% of the total number of properties in the Amazon.<sup>7</sup> Nonetheless, the concentration of lands remains one of its main characteristics: 1% of the landowners hold 57% of the area of rural estates.<sup>8</sup>

## PHOTOGRAPH

Agroville of the Coutinho União Settlement in Querência, Mato Grosso.

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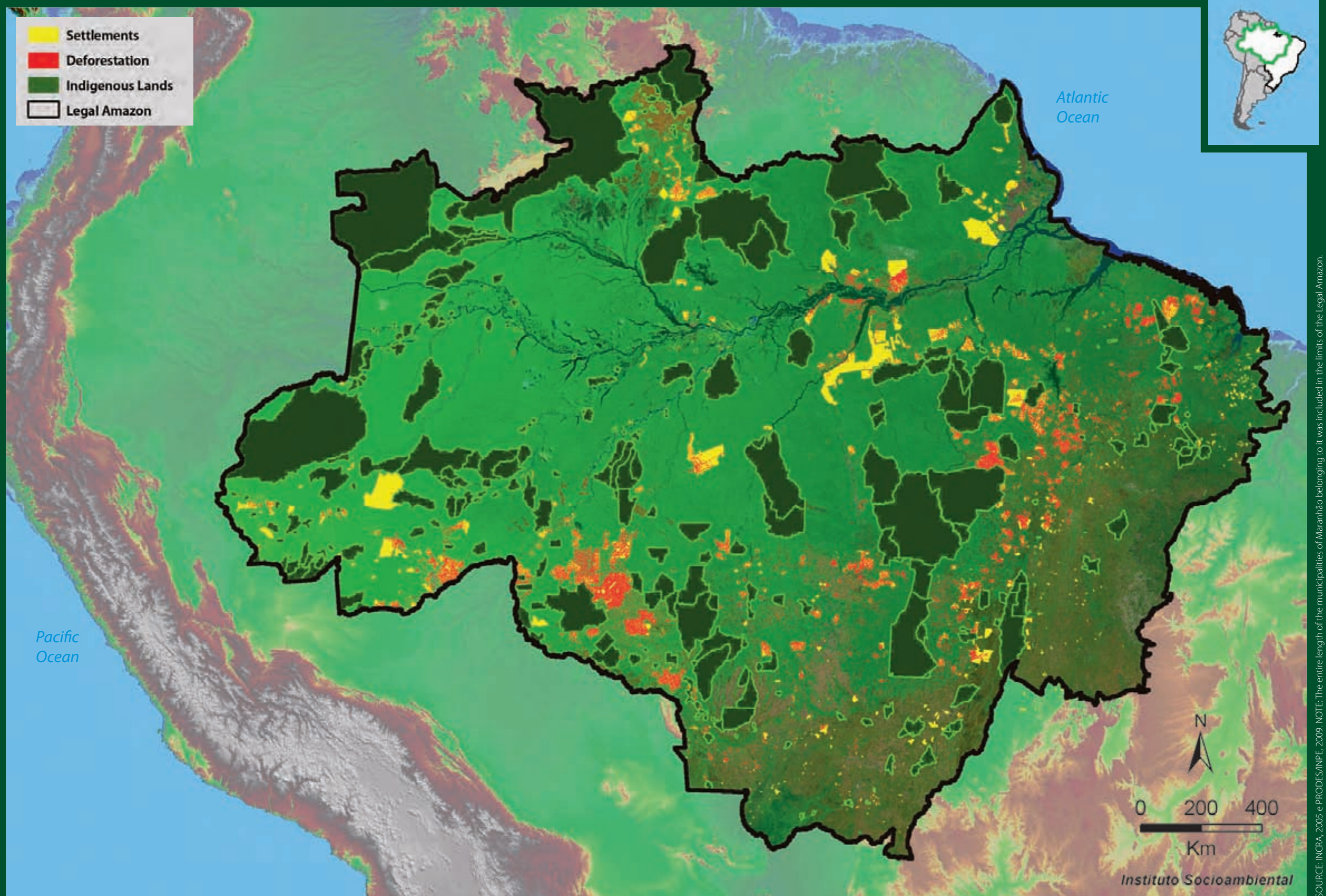
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ANDRÉ VILLAS BOAS/ISA

# SETTLEMENTS

## Settlements and Indigenous Lands



SOURCE: INCRA, 2005 e PRODES/INPE, 2009. NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.

# The “cattle-ized” Amazon

Pressure on Amazon ILs from agribusiness comes in the form of illegal land occupation, environmental degradation of their surrounding areas, political or judicial action against demarcation and even farming with consent of indigenous populations. These pressures take place primarily in Pará, Mato Grosso and Rondônia

One example is the Maraiwatsede IL, in Northeastern Mato Grosso. It was taken from the Xavante by ranchers and land grabbers in the 1960s and since then has been deforested. On account of conflicts and invasions, 630 indigenous people are currently confined to a single village. There are countless farms and a non-indigenous urban center in the area. Maraiwatsede is among the most deforested ILs in the country: 57% of its 165 thousand hectares have been cleared. Farmers and politicians try to prevent integral reinstatement by the Xavante in courts.

## Deforestation

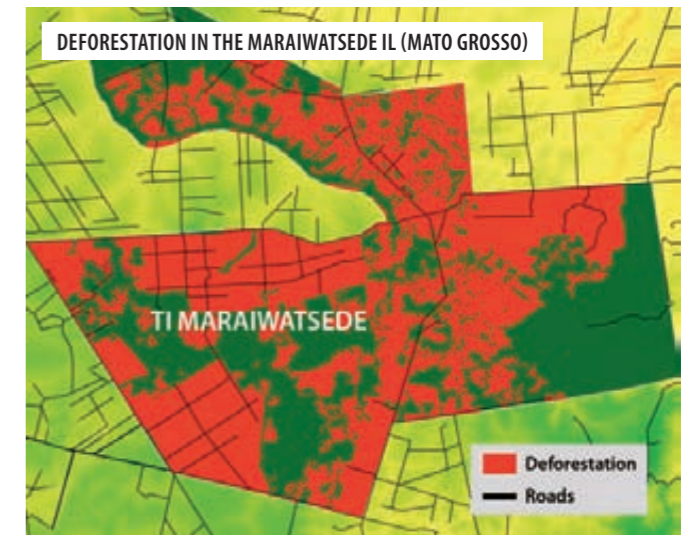
The 1970s also saw arrival in the Amazon of large farming projects attracted by the incentive and land distribution policies by the military government. Candidates applying

for legalization of a property and official cash transfers had to prove they were producing. The easiest way to do this was to plant pastures. Over time, the practice was adopted by land grabbers in order to simulate legal ownership of an area. Deforestation, land grabbing and cattle raising came together.

Currently, cattle raising is estimated to be responsible for 12% of Brazilian greenhouse gas emissions and 80% of the deforestation in the Amazon. The activity is under expansion mainly in Rondônia, Southeastern Pará and Northern Mato Grosso. The highest concentration of slaughterhouses and meat packers is found in these areas. On the **MAP**, the role of highways such as the BR-163, BR-364 and Transamazônica as disseminators of the meat production chain stands out.

Amazon cattle raising is under expansion mainly due to the low cost of land (or zero cost, in the case of land grabbing) – and official subsidies. Nevertheless, productivity is still far lower than in the rest of the country. The average occupation is under one head of cattle per hectare. Some years ago, the estimate was that 14% of the pastures were either abandoned or degraded.<sup>1</sup>

Mato Grosso is the largest cattle and soy producer in the country, The Legal Amazon houses 36% of the cattle and 23% of the lands cultivated with grains in Brazil. The region propelled the surge in the number of cattle in the past 20 years and, recently, had its pasture area expanded, while the opposite happened in the rest of the country. Between 1996 and 2006, the number of cattle in the Amazon doubled, from 37 million to 73 million heads of cattle, a growth three times larger than the national average. This “cattle-ization”



influenced the growth of 22% in the Amazon economy (twice the national rate), between 2003 and 2005. In 2006, farming accounted for 12% of the Legal Amazon's GNP, of R\$183 billion.<sup>2</sup>

Apart from the traditional productive zones in Mato Grosso, the area planted with soy in Rondônia and Pará is still small, but grew rapidly between 2000 and 2006. Studies show that at times of high agricultural prices, soybeans may drive pastures further into the forest. Between 2001 and 2004, stretches of forest were directly converted into cultivation of this crop in Mato Grosso, which was not common up to then.

Concern over possible expansion of crops for agrofuels in the Amazon is also growing. Between 2007 and 2008, biodiesel production in Mato Grosso rose from 15 thousand cubic meters to 285 thousand cubic meters and ethanol production surpassed one billion liters.<sup>3</sup> The PAC includes plans for R\$696.5 million in investments for biofuel and ethanol production in the state by 2010. There are already sugarcane and ethanol units in Presidente Figueiredo (Amazonas), Ulianópolis (Pará), and Arraias (Tocantins). Furthermore, there is fear that plantations for agroenergy in the Center-South may occupy pastures and shift more cattle toward the forest.

## PHOTOGRAPH

Cattle herd on the BR-163 near Rurópolis, Pará, September, 2007.

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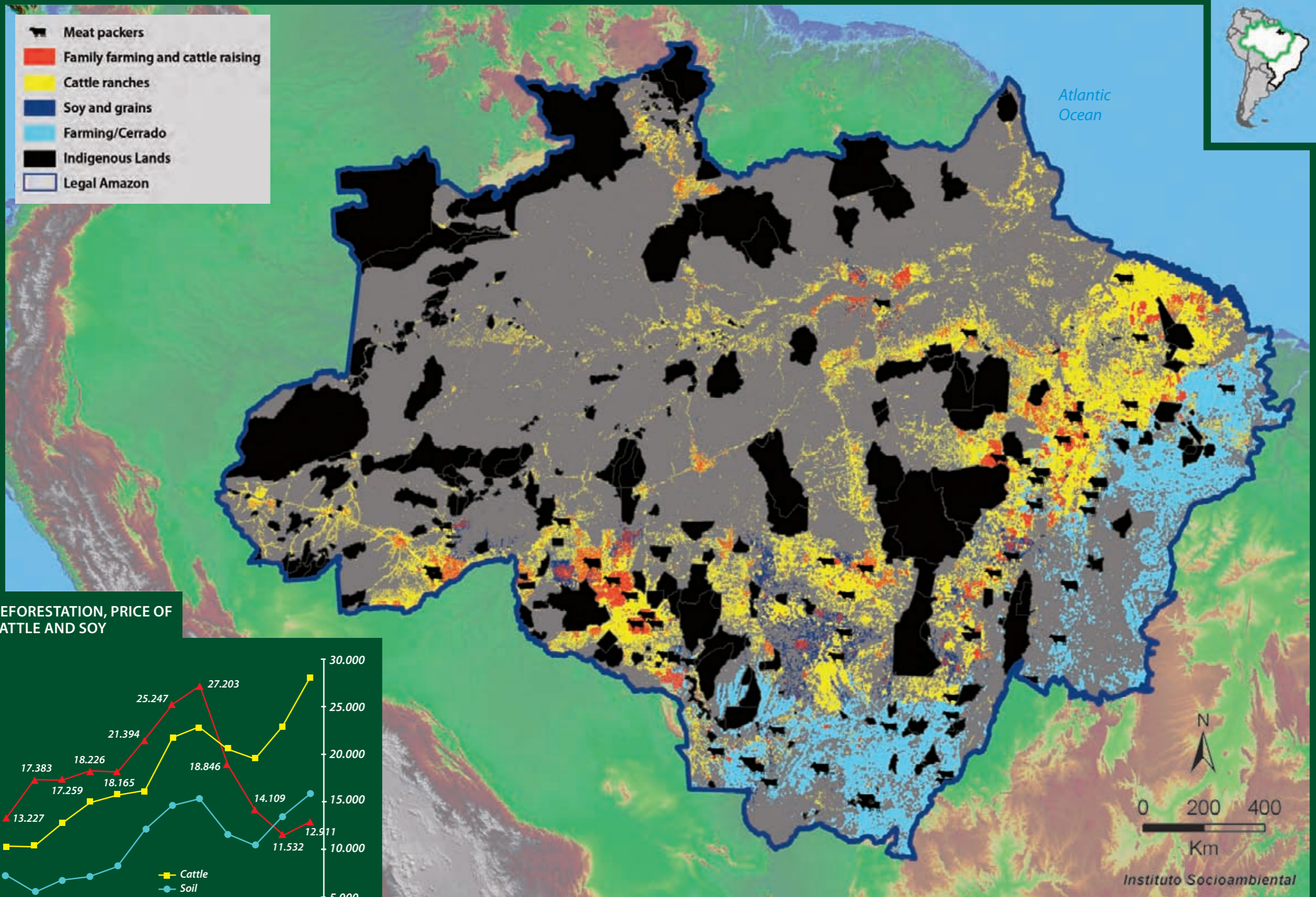
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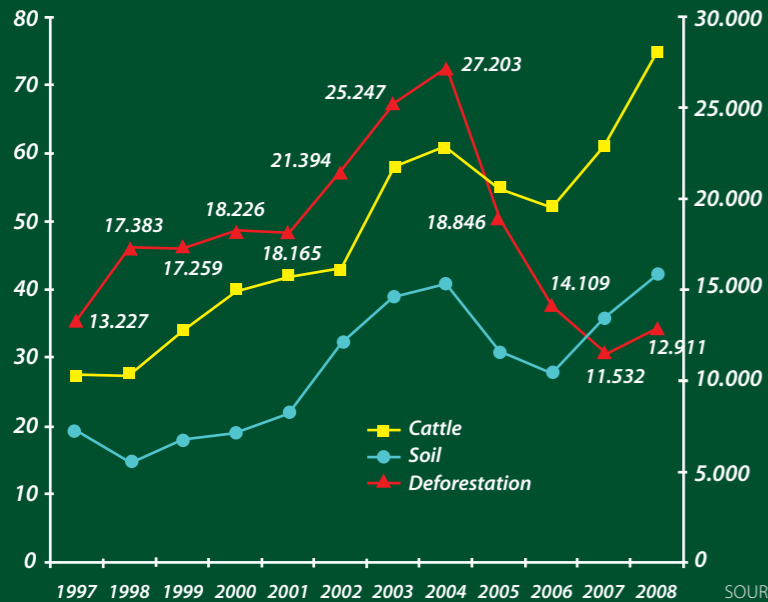
DANIEL BELTRÁ/GREENPEACE

LAND USE

An overview of land use in deforested areas of the Amazon



DEFORESTATION, PRICE OF CATTLE AND SOY



SOURCE: FEALQ - USP

SOURCE: IBGE, AMAZON e SA, 2009. NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.



BURNING

# Fire is already part of the daily life in the forest

Preventing and containing forest fires are currently two of the greatest socioenvironmental challenges in the Amazon and indigenous territories. Between 1997 and 1998, the climate phenomenon *El Niño* started a drought in Roraima which set the conditions for a fire which burned an area estimated at up to 40.6 thousand square kilometers, approximately 18% of the state, including part of ILs such as the Yanomami.<sup>1</sup> According to indigenous leaders, 1.1 thousand indigenous families were affected: they lost homes, suffered from a lack of water and food. Some became isolated. A total of at least 2.2 thousand hectares of gardens was devastated.<sup>2</sup>

The Xingu Indigenous Park, in Mato Grosso, is another example of ILs suffering from fires. In 2005, 208 heat spots were registered in the area. Fire advances from pastures in neighboring farms, but sometimes from indigenous farms as well. Brazilian Indians have difficulties adapting their traditional fire management techniques to recent changes in the regional climate (likely to have been caused by deforestation around the IL). With unexpected variations in the rainfall patterns and dry plant life, fires often get out

of control. Communities are becoming organized and participating in courses to avoid and combat fires.

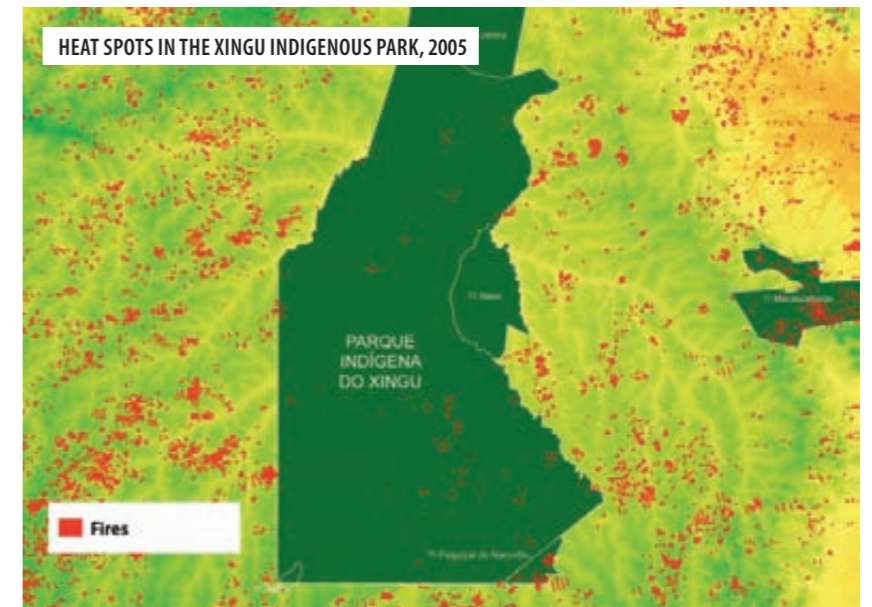
A study performed in 2002 showed that fires may cost the Amazon between 0.2% and 9% of its GNP, considering damage caused by accidental fires, impacts on human health and loss of carbon resulting from combustion of the vegetation.<sup>3</sup> According to a different study, by the Oswaldo Cruz Foundation (*Fundação Oswaldo Cruz – Fiocruz*), towns on the “arc of deforestation” are exposed to an amount of pollution 17 times larger than recommended levels due to smoke from fires, increasing occurrences of respiratory diseases.<sup>4</sup>

For over 20 years, Inpe has monitored the number of heat spots in Brazil using satellite images. With sparser vegetation and dryer climate, the Cerrado was the biome which was affected the most by fires until 2000. Since then, the Legal Amazon has surpassed the Cerrado. In 2005, 163,739 heat spots were registered in the region. According to Inpe, between the 2006-2007 and 2007-2008 periods, there was a surge in the number of spots registered in the Amazon: from 68 thousand to 101 thousand (see chart). There is a coincidence between this leap and the increase in the index of degraded areas in the same time span. Forest fires have become concentrated in Mato Grosso, Pará and Rondônia.<sup>5</sup>

Among pre-Columbus populations, fire was always a traditional instrument

for clearing cultivation areas. Nowadays, in zones of agricultural frontier expansion in the Amazon, it is used to burn vegetation left behind after removal of trees of commercial value. It often continues to be used for reforming degraded pastures or converting them into grain plantations. In the short run, the soil incorporates the nutrients resulting from combustion, but after years of repeated burning the practice degrades the land. Some fires get out of control and spread.

Ecosystems and climate are heavily affected by fire due to changes in the water cycle, amount of biomass, composition of vegetation, fauna, soil and atmosphere. One of the most important consequences of fires is that they make the area more vulnerable to new fires, starting a vicious cycle of degradation. Brazil is the fourth largest CO2 emitter in the world (one of the main gases responsible for global warming) and approximately 70% of national emissions originate from deforestation and fires.



PHOTOGRAPH

Fire started for clearing an area prepared for soy plantation in the Santarém, Pará region, 2003.

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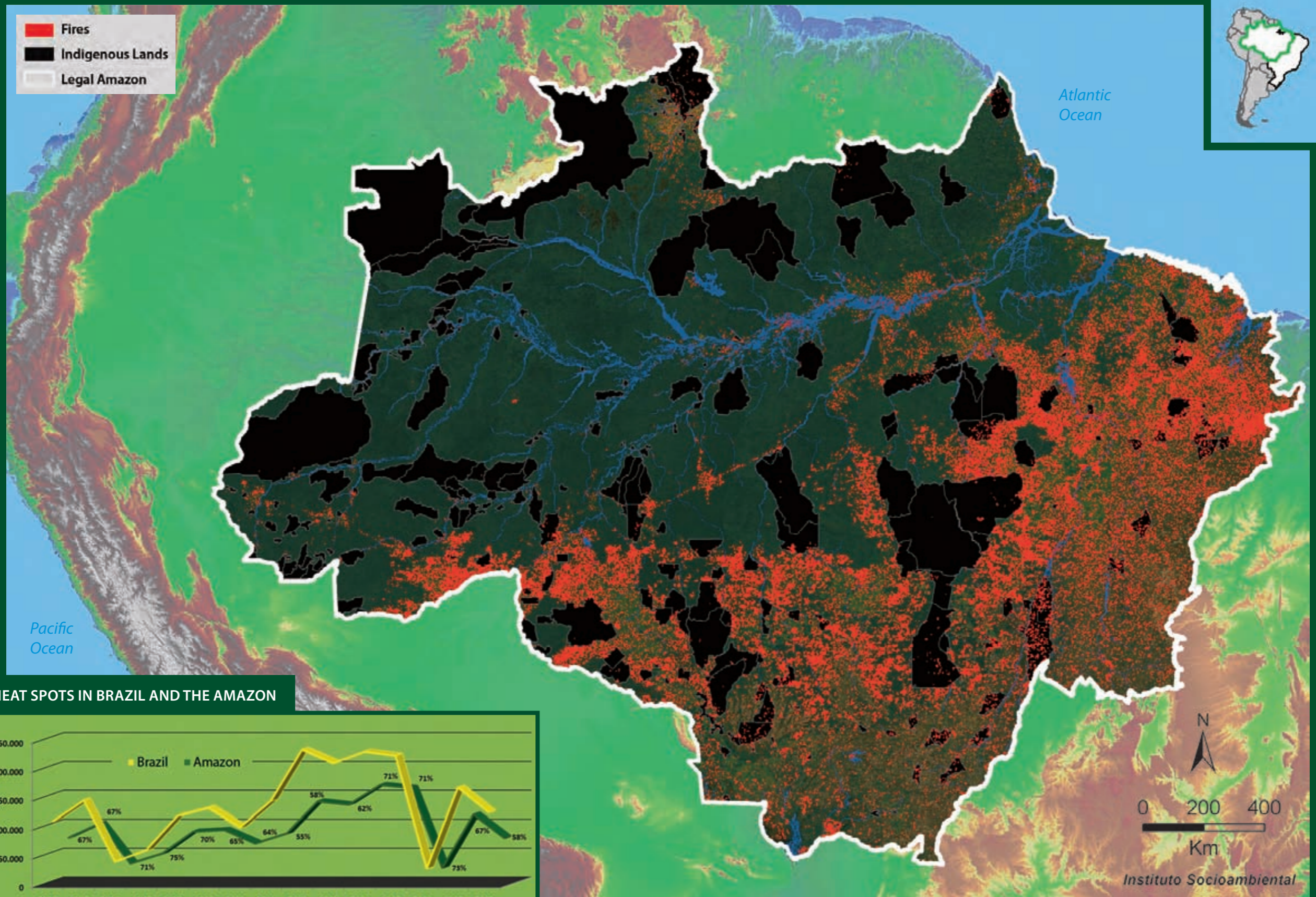
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DANIEL BELTRÃO/GREENPEACE

BURNING

Heat spots in 2005



SOURCE: INPE-CPTEC. NOTA: percentage refers to heat spots in Amazon in relation to Brazil's total.

# Mining and Indigenous Lands

**M**ining brings risks to indigenous territories because in its many forms, it may cause erosion, pollution and soil, water and air contamination, among other impacts. When granting ILs for physical and cultural survival of indigenous populations, the Federal Constitution acknowledged this threat and set forth that mining should only take place in these areas in exceptional situations. The Constitution forbid this type of activity in ILs pending regulation in a legal instrument, which has not taken place yet.

Thousands of requests for authorization to perform mineral exploration and exploitation in indigenous territories continue to be filed at the National Department of Mineral Production (*Departamento Nacional de Produção Mineral – DNPM*). In 2005, there were 5,064 mining-related processes in the Department – including exploitation permits and licenses, areas placed under availability, requests for prospecting and exploration (see table) – affecting 125 ILs in the Amazon. 329 companies are responsible for these, in addition to 66 persons and four cooperatives. Nearly half of the requests have gold as the object.<sup>1</sup>

In order to better illustrate the problem, suffice it to say that approximately 148 thousand people live in those 125 ILs. The Cajueiro (Roraima), Pequizal (Mato Grosso), Kwazá do Rio São Pedro and Roosevelt (Rondônia), Xikrin do Cateté, Baú and Arara ILs (Pará) have processes covering over 90% of their territory. 35 other ILs have over 50% of their area in the same situation. The lands with the highest number of processes are Yanomami (Amazonas, Roraima), with 640; Menkragnoti (Pará), with 413; and Alto Rio Negro (Amazonas), with 364.<sup>2</sup>

The **MAPA** shows an important concentration of ongoing mining activities (current mining) in areas surrounding the Waimiri Atroari (Amazonas and Roraima) and Xikrin do Cateté (Pará) (see the following map for further information) and Eastern Pará. The region which covers

Eastern Pará, Northeastern Mato Grosso and Western Tocantins has many mining exploration sites and requests for permits to start mining activities (future mining). The large number of requests for mining exploration in “available areas” (potential mining) in Rondônia, Western Mato Grosso, Southeastern Pará and in the Yanomami IL (Amazonas and Roraima) stands out.

## Political repercussion

The struggle between interests of mining companies and defenders of indigenous rights has always had significant political repercussions. During the National Constitutional Assembly (1986 to 1988), mining companies attempted to limit as much as possible any restrictions imposed on their activities. Civil society organizations and indigenous leaders mobilized and achieved some victories. The decision to analyze and authorize each mining project ended up in the hands of National Congress (after regulation of the subject matter), granting communities the right to be consulted and to participate in the profits from the extraction.

Some proposals for regulation under discussion in parliament represent a threat to indigenous people: they intend to make

a rule out of what should be a last resort, not requiring prior studies justifying the activity and treating the communities’ right to prior consultation as a mere formality.

On the other hand, government recently submitted a proposal to Congress for the Statute of Indigenous Peoples prepared by the National Indigenist Policy Commission (*Comissão Nacional de Política Indigenista – CNPI*) – where indigenous communities hold a seat – which regulates the subject matter and incorporates achievements defended by these groups. Among these achievements is the annulment of all requests for exploration and exploitation made so far; requiring a bidding process for mining on ILs; and the right of veto by communities to the activity on their lands.

## Mining in the Amazon

In 2008, mineral production in Brazil totaled R\$54 billion and the Legal Amazon accounted for over 25% of that amount.<sup>3</sup> Up to 2010, approximately R\$8 billion (36.7% of the total for the country) should be invested in implementation and expansion of mines and plants in the North, where some of the largest known deposits of minerals such as bauxite,

cassiterite and copper are located.<sup>4</sup> Investments in research and exhaustion of deposits in the Center-South tend to increase mining activities in the world’s largest tropical rainforest. Figures can give an idea of the interests at stake. Mining companies have tax exemptions and government subsidies and only a slim fraction of their profits remains in the Amazon. The mineral extraction industry accounts for only 7% of the region’s GNP and generates only 3% of the formal jobs.<sup>5</sup>

### MINING PROCESSES IN ILS IN THE LEGAL AMAZON (until 2005)

Stage	Valid processes with areas in the Legal Amazon	Processes entirely or partially in ILs	Denied processes		Total number of processes
			Possible errors in precision	Processes cancelled by DNPM	
Authorization for Exploration	5.580	275	40	18	217
Mining concession	529	8	4		4
Availability	1.481	37	8		29
Prospecting	1.152				
Licensing	1.405	9			9
Extraction Registration	17				
Request for Mining	6.887	17	4		13
Request for Prospecting	22.446	172	7		165
Request for Exploration	8.942	4.769	142		4.627
Request for Registration of Extraction	13				
<b>Total</b>	<b>48.452</b>	<b>5.287</b>	<b>205</b>	<b>18</b>	<b>5.064</b>

SOURCE: Mineração em Terras Indígenas na Amazônia Brasileira. ISA. 2005.

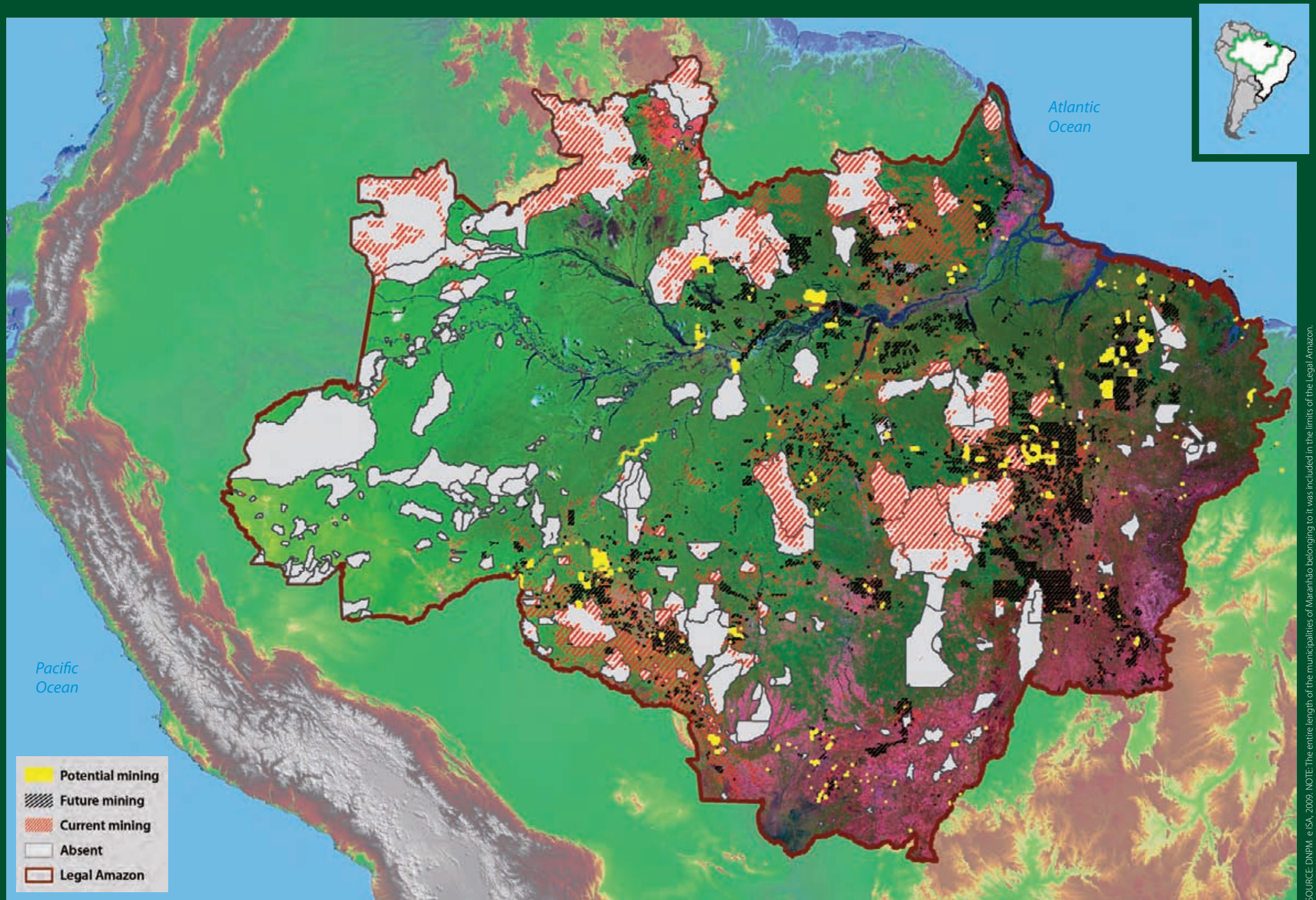
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# Mining processes in the Legal Amazon



# Socioenvironmental liabilities of mining in ILs

The **MAP** classifies ILs according to the nature of the mining process affecting their territory. ILs shown in red (potential threat) have an enormous number of requests for research, or areas classified as “available”. Those shown in orange (future pressure) have ongoing mining exploration or requests for authorization submitted for the start of mining activities. ILs shown in yellow (current pressure) are those which have a concentration of ongoing mining activities in surrounding areas. In this last category are the Xikrin do Cateté and Waimiri Atroari ILs, two of the most emblematic examples of impacts brought about by mining in indigenous territories.

## The Xikrin do Cateté

The Xikrin do Cateté IL has 99.32% of its area affected by 8 mining titles and 120 requests for research. The processes involve 11 different substances such as copper, nickel, tin and lead. Over 60% have gold as the object.<sup>1</sup>

At the start of the 1980s, the Carajás mountain range, in Southeastern Pará, an area on the border of the Xikrin do Cateté IL, began to be mined by the Vale do Rio Doce Company (*Companhia Vale do Rio Doce – CVRD*). Over 1 billion tons of iron ore have been extracted from the location. Along with the mines came steel companies, roads, immigration, some economic growth, no income distribution and a lot of deforestation.<sup>2</sup>

In 1989, CVRD started a program with education, healthcare and infrastructure activities, among others, in order to compensate the Xikrin for the socioenvironmental impacts of its activities. The community also started to receive stipends, which facilitated access to a greater quantity and variety of foods, but also sedentariness and new consumption habits. Uncommon diseases such as cancer, diabetes and hypertension are appearing. There is accumulation of garbage and transit of non-indigenous

people in villages. The relations between the indigenous group and CVRD have been marked by conflict. The Xikrin protest and demand more resources and efficiency in the services offered.<sup>3</sup> In 2006, the Vale Company suspended payments and the matter was taken to court.

## The Waimiri Atroari

The Waimiri Atroari IL has 2.5 million hectares. Of these, 44.5% are in 195 mining processes at the DNPM: 193 requests for exploration, particularly for cassiterite and copper; in addition to a mining concession and one other authorization for exploration.<sup>4</sup>

In the 1970s, a large deposit of cassiterite was found in the region. After its official recognition in 1971, the Waimiri Atroari Indigenous Reservation was dosed off and lost over 525 thousand hectares on account of pressure from politicians and companies interested in the mineral deposits<sup>5</sup>. Among these companies was Paranapanema, which, in 1982, opened in the area what was to become the



largest cassiterite mine in the world. The mining companies' activities caused a series of negative impacts. Springs and riverbanks were deforested. Reservoirs used to wash the ore burst open, contaminating the Alalaú River Basin, which drains 55% of the territory.

In 1987, the Balbina hydropower plant was built on Waimiri lands. The site is considered a socioenvironmental disaster: 2.3 thousand square kilometers were flooded, forcing two villages to be dislocated for generation of a mere 250 MW. To compensate the indigenous people, Eletronorte financed demarcation of their lands and implemented the Waimiri Atroari Project, with activities aimed at health, education, support for economic activities and monitoring of the territory. The population eventually recovered and currently is at over one thousand people.

## PHOTOGRAPHS

A. Carajás mountain range, iron ore mine exploited by the CVRD, 1996.

B. Aerial view of the Waimiri Atroari's Alalaú village, Alalaú River, Waimiri Atroari Indigenous Land, Amazonas.

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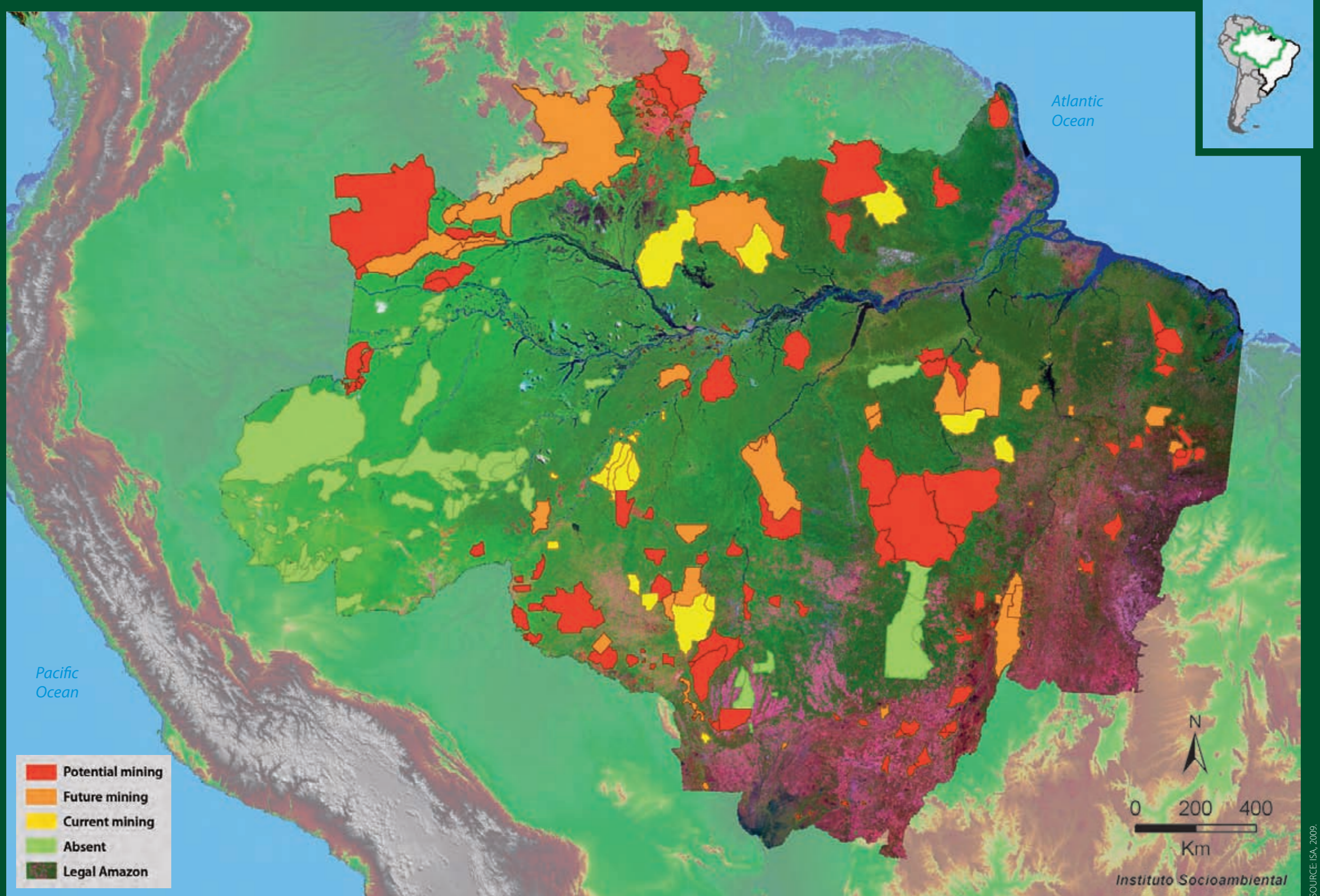
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# ILs according to pressures and threats from mining activities



# Prospecting

An inoperant and conniving State, in combination with political and economic interests, turned prospecting into one of the most severe problems faced by Amazon indigenous communities. The Federal Constitution recognized this situation and forbid prospecting by non-indigenous people on ILs.

The orange polygons shown on the **MAP** indicate the presence of active or inactive prospecting sites on a given micro-basin. The polygon located at the Mundurucu IL, in Southeastern Pará, is one of the main prospecting zones in the country. In 1983, the federal government created the Tapajós Prospecting Reservation in the area, with 2.8 million hectares. The Ministry of Mining and Energy (*Ministério de Minas e Energia – MME*) currently estimates that there are 20 thousand prospectors in the region. Many are clandestine workers in the Mundurucu IL. In 2006, the Ministry of Environment (*Ministério do Meio Ambiente – MMA*) created the Tapajós Environmental Protection Area, the Jamaxi and Amaná National Forests, for a total of 3.9 million hectares under protection, including the lands of the former Prospecting Reservation.

From 1987 to 1990, nearly 40 thousand prospectors invaded the Yanomami (Amazonas and Roraima) lands searching for gold. Over one thousand indigenous people died on account of conflicts and diseases (currently, there are approximately 15.5 thousand Yanomami in Brazil). Even after creation of the Yanomami IL, in 1992, and several operations to remove invaders, problems persisted.<sup>1</sup> In 1993, prospectors murdered 16 indigenous people. The Haximu Massacre, as it became known, was considered genocide by the legal system. Between 2008 and 2009, Yanomami leaders once more denounced an increase in the presence of invaders on their lands.

In 2004 another massacre, this time involving 29 prospectors, took place on the Cinta-larga's Roosevelt IL (Rondônia). The crime was the climax of a cycle of violence which began

in 1999, when one of the world's largest diamond deposits was discovered in the area. Nearly five thousand prospectors worked at the site. Between 2000 and 2004, both Cinta-larga leaders and prospectors were injured or killed. Police operations removed thousands of invaders, apprehended equipment and diamonds, but this has not stopped them from returning.

Because of the conflicts in the Roosevelt IL, a presidential decree created a work group to monitor and discourage any type of mineral exploitation on ILs. The subject matter still awaits legal regulation. Recently, a decision by the Supreme Court (*Supremo Tribunal Federal – STF*) reinforced the need for regulation by Congress and conditioned prospecting by the indigenous groups on State authorization (clarifications about this from the STF are still pending). The issue divides indigenous peoples. Some show interest in prospecting. There are extraction experiences which were organized and used methods of low environmental impacts.

Since the 1970s, when many prospecting sites appeared in the Amazon, due to the total lack of monitoring, these places became centers of uncontrolled population growth, violence, prostitution, diseases and degrading working conditions. The most famous case was Serra Pelada (Pará), which was once the largest open-air gold prospecting site in the world, in the 1980s. Currently, 1.3 thousand prospecting sites are estimated to exist in the Amazon, both active and inactive (*see table*).<sup>2</sup> Information about them is imprecise and difficult to obtain, since the activity is temporary and nearly always illegal.

Prospecting (*garimpo*) is a rudimentary form of mining which uses simple equipment, such as hoses and chutes. Its socioenvironmental impacts are very large. In the case of gold prospecting, the mercury used for amalgamation can contaminate water and animals, especially fish. Intoxication also takes place by inhalation of the vapors from burning the amalgam. The worst effects attack the nervous system and may lead to loss of motor skills.

## PROSPECTING SITES IN THE AMAZON

Year of registration	State	Number	Observations
2008	PA	630	585 active (519 gold); 1 diamond (inactive)
2004	MT	214	182 gold
2004	RR	204	143 gold
2007	RO	138	75 gold; 16 diamond
2006	AM	58	46 gold
2004	AP	44	38 gold
2004	TO	22	6 hyaline quartz; 5 gold
2004	AC	1	gold
<b>Amazon (Total)</b>		<b>1.311</b>	

NOTE: 1) There are no data for Maranhão. 2) Data in the table do not correspond to indications on the map.  
SOURCE: Geological Service of Brazil (*Serviço Geológico do Brasil – CPRM*).

### PHOTOGRAPHS

A. Cinta-largas work in illegal diamond prospecting site in the Parque Aripuanã (Rondônia) Indigenous Land. Some communities are coaxed by prospectors.

B. Brazilian Air Force helicopter pilot transporting sick Yanomami woman. Prospecting often spreads epidemics among indigenous populations. January, 1990.

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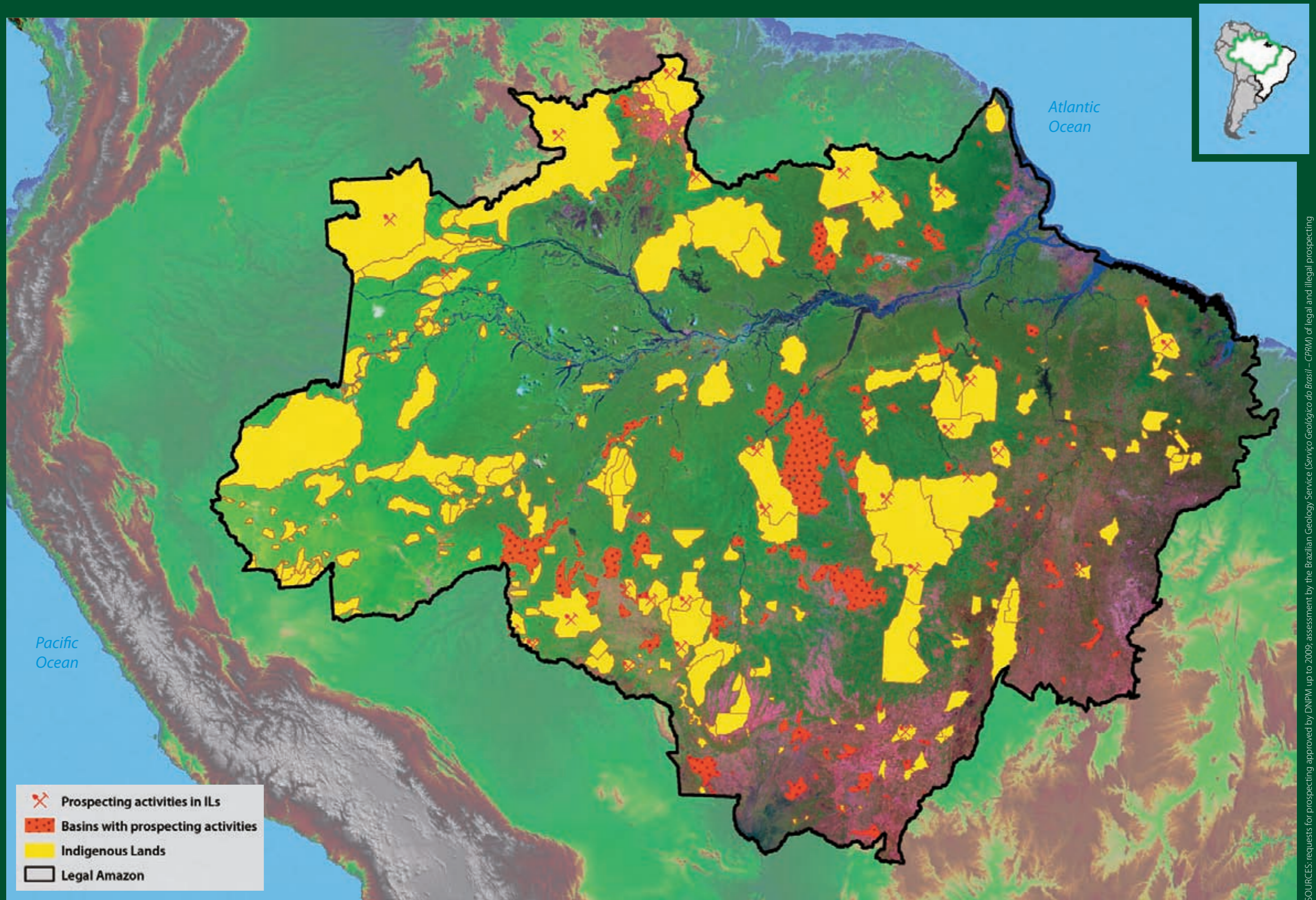
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ANTONIO GAUBRIO/FOHA IMAGES

CHARLES VINCENT/ISA

## Prospecting activity according to micro-basin



SOURCES: requests for prospecting approved by DNPM up to 2009; assessment by the Brazilian Geology Service (Serviço Geológico do Brasil – CPRM) of legal and illegal prospecting sites (2001); records from ISA news database. NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.



# Conflicts and impacts oil extraction in the Western Amazon

As shown on the **MAP**, the main oil and natural gas fields in activity and many deposits which may be used in the Amazon biome are in its far West, near the Andes, in Colômbia, Bolivia, and especially Ecuador and Peru. There are ten sedimentary basins (where there may be oil) in the Brazilian Amazon. Commercial exploitation, however, is limited to the Urucu River Valley, Amazonas, 650 kilometers southwest of Manaus. There are no indigenous territories near wells in activity in this region. The Cajuhiri-Atravessado, Paumari do Lago Manissuá, Paumari do Lago Paricá and Paumari do Cuniuá ILs are in the vicinity of the polygon with potential for exploitation.

Use of the oil may bring risks to the environment from extraction, refinement and transportation to consumption, due to emission of polluting gases. The greatest damage is caused by leaks in pipes or cargo ships. Residues from perforation and substances which are extracted along with the oil may be highly toxic. When discarded directly into the environment, they contaminate underground waterways and the ecosystem. As in other projects in the Amazon, if

appropriate preventive measures are not taken, roads and construction sites necessary for installation of wells, refineries, oil and gas pipes may lead the way for deforestation, land invasion and uncontrolled migration. Erosion, pollution and contamination of rivers may also take place.<sup>1</sup>

Recently, Petrobrás plans to exploit oil in Acre and Ecuador, in the Yasuni National Park, inhabited by the Huaorani, caused controversy. In the latter case, the company gave up on the project after being accused by non-governmental organizations of attempting to work in indigenous territories abroad because it is not allowed to do so in Brazil. In Acre, where extraction began in 2008, indigenous peoples' movements and local organizations question the lack of transparency in the information regarding this activity.

At the start of the 1980s, the disastrous actions of the French company Elf-Aquitaine in the Andirá-Marau (Amazonas and Pará) and Coatá-Laranjal (Amazonas) ILs, of the Sateré-Mawé and Mundurucu, had international repercussions. The company carried out assessments to find oil in both areas without prior consent of the indigenous communities, based solely on authorization from Funai and contracts with Petrobrás. According to accounts by the indigenous people, explosions took place near villages. Sticks of dynamite which did not go off were left in some locations, and four people died when handling them. Stretches of forest and indigenous farms, including sacred sites, were torn down and burned. In the end, Elf-Aquitaine paid compensation to both indigenous groups.<sup>2</sup>

Oil exploitation was also responsible for one of the worst environmental disasters on Amazon territory. Between 1964 and 1992, the American company Texaco, currently Chevron, exploited hundreds of wells in Shushufindi, in

Northern Ecuador. According to representatives from local communities which are filing a lawsuit against the company, it contaminated rivers, underground water and the soil in the region with millions of liters of oil and toxic substances. Approximately 30 thousand people were affected, including indigenous people who were forced to leave their lands. There are countless cases of diseases caused by contamination. The issue of compensation for the damage has not yet been settled.<sup>3</sup>

## Urucu

The oil extracted from Urucu is the best in the country. Therefore, it is transformed into noble derivatives, with high added value, such as diesel and polymer, in refineries in Manaus.<sup>4</sup> Between 2006 and 2009, Petrobrás built the Urucu-Manaus gas pipeline. Much of the gas transported will be used to supply thermoelectric plants in the Amazonas capital and neighboring municipalities. Another gas pipeline, still under study, should connect Urucu and Porto Velho (Rondônia).

Between 2002 and 2008, oil production in Amazonas fell from 3.5% to 1.7% of the national production; in absolute terms, it went from 15.9 million to 11.6 million barrels per year. On the other hand, natural gas production in Amazonas corresponded to 17.2% of Brazilian production. Deposits in the state reach nearly 70 billion cubic meters, which is approximately 14% of the national reserves.<sup>5</sup>

There are at least nine other oil fields under development in Amazonas.<sup>6</sup> Gas fields in Juruá and Araracanga, near the municipality of Carauari, are on the Petrobrás list of strategic projects. The former has the largest land deposit of non-associated (without oil) natural gas in the country, with over 40 billion cubic meters.<sup>7</sup>

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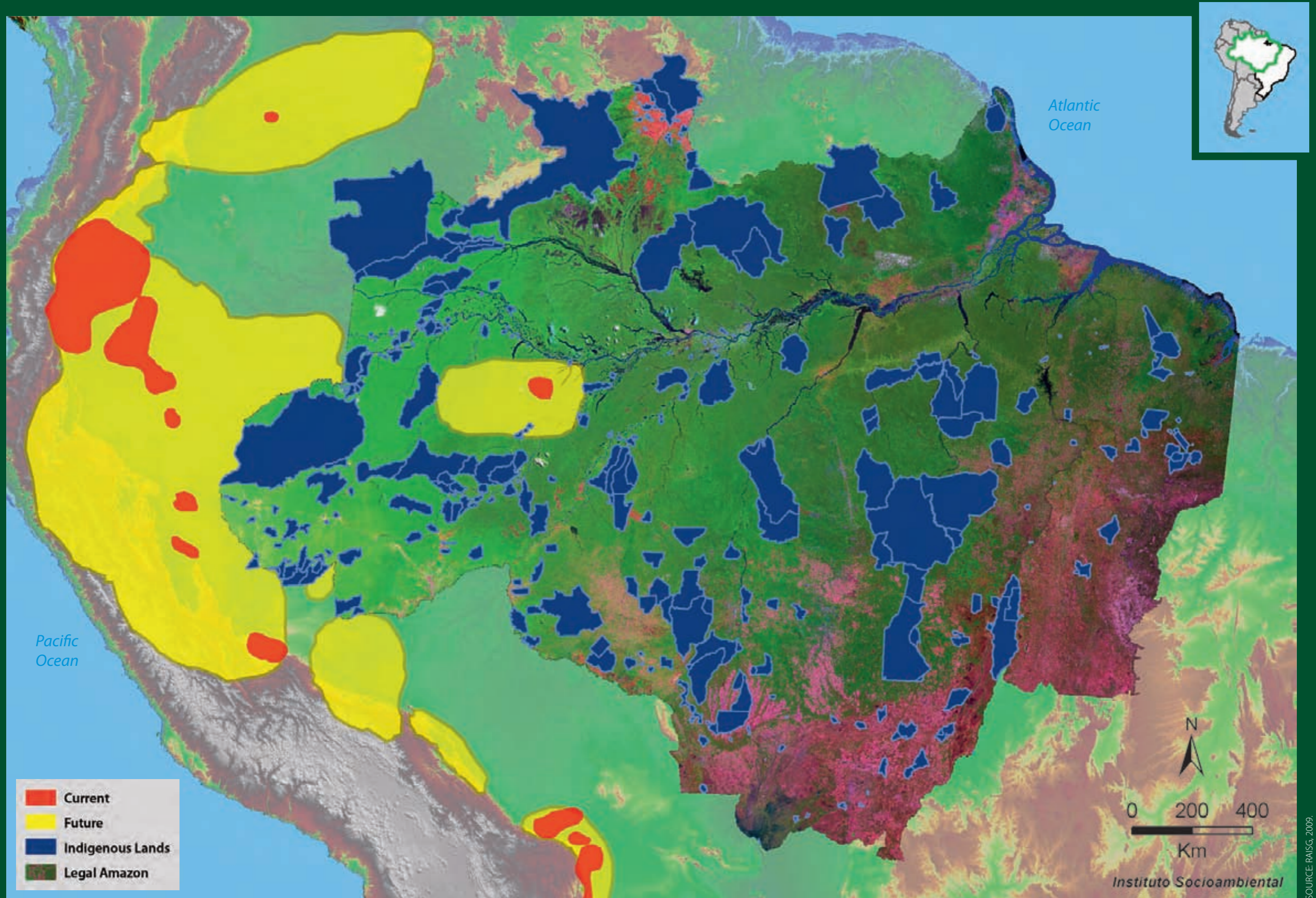
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## OIL PRODUCTION IN PAN-AMAZON

Country	Production (barrels/year)	Main production areas
COLÔMBIA	4.611.786	Putumayo
BOLÍVIA	2.744.161	Santa Cruz
BRASIL	16.753.500	Urucu
EQUADOR	182.693.891	Sucumbios, Napo, Orellana, Pastaza
GUIANA	-	-
PERU	16.500.615	Ucayali, Loreto
SURINAME	4.800.000	-
VENEZUELA	-	-
<b>Total</b>	<b>243.822.237</b>	-

NOTE: Data for 2006.  
SOURCE: *GeoAmazônia*. Perspectivas do Meio Ambiente na Amazônia. PNUMA/OTCA/ Centro de Pesquisa da Universidad del Pacífico. 2008.

## Oil and natural gas: current exploitation zones and declared interests



## LOGGING

## PHOTOGRAPHS

A. Ibama and Greenpeace inspect Selvapad logs on the Jaurucu River, Pará.

B. December 11, 2003. The Madenorte sawmill in Breves, Pará.

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## Spearpoint of deforestation

As early as the 1980s, invasions became commonplace in Amazon ILs for theft of wood, especially in Pará, Mato Grosso and Rondônia. The Romero Jucá administration in Funai (1986-1988) came to the point of defending that indigenous communities themselves should finance assistance and brokered contracts between some of them and timber extraction companies. Agreements were made in exchange for construction of roads, schools and health care outposts. In many cases, these promises were not kept, prices were unfair for the indigenous groups and there were no management plans. Later, these contracts were annulled in court, but many companies continued to invade ILs, although the 1988 Constitution forbid extraction of wood from these areas by non-indigenous people.<sup>1</sup>

Some indigenous people accepted to allow exploitation of their lands due to the pressure put on them by companies, the failure of Funai services and the need to generate income. Many communities never managed to control the activity and remained unaware of its impacts. In the case of the Xikrin do Cateté IL (Pará), there are estimates that companies extracted up to three times more wood than agreed upon.<sup>2</sup>

The experience made the Xikrin paralyze extraction in their territory and, from 1991 to 2002, with support from indigenist organizations, such as ISA, they were the first indigenous community in Brazil to perform experimental timber and non-timber product management in accordance with all legal and environmental requirements.<sup>3</sup>

The entryway into the Sete de Setembro IL (Rondônia) was also opened for timber companies by Funai, in 1986. Currently, theft of wood is one of the main problems faced by its inhabitants, the Paiter (Rondônia Suruí). Leaders have denounced the situation and are under death threats. Contact with invaders has had devastating effects: the community has one of the highest rates of tuberculosis contamination in the country. The epidemic is also a consequence of scarce game for hunting and fishing caused by the devastation<sup>4</sup>. Approximately 2% of the 247.8 thousand hectares of the IL have been cleared.

## Main timber zones

Indications on the **MAP** assemble information regarding sawmills, main timber poles, transportation corridors, degraded areas and recorded timber exploitation from ISA's news database. While Northeastern Pará remains the largest and oldest timber zone, the state's Center-South, Northern Mato Grosso and Southern Amazonas rise as very active poles (see smaller map). In Western Amazonas, timber companies are active along the Amazonas River.

At least 24.4 million cubic meters of timber are estimated to have been consumed by the main timber poles in the Amazon. In the same year, the timber industry in the region generated gross income of US\$2.3 billion and 380 thousand jobs (4% of the economically active population). Pará was then responsible for 45% of the regional



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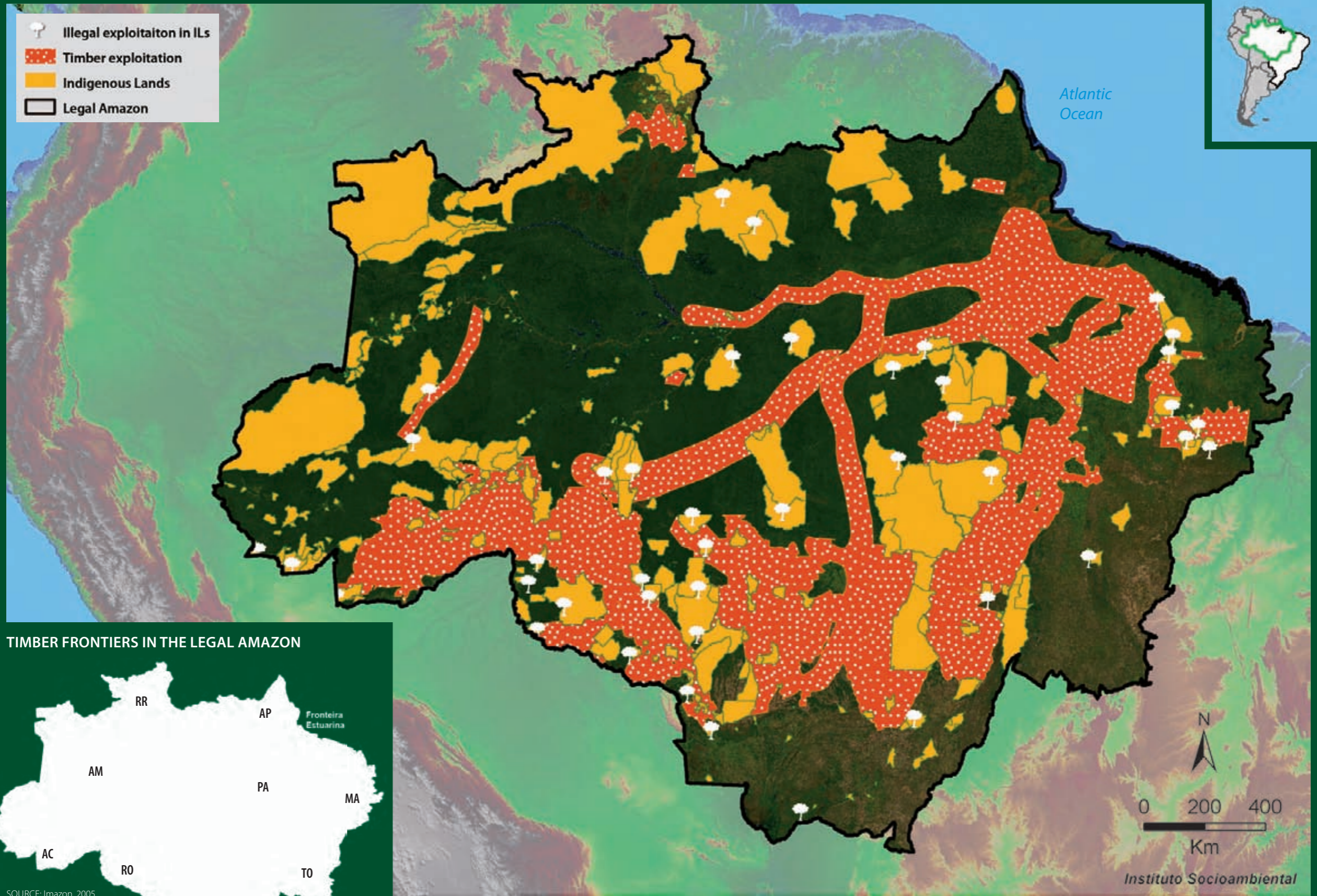
production, followed by Mato Grosso (33%) and Rondônia (15%).<sup>5</sup> The share of timber exploitation in the GNP of the three states varies between 15% and 20%.<sup>6</sup>

The sector is the spearpoint of deforestation since it starts the process of degradation in areas which, in following years, are converted for farming. In 2007, 14.9 thousand square kilometers were degraded (with selective tree cutting) in the Amazon. In 2008, the figure climbed to 24.9 thousand square kilometers (an area the size of Alagoas). Approximately 12% of the area degraded in 2007 was totally cleared (low cuts) in 2008.<sup>7</sup> Timber companies promote new deforestation not only through illegal extraction, but also upon opening roads and buying irregular timber.

Under 3% of Amazon timber production is obtained from sustainable management. In 2007, the area proven to be under management was only 12.4 thousand square kilometers of certified forest in accordance with international standards. Techniques used by the sector in the Amazon are generally inappropriate and low in productivity. The volume used in each processed log is only 42%. And what is worse is that half of what is left over is burned for no purpose.<sup>8</sup>

LOGGING

Timber exploitation zones



SOURCE: Imazon, 2005.

SOURCE: IMAZON, 2005 e IBGE e ISA, 2009. NOTE: The entire length of the municipalities of Maranhão belonging to it was included in the limits of the Legal Amazon.

# Indigenous people and Amazon cities

A simple comparison cannot be made between sanitary conditions in cities and in ILs. Among other reasons, many villages are in remote regions. On any account, countless indigenous people currently face some of the main basic sanitation problems which affect Brazilian people. Many indigenous people have come to live with accumulated garbage, for example. Many illnesses suffered by indigenous children are connected with the quality of the water they consume. According to the National Health Foundation (*Fundação Nacional de Saúde – Funasa*), up to 2008, no village had sewage systems in the Amazon (in Brazil, only 12 have this service). The agency claims to have constructed outhouses with septic tanks in 23.3% of the households in indigenous villages in the Amazon.

But these problems do not affect indigenous people in remote locations only. The indigenous urban population has been growing and, when establishing a foothold on the outskirts of towns, they are forced to deal with the same difficulties faced by poor migrants coming from rural areas.

São Gabriel da Cachoeira, in the Upper Negro River, far Northwestern Amazonas, is the most indigenous of

all Brazilian municipalities: of its close to 40 thousand inhabitants, over 90% are indigenous.<sup>1</sup> Between 1970 and 2000, urban dwellers went from 10% to 40% of the total. In absolute numbers, this population rose from 1,346 to 12,373 people during the period.<sup>2</sup> Many went to town in search of education and income.<sup>3</sup>

In 2000, 66% of the inhabitants of São Gabriel did not have sanitary installations. The town seat does not have sewers and is largely supplied with untreated water from the Negro River. The local garbage dump is located on the edge of a riverbank which flows into the same Negro River. The number of hospitalizations due to diseases related with sanitary problems is high.<sup>4</sup> Of the city's inhabitants, 27% do not have water services.<sup>5</sup>

## The urbanized Amazon

Contrary to appearances, São Gabriel da Cachoeira is a good example of what happened in the Amazon. One of the greatest myths about the region is that it is predominantly rural and sparsely inhabited, a “population vacuum”. But the truth is that the Amazon population

has surpassed 24 million inhabitants and its urbanization process was as intense as in the rest of Brazil. 40 years ago, urban inhabitants of the Legal Amazon accounted for 35.5% of the total, and now they are at 70%. In absolute numbers, this number was multiplied six fold, from 2.7 million to over 16.8 million inhabitants nowadays.<sup>6</sup>

As shown in the **MAP**, there is a large concentration of urban centers in Maranhão, Northeastern Pará and Northern Tocantins. In the past 20 years, there was also an important proliferation in cities

## BASIC SANITATION

	Urban population with water supply systems	Urban population with sewer systems	Hospitalizations due to diseases related with sanitation (per 100 thousand inhabitants)
<b>Brazil</b>	<b>92,6%</b>	<b>57,4%</b>	<b>308,8</b>
<b>Amazon</b>	<b>76,2%</b>	<b>12,9%</b>	<b>509,5</b>
Acre	68,3%	20,4%	485,4
Amapá	67,8%	2,7%	224,1
Amazonas	80,8%	27,8%	254,5
Maranhão	81,2%	15%	660,9
Mato Grosso	88%	12,3%	342,1
Pará	58%	4,9%	914,9
Rondônia	51,5%	4,5%	639
Roraima	97,1%	14,1%	495,2
Tocantins	93,2%	15,2%	569,9

NOTE: Data regarding water supply and sewage systems from 2007 and regarding hospitalizations from 2008. SOURCE: IBGE.

along the banks of the Amazonas, in Mato Grosso and in Rondônia. State capitals house large part of the population: nearly 20% is concentrated in Manaus, Belém, São Luís and Cuiabá. The Legal Amazon has 824 municipalities and approximately 1% of them have over 250 thousand inhabitants; 8.5% between 50 thousand and 250 thousand and over 90% have up to 50 thousand people.<sup>7</sup>

Expansion of public services did not keep up with the urban boom. The lack of living spaces is a problem in many Amazon capitals. On average, only 13% of city inhabitants in the Legal Amazon have access to sewage and only part of the collected waste is treated. Little over half of urban inhabitants in Rondônia and Pará have water supply systems, while the Brazilian average is 92.6% (see table).<sup>8</sup> The lack of sewage collection and treatment, disorganized occupation, deforestation and inappropriate garbage disposal are degrading rivers and riverbeds. The result is water contamination, spread of diseases and impacts on the fauna.<sup>9</sup>

### PHOTOGRAPH

Aerial view of São Gabriel da Cachoeira, Amazonas).

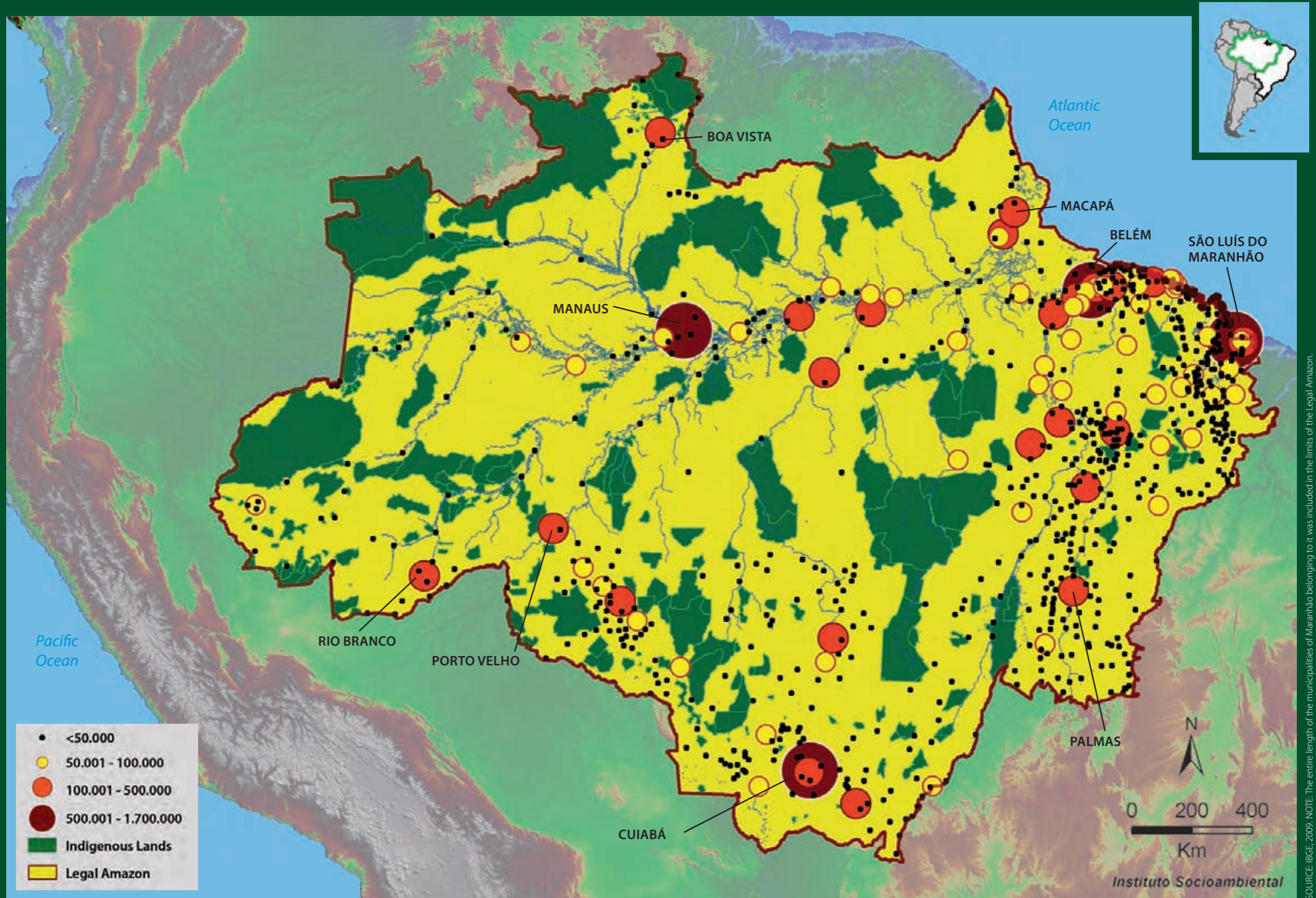
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# Municipal capitals according to population



## AREAS UNDER STRESS

# A summary of pressures and threats to ILs

Indigenous peoples in the Amazon depend directly on the water available in their territories, either from rivers and underground water for human consumption, or because fish is still one of their main sources of food. In order to indicate the greatest dangers for ILs in the region, it is therefore necessary to evaluate the conditions of the network of water resources where they are located.

The **MAP** shows a classification of Amazon sub-basins according to the degree of pressures and threats which they face. The indicator used for classification was the presence of mining activities, deforestation in the past three years and main infrastructure projects included in the PAC: the BR-319 and BR-163 highways, power transmission lines, hydropower plants and waterways (not in order of importance). The hashed area indicates the sub-regions most directly affected by these vectors.

Shown in red, the Xingu Basin concentrates all types of pressures and threats, with ubiquitous deforestation and roads, from its headwaters, in Northeastern Mato Grosso to its mouth on the Amazonas River, in Pará. This is a region of rapid expansion of the agricultural frontier and timber extraction, especially along the BR-163 highway (from Cuiabá to Santarém) and in Southern Pará. Also on the Xingu River, in Altamira, Pará, construction of the largest HPP in the Amazon is planned, in Belo Monte. The Tapajós and Madeira sub-basins have pressures mainly

from deforestation, hydropower plants and waterways. As shown on the map on page 18, power transmission lines for the Santo Antônio and Jirau plants, in Rondônia, may lead to proliferation of new hydropower plants in Rondônia and Western Mato Grosso, with impacts on local ecosystems and indigenous populations.

Under great pressure from a socioenvironmental standpoint, the group formed by the sub-basins of the Madeira, Tapajós and Xingu rivers houses the greatest deforested areas in the Amazon. Although the total cleared area is different in the three sub-basins, their rates of deforestation are similar. This means they are losing forest cover at the same speed. If expansion of the “arc of deforestation” is taken into consideration, the demand for infrastructure projects increases, and the tendency is for worse pressures in this region. Removing forest cover and consequent degradation of headwaters of a river may have

consequences which propagate over time and space, such as pollution, changes in the water cycle and quality and flow of the water.

The greatest pressures and threats faced by the Amazon Biome, therefore, are concentrated in the Southern region, on the tributaries of the right margin of the Amazonas. Mato Grosso is in a strategic geographical and hydrographical position. The state houses the headwaters of the following tributaries: Araguaia, Madeira, Tapajós and Xingu. The health of its ecosystems – and the future of the people who live there – depends in environmental management of these regions, but Mato Grosso is responsible for nearly half of all deforestation in the Amazon, the highest rates of fires and use of the largest amounts of agrottoxins on crops. The Tocantins and Araguaia sub-basins, at mid-level risk, are located in regions where the agricultural frontier has been consolidated

and which have had high rates of deforestation since the 1970s. Therefore, there are few areas remaining to be cleared. The other sub-basins are under low or medium risk levels, with isolated threats.

The sub-basins of the Purus and Juruá rivers, in the Western part of the biome, for example, can so far be considered a little better protected from the expanding agricultural frontier and have lower rates of deforestation if compared with other locations. Renovation or opening of new access routes, such as the BR-319 highway (from Manaus to Porto Velho), however, can increase pressures for more deforestation in Southern Amazonas and Acre.



## PHOTOGRAPH

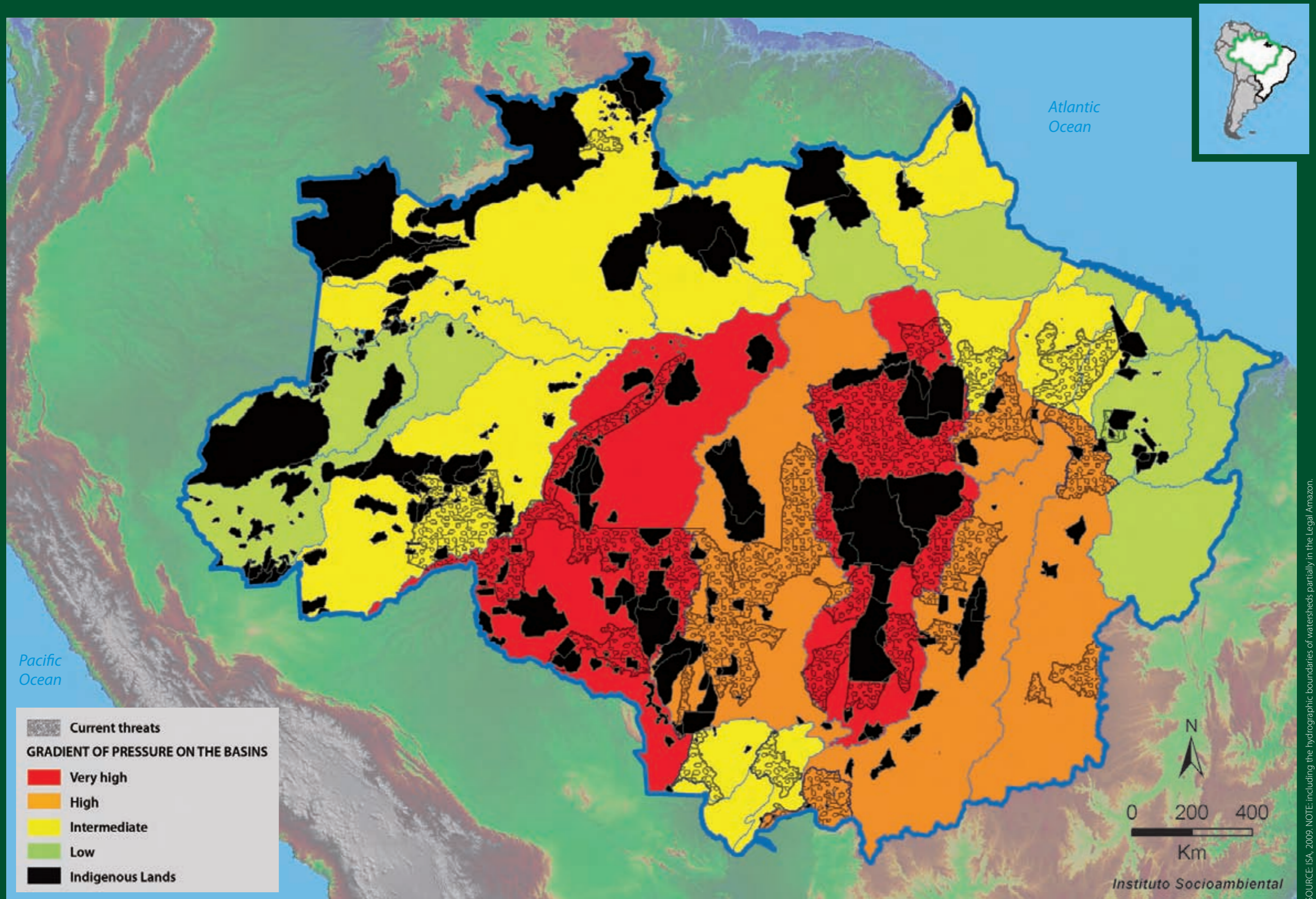
Under heavy pressure and threats, the Xingu River Basin houses one of the most important land corridors of Indigenous Lands in the world. Xingu River.

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AREAS UNDER STRESS

Classification of Amazon sub-basins according to pressures and threats







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