EXECUTIVE SUMMARY

ANA
NATIONAL WATER AGENCY

STRATEGIC PLAN OF WATER RESOURCES OF THE SOUTHBANK TRIBUTARIES OF AMAZON RIVER

PERH – MDA

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NATIONAL WATER AGENCY

STRATEGIC PLAN OF WATER RESOURCES OF THE SOUTHBANK TRIBUTARIES OF AMAZON RIVER

PERH – MDA

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STRATEGIC PLAN OF WATER RESOURCES OF THE SOUTHBANK TRIBUTARIES OF AMAZON RIVER

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Confluence of Xingu River with Iriri River - PA - Rui Faquini/ANA Image Bank

ILLUSTRATIONS

TABLES AND CHARTS

ACRONYMS

ANA – National Water Agency

ANEEL – National Agency of Electrical Energy

ANTAq – National Agency of Aquatic Transportation

APL – Local Production Arrangement

BH – Hydrographic Basin

CNRH – National Water Resources Council

DBO – Biochemical Oxygen Demand

EIA – Environmental Impact Assessment

EPE – Energy Research Company

ETA – Water Treatment Station

ETE – Sewage Treatment Station

IBGE – Brazilian Institute of Geography and Statistics

IPO – Index of Organic Pollution

MDA - Southbank Tributaries of Amazon River

OGERH – State Management Organ of Water Resources

OGU – General Budget of the Union

ONG – Non Governmental Organization

PAC – Growth Acceleration Program (federal governmental program)

PAS – Sustainable Amazon Program

PCH – Small Hydroelectric Power Plant

PERH-MDA – Strategic Plan of Water Resources of the Southbank Tributaries of Amazon River

PNQA – National Program for Water Quality Assessment

PNRH – National Water Resources Plan

RIMA – Environmental Impact Report

SNIRH – National System of Information on Water Resources

SPE – Specific Purpose Company

TI – Indigenous Land

UC – Conservation Unit

UHE – Hydroelectric Power Plant

UPH – Hydric Planning Units

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PRESENTATION

It is with great pleasure that I present the Executive Summary of the Strategic Plan of Water Resources of the Southbank Tributaries of Amazon River - PERH-MDA, which represents an unfolding of the Sustainable Amazon Plan - PAS. This PERH (Strategic Plan of Water Resources) establishes a dialogue with the Ecological - Economic Macrozoning - Macro ZEE of Amazon region, sharing complementary visions and a strong commitment to sustainable development of the region, besides building an important axis for the alignment of public policy and thematic plans in Amazon region.

Following the CNRH nº. 17 resolution, the Plan makes a comprehensive diagnostic of the state of water resources and their management in the MDA; it formulates scenarios (including the consideration of possible climate changes and its effects on future water resources availability); outlines goals for water management in the MDA and organizes them as interventions.

The PERH-MDA fully exercises its condition as a management tool: develops global and specific goals and objectives; offers guidelines for the other instruments of water resources management; examines challenges and opportunities for the various uses of Amazonian waters in the MDA; evaluates the existing sectorial plans in its diagnosis and scenarios, integrating them in order to give unity to the water resource management and returning them to the responsible sectors as recommendations; identifies the interventions planned by several sectors and especially those considered to manage; and formulates an initial model of water management, with the participation of Amazonian States, capable of developing and promoting the creation of committees in the basins where conditions so allow it.

I am convinced that PERH-MDA is an important contribution of the National Water Agency - ANA for Brazilian water resources management. Its elaboration and further discussion and approval by the National Council of Water Resources - (CNRH) represents anticipatory answers which indicate what must be done, and identify areas which are most sensitive or subjected to pressures that mainly demand the presence and guidance of Brazilian State, as well as subjects and places in which studies and research should be invested . The Plan is the introductory proposal of successive cycles of action, discussions with the involved stakeholders and deepening of the issues that involve the Amazonian water resources.

I hope the PERH-MDA contribution results in important accomplishments for the sustainable management in the region.

Izabella Mônica Vieira Teixeira
Minister of Environment

PRESENTATION

The Amazonian basin constitutes the most extensive hydrographic system of the Earth, covering nine countries of South America and more than 6 million square kilometers. The Strategic Plan of Water Resources of the Southbank Tributaries of Amazon River (PERH-MDA) comprises the area, in national territory, of seven large tributaries basins of the Amazon River - besides smaller basins located among those. Five states of the Union are inserted in the area of the Plan, which is 2.54 million Km^2 (corresponding to 30% of national territory) inhabited by 5.11 million inhabitants (2.8% of the total Brazilian population, in 2007) of which 60% live in urban areas.

The Xingu, Tapajós and Jutaí basins are entirely national while the waters of Madeira, Purus, Juruá and Javari basins occupy Bolivian territory (the first two), from Brazil and from Peru (the last two). Apart from the Jutaí River basin, all the others have dimensions that are equivalent to many countries of great political and economical expression. The Tapajós Basin, for example, is equivalent in area to France: It is 485,000 km^2 in comparison to 551,500 km^2 of France. However, when compared to that nation, great differences are revealed: with a population equivalent to 1.86% of France, its Gross Domestic Product (GDP) represents 0,27% of the national french product, and cattle is 46% of the french one; in contrast, it is much richer in terms of minerals and has a hydroelectric power potential, higher than 17,000MW, almost entirely to be yet explored (not taken into account the small hydro power plants (PCHs) and Juruena River Basin, one of its tributaries that is still in inventory studies at the time of conclusion of this Plan while France has already run out of its potential hydropower. The Southbank Tributaries of Amazon River - MDA is also responsible for an expressive mineral production, especially gold, tin, bauxite, limestone, oil and gas (already extracted in Juruá and Urucu, with great possibilities to be found in many other places) plus deposits of sylvite, gypsum, copper and gold that have not yet been extracted.

ANA conceived the PERH-MDA after hearing government organs (Federal and State), the State Counsels of Water Resources and by presenting it in several public meetings, in different occasions, based on the fact that Amazonian region should be carefully discussed, considering the need of understanding it, listening to its inhabitants and investing in research. A meticulous study, employing modern techniques of remote sensing, discussions with representatives of states, environmental agencies, water resource management agencies and participation of Brazilian consultants of international status, allowed the recognition of the “personalities” of each basin of the MDA (which result from its origin and evolution), of their many potentials and of land occupation, development or protection situation.

The emphasis of the Plan is to anticipate, prevent, guide and intervene, acting with greater focus on sensitive, endangered and vulnerable areas or where monitoring and control are already required due to water demands. A relevant aspect of this process was the evaluation of the seven basins jointly as well as of the projects planned, not only in themselves, but faced within the basin where they are located and also among all the basins of the MDA.

The PERH-MDA provides a structural axis for integration and alignment with the Ministry of Environment thematic plans besides others existing sectorial plans. They were all considered in its construction, making it possible that the water resources management, environmental management and sectorial actions oriented towards socio-economic region development in sustainable base may be integrated from a specific treatment for each basin of the MDA. This, according to its intrinsic characteristics, especially vulnerabilities and potentials, as noted in the Plan.

To handle this proposal, the PERH-MDA formulates programs to be implemented, focused on water resource management. Its many aspects and interfaces with environmental management, structural interventions planned among different water resources users and the region needs (as environmental sanitation), were considered, besides focusing on relevant research subjects to understanding the functioning of region’s water resources and aquatic ecosystems.

The PERH-MDA proposes that the Rivers Tapajós, Madeira and Xingu basins are considered priority for water resources management due to their mining and energy potential, the higher water demands, the major MDA ventures planned, mining operations, high technology agriculture and accelerated urban expansion - emerging among them the Tapajós Basin as the key basin of the MDA. The plan prescribes that the large projects sectorally foreseen are subjected to rigorous examination and environmental licensing by river basin, so that they are considered in block, on a integrated way, analyzing their set in the basin in which they operate, weighing up the other intended use of basin water, the synergic effect and commitment solutions (trade-offs) possible in relation to the other basins in the MDA. Entrepreneurs are, thus, encouraged to take

increasing roles as sustainable development stakeholders for the region.

National Water Agency believes that the PERH-MDA is a contribution to the debate on the Amazon and to the construction of a water resources policy, with a national focus for the region. It was projected in a wider horizon, but based on the context of the resumption of a national development in sustainable basis, from a concept of water resources management scientifically grounded and the role of inducing agent, manager and regulator's in Amazon played by the Brazilian State.

The present publication *EXECUTIVE SUMMARY OF STRATEGIC PLAN OF WATER RESOURCES OF THE SOUTHBANK TRIBUTARIES OF AMAZON RIVER (PERH-MDA)* provides a document of executive nature which summarizes the mains aspects of the diagnosis and of all the scenarios of the Strategic Plan and provides guidances, recommendations and proposed interventions. We hope it to be an instrument to promote decisions – making and sustainable management of the Amazonian water resources.

Executive Board

Rio Branco - Boa Vista - RR - Rui Faquini/ANA Image Bank

INTRODUCTION

1

The National Water Agency - ANA began in september 2007, the preparation of the Strategic Plan of Water Resources of the Southbank Tributaries of Amazon River (PERH-MDA). The Plan covers the territory of the hydrographic basins of the rivers: Xingu, Tapajós, Madeira, Purus, Juruá, Jutaí and Javari, covering an area of 2.54 million km^2. It integrates the largest hydrographic basin of the world, in which live about 5.11 million people (3 million of them living in cities of the region). The general purpose is to obtain an instrument of effective management for the water resources, to ensure their rational, sustainable and multiple use, for the benefit of the present and future generations. Integrates the region 224 municipalities (195 with their headquarters on the MDA) of five states of the Union (Acre, Amazonas, Mato Grosso, Pará and Rondônia). The illustration 1.1 presents the Southbank tributaries of the Amazon River – MDA and the large basins which constitute them.

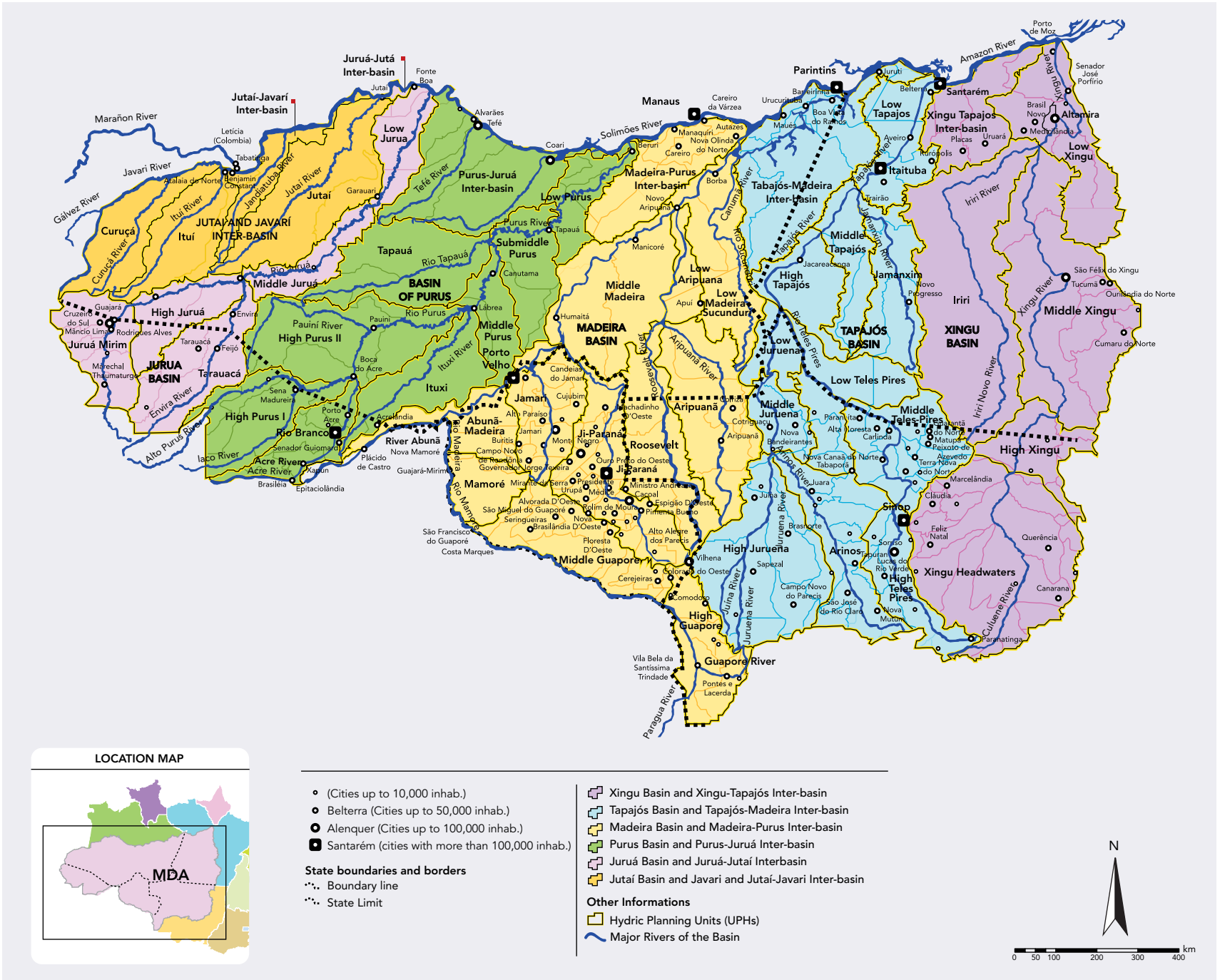


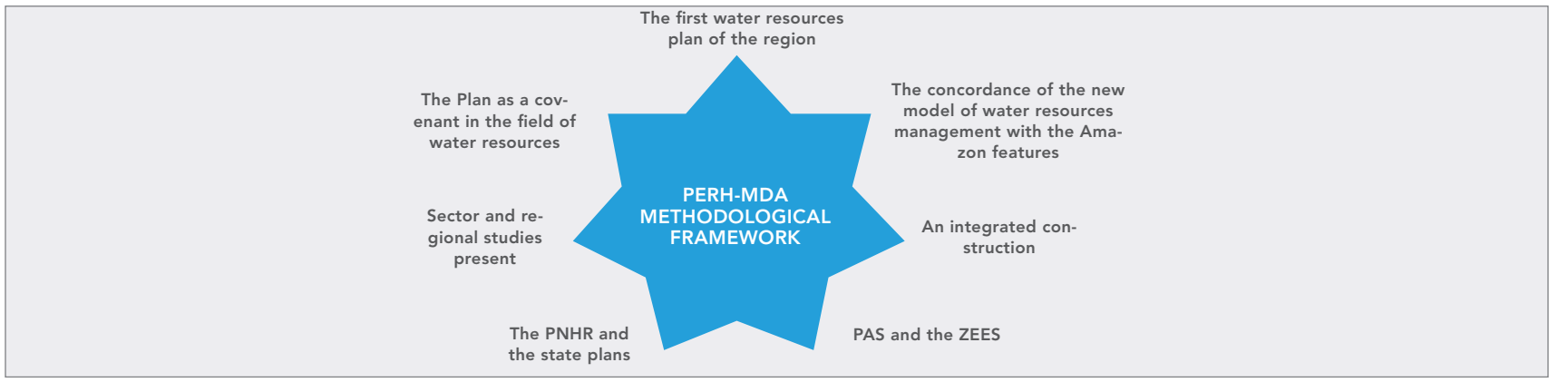
Illustration 1.1 Basins and inter-basins of the Southbank tributaries of the Amazon River - MDA

To accomplish this goal, socio-environmental information, policies, plans, programs and projects of regional development and exploitation, use and conservation of the water resources has been risen,among other actions:

1. To investigate alternatives to balance the social-economic development of the region, the use of water resources and environmental protection.
2. To make provisions for protecting, promote, and where required, recover the water quality in order to improve human health, aquatic life and environmental quality, proposing guidelines for integrated management of the water resources and for the enhancement of institutional mechanisms.
3. To encourage multiple, rational and sustainable use of water resources, identifying and characterizing the conditions of water usage in these basins, taking into account the local and regional plans in progress or future plans in the region.
4. To integrate the plans, programs, projects and other sectorial studies that involve the use of the basin water resources, by including it in the Plan, in accordance to its capacities by systematizing and consolidating the information already produced in studies performed before, with emphasis on those aspects whose repercussions on water resources are most relevant.
5. To subside the inter-sectorial articulation of governmental actions and among ministries, regulatory agencies, state and municipal governments regarding the management of water resources, integrating the technical-economic and social-environmental aspects.
6. Establish planning actions and water resource management in interstate river basins that have not yet disposed of basin committees in order to ensure multiple uses and sustainable use of water resources for present and future generations, proposing guidelines for instruments implementation of water management, recommendation for the users, interventions and an initial model of institutional agreement related to the management of water resources.
7. To provide guidelines and contribute to consensus among the relevant social stakeholders regarding the water resources management.
8. To support articulations for the management of trans boundary basins and border.
9. To promote environmental education and dissemination of information regarding water resources management in the MDA.

Also influenced the decision to develop the PERH-MDA, the physical characteristics and population density of the MDA basins, which still show difficulties for the different social segments organization and the creation of forums for the achievement of the national objectives of water resources multiple and rational use, beyond the idea that important users sectors of these resources may identify specific interests and come to implement its projects based on their own sectorial plans, without proper consideration of the multiple uses or mediation of water resources management institutions to achieve the goals of multiple and rational use. In this regard, the existence of a water plan for MDA can be crucial to the creation, in time and where appropriate, of basin organizations and the application of management instruments foreseen on the National Policy of Water Resources (Law 9.433/1997).

Therefore, it used a methodology that, based on the resolution nº. 17 of National Water Resources Council, would take into account the characteristics of the MDA region and the context of regional management, which configure the methodological base adopted, summarized in Illustration 1.2 below:



Notes: PNRH – National Plan of Water Resources; PAS – Sustainable Amazon Plan; ZEE – Ecological-economic zoning.

Illustration 1.2 PERH-MDA Methodological concept

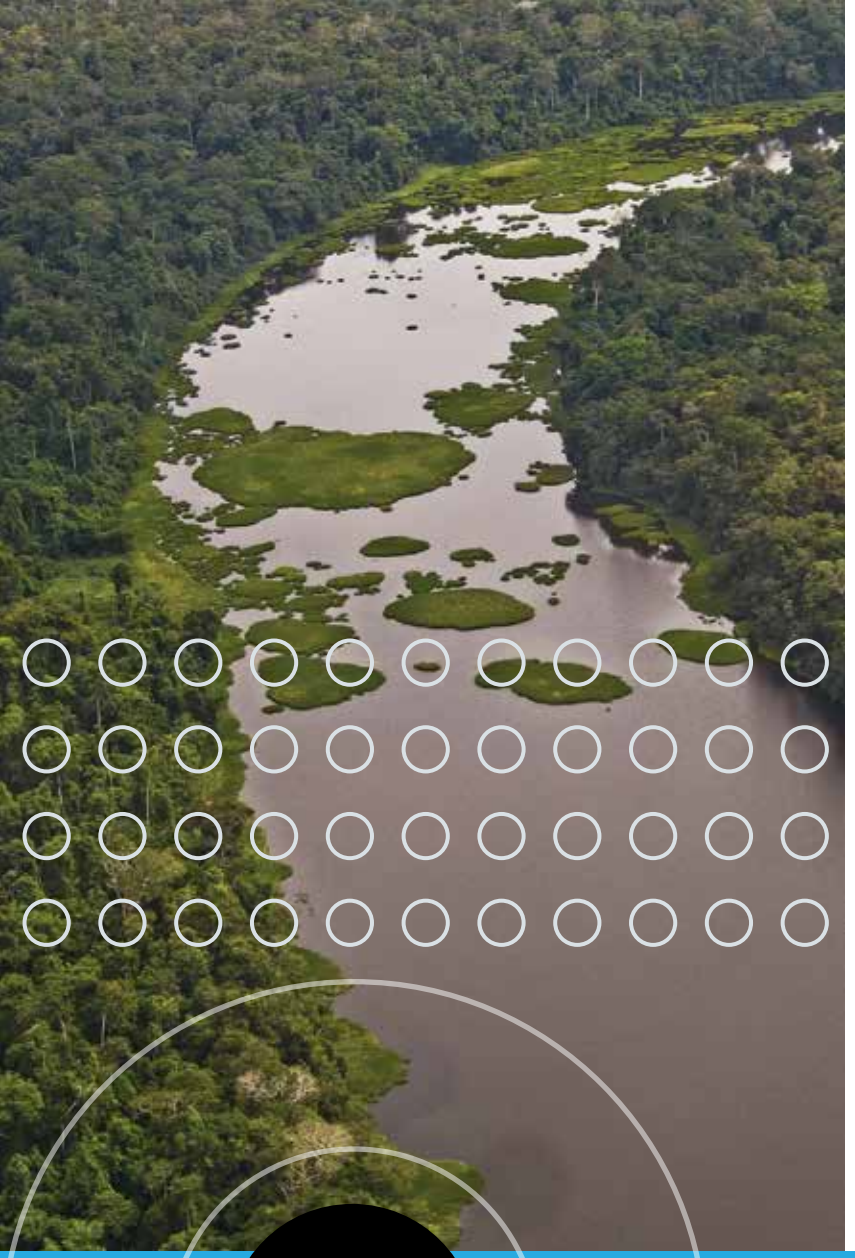
The work performed showed the tight relation among water management and sustainable development of the Amazon.

The stage reached by studies not only allows to establish a diagnosis of the present condition of water resources in these seven basins: it allows, in addition, a prospective examination of the evolution of the diagnosis and anticipation of a basic set of actions intended to match the development Amazon needs with the capacities identified in these basins, that compose an opportunity for government intervention in the area, in order to value it, protect it and, further, provide contributions to a national proposal integrated to the development of Amazon. Stands out the important contribution received from several federal institutions which are present in the region, the Ministry of Environment MMA and the states of MDA, particularly its water resources management agencies that provided the knowledge that they are holders, as well as the various organizations that were contacted during the preparation of studies, ensuring that different perspectives could be included in the Plan.

The work was organized in three steps - Diagnosis, Scenarios and Intervention Proposition, Guidelines and Recommendation - and conducted by the technical team of National Water Agency/Superintendency of Water Resources Planning – ANA/SPR, Superintendency of Hydrometeorological System Management– SGH, by the Nucleus of Hydrological Studies - NHI and special consultants[1], and it lasted from September 2007 to June 2010. The Plan was approved on June 29, 2011, at the 31st Special Meeting and 25th Meeting of CNRH (Resolution CNRH nº. 128), and covers the period from 2011 to 2030.

Meanders of Juruá River - AM - Viviane Brandão/ANA Image Bank

[1] Bertha Becker, Antonio Carlos Tatit Holz, Belmiro Castor, Eneas Salati, José Galizia Tundisi, Otamar de Carvalho, Paulo Haddad and Maria Inês Persechini.



2

SITUATION REVEALED BY DIAGNOSIS AND SCENARIOS

In the Amazon, water, geology and vegetation set multiple combinations, establish remarkable diversity and shapes the appropriation of the territory, allowing to state that there are several "Amazons" inside Amazon. These factors, allied to human occupation, caused that the seven basins and six inter-basins[2] of MDA were divided into 49 hydric planning unit – UPH[3], as shown on Table 2.1 and Illustration 2.1.

Table 2.1 Area of river basins and hydric planning units of the MDA

River Basin	Hydric Planning Units - UPH	Area (Square kilometers)	Area of the UPH in the basin (%)	Area of the UPH in the MDA (%)
MDA		**2,544,574**		**100.0**
Xingu		**509,685**		**20.0**
	Xingu Headwaters	138,554	27.2	5.4
	High Xingu	33,118	6.5	1.3
	Middle Xingu	130,865	25.7	5.1
	Low Xingu	65,070	12.8	2.6
	Iriri	142,079	27.9	5.6
Inter-basin Xingu-Tapajós	**Xingu-Tapajós**	**44,896**	**100.0**	**1.8**
Tapajós		**492,263**		**19.3**
	High Teles Pires	34,806	7.1	1.4
	Middle Teles Pires	55,996	11.4	2.2
	Low Teles Pires	51,105	10.4	2.0
	High Juruena	93,092	18.9	3.7
	Middle Juruena	21,402	4.3	0.8
	Low Juruena	16,992	3.5	0.7
	High Tapajós	33,485	6.8	1.3
	Middle Tapajós	25,573	5.2	1.0
	Low Tapajós	43,078	8.8	1.7
	Arinos	58,734	11.9	2.3
	Jamanxim	58,001	11.8	2.3
Inter-basin Tapajós-Madeira	**Tapajós-Madeira**	**95,136**	**100.0**	**3.7**
Madeira		**548,960**		**21.6**
	High Guaporé	40,744	7.4	1.6
	Middle Guaporé	57,060	10.4	2.2
	Mamoré	23,150	4.2	0.9
	Abunã-Madeira	39,478	7.2	1.6
	Roosevelt	59,844	10.9	2.4
	Jamari	39,977	7.3	1.6
	Ji-Paraná	63,910	11.6	2.5
	Aripuana	70,832	12.9	2.8

Continues

[2] Hydrographic inter-basins, areas between two major river tributaries, whose rivers pour their waters directly into the Rio Amazonas / Solimões, being influenced by its floodplain.
[3] UPHs Hydric Planning Units: are subdivisions of the seven studied basins, characterized by a homogeneous geomorphological, hydrological and hydrographic factors that allow study organization, planning and basins water resources utilization. The UPHs (hydric planning units) are composed of sub-basins of the Amazon tributaries and/or segments of the main river basins, with spatial continuity.

Table 2.1 Area of river basins and hydric planning units of the MDA

River Basin	Hydric Planning Units - UPH	Area (Square kilometers)	Area of the UPH in the basin (%)	Area of the UPH in the MDA (%)
	Low Aripuana	16,345	3.0	0.6
	Middle Madeira	77,697	14.2	3.1
	Low Madeira-Sucunduri	59,923	10.9	2.4
Inter-basin Madeira-Purus	**Madeira-Purus**	**51,634**	**100.0**	**2.0**
Purus		**354,051**		**13.9**
	High Purus I	48,847	13.8	1.9
	High Purus II	78,377	22.1	3.1
	Middle Purus	26,293	7.4	1.0
	Submiddle Purus	35,999	10.2	1.4
	Low Purus	26,912	7.6	1.1
	Acre River	31,032	8.8	1.2
	Ituxi	43,857	12.4	1.7
	Tapaua	62,734	17.7	2.5
Inter-basin Purus-Juruá	**Purus-Juruá**	**84,101**	**100.0**	**3.3**
Juruá		**177,330**		**7.0**
	High Juruá	35,969	20.3	1.4
	Middle Juruá	25,917	14.6	1.0
	Low Juruá	26,737	15.1	1.1
	Juruá Mirim	36,822	20.8	1.4
	Tarauacá	51,884	29.3	2.0
Inter-basin Juruá-Jutaí	**Juruá-Jutaí**	**1,362**	**100.0**	**0.1**
Jutaí		**78,853**		**3.1**
	Jutaí	78,853	100.0	3.1
Inter-basin Jutaí-Javari	**Jutaí-Javari**	**24,426**	**100.0**	**1.0**
Javari		**81,876**		**3.2**
	Curuçá	39,419	48.1	1.5
	Ituí	42,456	51.9	1.7

The undertaken diagnosis and the delineated scenarios demonstrate the existence of profound difference among the seven studied basins, suggesting distinct guidelines for the water resources management on each one. Moreover, within the same basin, some UPHs stands out in great significance, what results in many routings and priorities for actions and interventions.

A first look, based on human presence, allows to separate the seven basins in two major groups:

- The group formed by the Xingu, Tapajós and Madeira basins, where the human presence and economic activity are irreversibly consolidated, in whole or in part of the basin.
- The group which gathers the Purus, Juruá, Jutaí and Javari basins, in which the human presence is shown significantly less.

Examining them globally from the physical characteristics of the vegetation and other biotic aspects of interest, the land use and occupation, as well as the consideration of socioeconomic and cultural aspects, it is possible to recognize, on the studied basins, the following situations, with direct consequences on the water resources availability and demands and its management:

- Consolidated areas of human occupation, where a high degree of expanding technology agriculture was established, which correspond mainly to the MDA plains, which increasingly resort to irrigation and begin to attract swine projects, poultry and industries

that take advantage of local production. The populated areas respond globally by 14% of the MDA and its distribution per hydric planning units is detailed on Appendix 1. These areas of technified agriculture correspond to the UPHs of High Juruena, High Teles Pires, Arinos (in the Tapajós River Basin) and Xingu Headwaters, and respond today, for 6% of corn production and 22% of soy production in Brazil. Table 2.2 brings together the production of these grains on basins and inter-basins of MDA, which shows the importance of the Tapajós and Xingu basins, which accounted for 87% of MDA grain production in 2006.

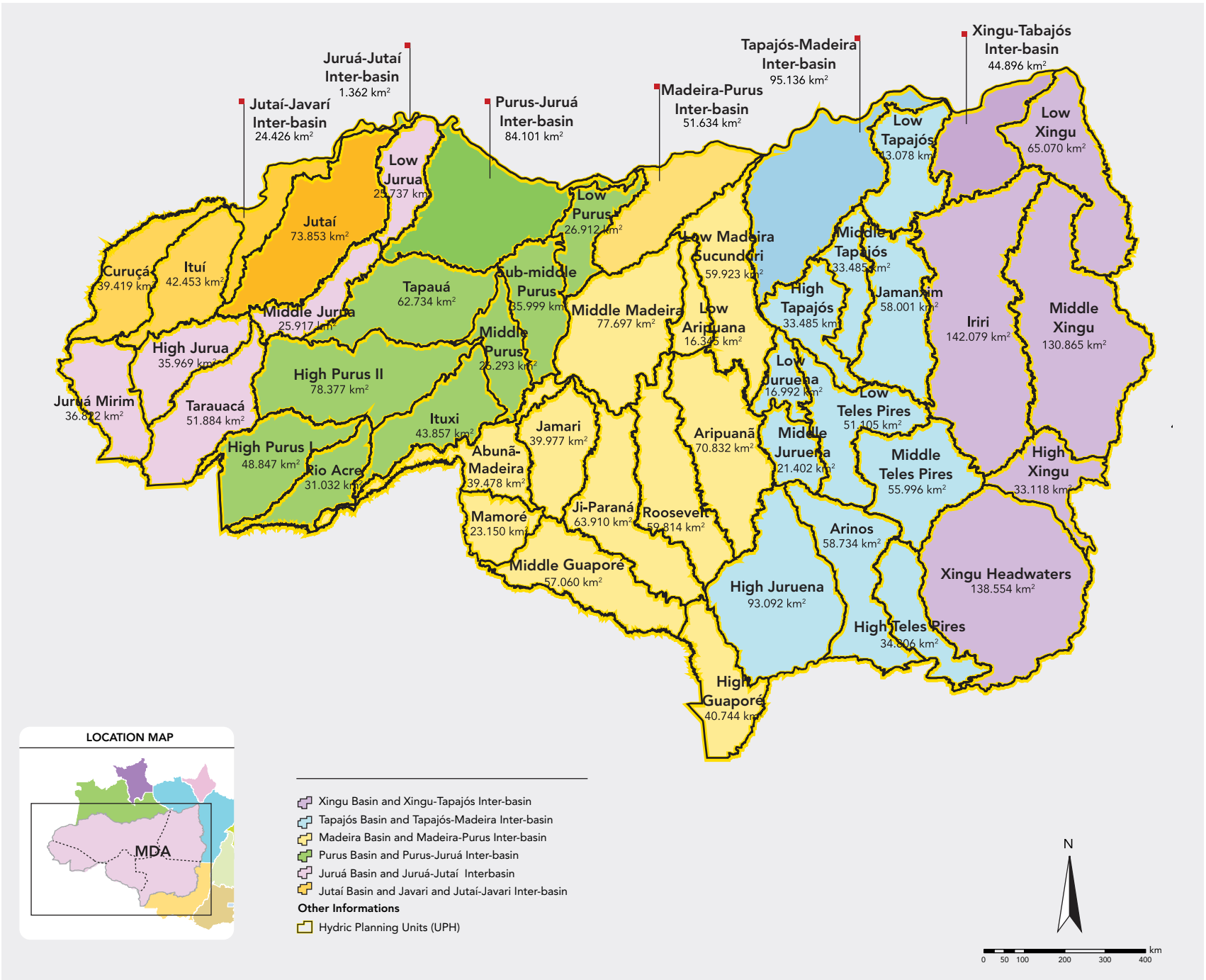


Illustration 2.1 Representation of hydrographic river basin of MDA and its respective UPHs

Table 2.2 Agricultural production in tons per basin

Basin	Grains*	Corn (in grains)	Soy (in grains)
Xingu	3,024,597	319,521	2,373,958
Tapajós	13,382,856	2,686,345	9,547,834
Madeira	945,535	349,609	365,899
Purus	66,554	36,941	463
Juruá	33,040	18,938	–
Jutaí	269	217	–
Javari	394	355	–
Xingu-Tapajós	126,963	34,177	33,388
Tapajós-Madeira	19,999	6,208	4,870
Madeira-Purus	6,629	5,600	13
Purus-Juruá	2,083	1,509	–
Juruá-Jutaí	14	6	–
Jutaí-Javari	574	466	–
Total	**17,609,507**	**3,459,891**	**12,326,425**

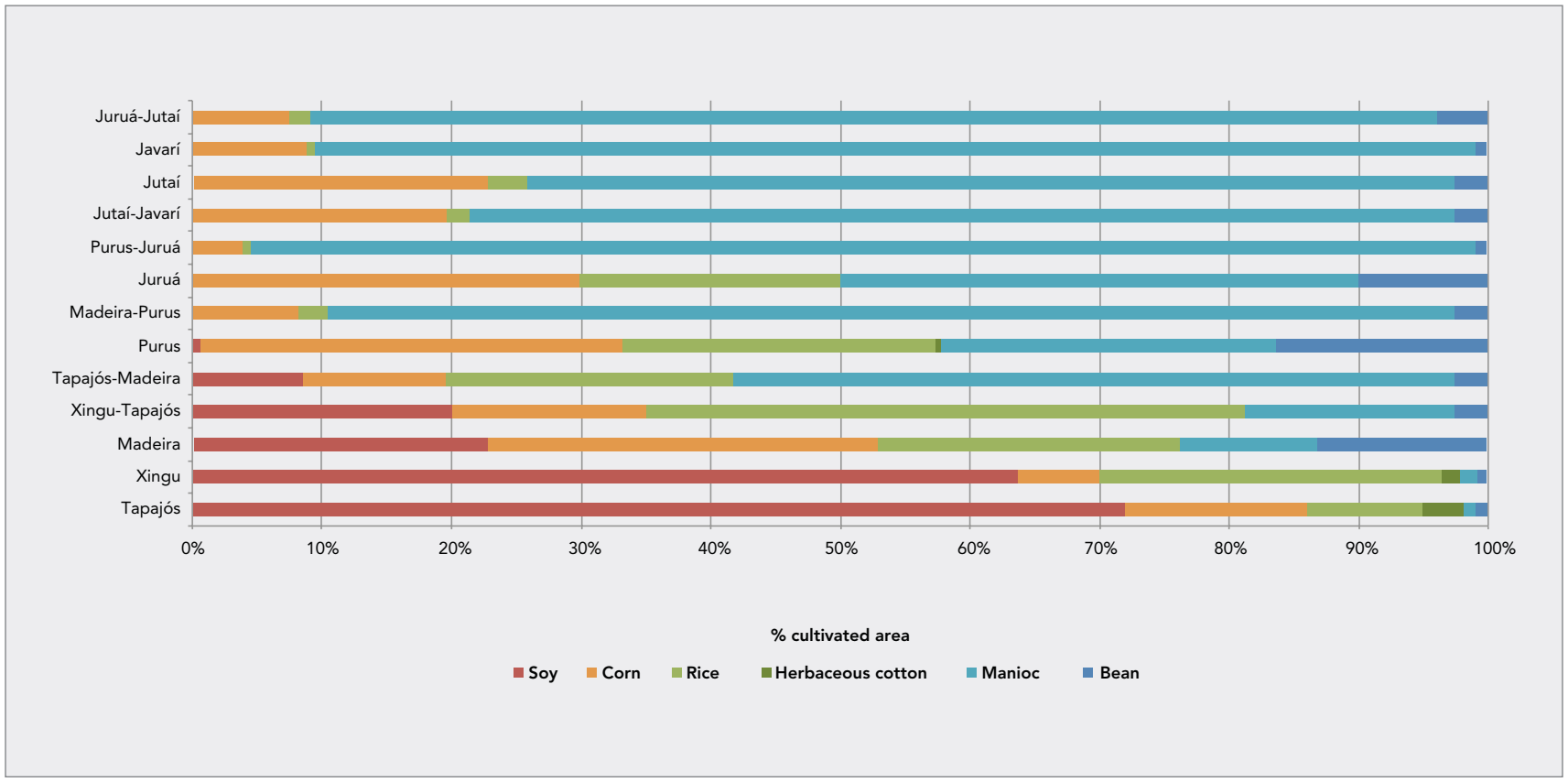
Note: * herbaceous cotton (seed), peanuts (in shell), rice (paddy), oats (grain), rye (grain), barley (grain), beans (in grain), Sunflower (grain), castor (berry), corn (grain), soybeans (grain), sorghum (grain), wheat (grain), triticale (grains).
Source: Brazilian Institute of Geography and Statistics - (IBGE) - Municipal Agricultural Production (2006).

- Areas of extensive livestock, conventional agriculture (medium and low technification), corresponding to the existing Precambrian land in Rondônia, Mato Grosso, Pará e Acre, which separates sedimentary terrains of southern MDA from those of the Amazon river channel. Livestock is distributed by the basins of MDA, as shown in Table 2.3, while illustration 2.2 shows the differences between the basins and intra-basins in respect of predominant agricultural crops.

Table 2.3 Flock in number of heads per basin

Basin	Bovine	Swine	Birds
Xingu	7,698,916	192,930	1,416,482
Tapajós	8,920,142	730,364	7,831,037
Madeira	15,190,686	397,363	5,166,606
Purus	2,242,065	78,117	941,862
Juruá	309,741	72,726	661,976
Jutaí	3,824	3,420	68,507
Javari	2,643	1,979	-
Xingu-Tapajós	544,764	25,916	501,667
Tapajós-Madeira	269,677	23,179	365,211
Madeira-Purus	196,685	16,538	341,191
Purus-Juruá	10,612	4,345	179,477
Juruá-Jutaí	117	87	1,784
Jutaí-Javari	3,146	1,284	55,197
Total	**35,393,018**	**1,548,248**	**17,530,997**

Source: Municipal Livestock Survey (IBGE, 2006)*



Source: Municipal Livestock Research (IGBE, 2006).

Illustration 2.2 Distribution of cultivated areas with seasonal crops in each hydrographic basins of the southbank tributaries of Amazon River region

- Expansion fronts of human activity, especially in Xingu, Tapajós and Madeira Basins, and, secondarily, in the Juruá Basin and in the UPHs of Acre River and Ituxi, at the Purus basin, always leveraged by major highways in the region whose pace and occupation conditions need to be evaluated, organized and monitored.
- Stable areas regarding land cover and anthrophization, represented by the MDA oldest cities, founded before the 1960s, predominantly located on the main river beds and their tributaries (the "riverbed cities"- Illustration 2.3 - that differ from "cities of the roads" - Illustration 2.4 - founded predominantly after that decade), characterized by stability or low growth rates of human activities, for which we see the need for new public policies in order to increase, on a sustainable basis, the economic activities.
- Protected areas (units of conservation - UCs and indigenous lands - TIs),[4] whose spatial distribution in MDA until January/ 2009, is summarized on the Table 2.4 and sum up combined 44.8% of the MDA total area.

[4] Conservation Unit UC: protected area, legally established by government, with defined boundaries and specific restrictions of use according the category which fits by the National System of Conservation Units - SNUC (Act Nº. 9985 of June 18, 2000) - Indigenous Land - TI: protected area, legally established by public authority, with boundaries defined and specific use restrictions . they are conceptualized by the Federal Constitution of 1988 as "those inhabited by them (amerindians) on a permanent basis, those used for their productive activities, those indispensable to the preservation of environmental resources necessary for their well-being and for their physical and cultural reproduction, according to their uses, customs and traditions. "

[5] After January 2009, were created, in the MDA area, eight protected areas (seven state areas - one in the Acre and six in Amazonas - and one federal area, in the state of Pará) totaling 25,503.2 km². They represent 1% of the total area of MDA and data is not included on Table 2.4.

Illustration 2.3 Cruzeiro do Sul (AC) - a typical riverbed city

Illustration 2.4 Sinop (MT) – a typical city of roads

Table 2.4 Protected areas spatial distribution in MDA

Domain	Protected Areas (% MDA)		
	Full Protection	Sustainable Use	Indigenous lands
Union	6.0	9.0	23.8
States	1.4	5.6	–
Total	**7.4**	**14.6**	**23.8**

Observation: the total amount of protected area includes the sum of occupied areas by UC and TI, subtracting the overlap areas among them.

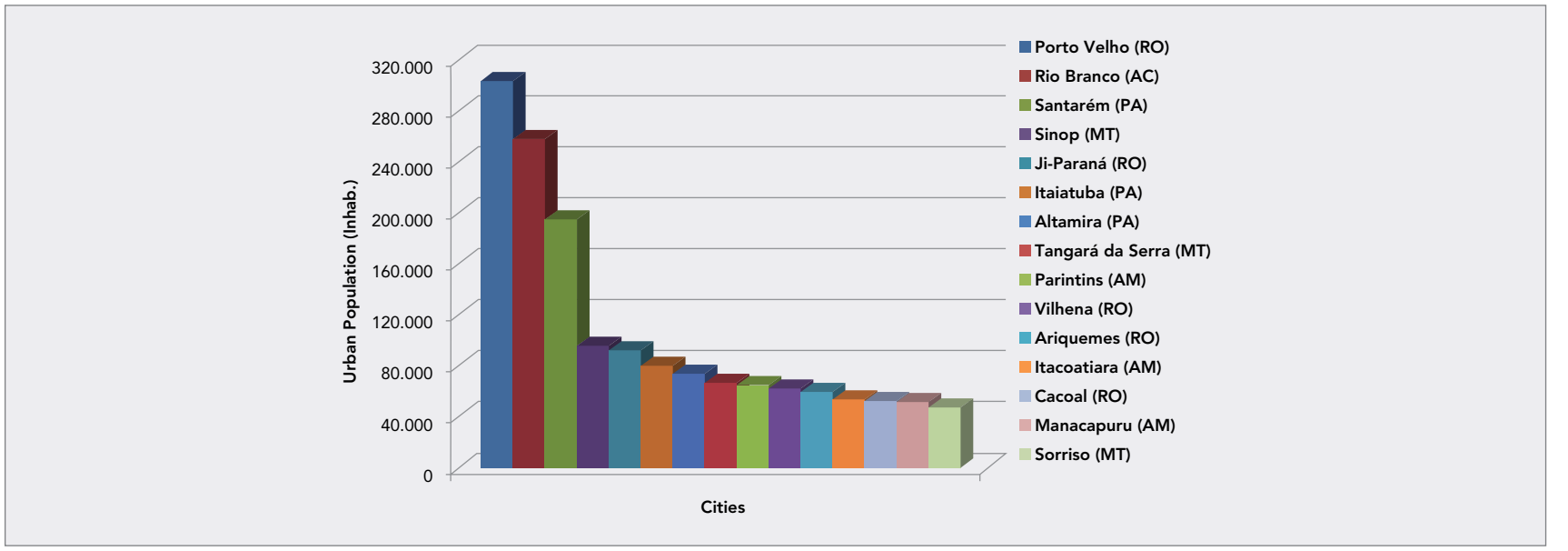
Among all the UCs (representing 22% of the MDA), 54.5% are state units. Table 2.5 shows the land occupational percentage according to basins, while Appendix 2 details the distribution of protected areas by type, by UPH (Hydric Planning Units) and by basin. It should be highlighted the effectiveness of the protection actions performed by theses units, detected through overflights and satellite images.

Table 2.5 Land cover percentage in MDA

Basin	Water (%)	Forest (%)	Savannah (%)	Anthropic use (%)
Xingu	1.5	50.7	6.7	18.9
Tapajós	1.3	39.1	8.9	26.4
Madeira	0.9	65.1	6.4	18.3
Purus	0.1	89.3	1.0	4.0
Juruá	2.1	94.9	0.3	2.4
Jutaí	0.03	99.6	0.2	0.2
Javari	–	92.6	0.03	0.2
Xingu-Tapajós	208	71.9	4.2	12.1
Tapajós-Madeira	5.0	88.5	1.3	3.3
Madeira-Purus	4.1	89.6	1.4	4.9
Purus-Juruá	3.4	95.4	0.1	0.3
Juruá-Jutaí	22.4	73.6	3.0	1.0
Jutaí-Javari	6.2	99.8	0.4	0.5
Total	**1.4**	**67.6**	**4.8**	**14.0**

Observation: the forest category includes the following vegetation types: dense ombrophilous forest, open ombrophilous forest, decidual stational forests and semideciduous stational forest. Absent in the table the following vegetation categories: Areas of pioneer formations, ecological tension areas and meadow. Therefore, the sum of the land use categories in this table does not sum up 100% (Appendix 1 shows the distribution of all vegetation types per river basin and UPH (Hydric Planning Units) in the MDA.

- Large urban areas: Rio Branco, Porto Velho and Santarém - in which now live in about 40% of the total MDA population and present themselves as critical areas, due to the accelerated growth that they may experience towards the implementation of great infrastructure projects planned for the duration period of this Plan, resulting in migratory outbreaks and uncontrollable urbanization.



Source: IGBE (2007).

Illustration 2.5 Population of major cities of the MDA

- Area of mineral interests, correspondent to important mineral deposits, already identified and/or in active exploitation, among which the plan highlights:
  - Rondônia Tin Province, in the Madeira Basin, - the sylvite deposit of Nova Olinda (in UPH) Low Madeira Sucunduri), yet to be exploited;
  - the vast bauxite deposits in Tapajós-Madeira Inter-basin, highlighting the Juruti Project, inaugurated in sept./2009, with a production of 2.4 ton/year;
  - the gold deposits along the Xingu, Tapajós and Madeira basins;
  - a gold mining reserve in the Tapajós River basin, with an area of 28,000 square kilometers, where 3 ton/year of gold, in a semi-mechanized way, is exploited;
  - deposits of limestone in Itaituba and gypsum in Aveiro, both in UPH Low Tapajós;
  - occurrences of iron and phosphorus in Rosario do Oeste;
  - oil and gas.

According to the National Department of Mineral Production database - DNPM and the specific report of Brazilian Mineral Istitute - IBRAM , the Xingu, Tapajós and Madeira basins, as well as the Xingu-Tapajós and Tapajós-Madeira inter-basins, concentrates the burdened areas by mineral rights. The table 2.6 presents for those basins the percentage of burdened areas compared to its total areas. Among the policies, the concession policy was the most frequent.

The three basins represent the largest mineral vocation in the MDA, as reflected by the representative density of mineral concessions in their territories. Their burdened areas, by research request, covers 333,796 km^2 (equivalent to 13.3% of MDA total area or 21.6% of the three basins area); and burdened areas by authorizations by business licenses represents more than 259,282 km^2 (10.2% of the MDA or 16% of area of the three basins), which may mean future areas of mineral extraction. It should be taken into account the fact that it does not mean that the areas where already exist permissions for research, even it representing a more advanced stage in the search for minerals, will turn into a mining venture.

Among the already existing and foreseen mining ventures in the MDA stands out: the Juriti (Alcoa, operation started in the second half of 2009 and production of 2.6 million tons/year of bauxite), that of CSN, in Rondônia (2,600 tons of cassiterite/year), of the Agroindustrial Company of Monte Alegre - Caima (Group João Santos, in Itaituba, 1.1 million limestone/year) and Serabi Minig (in Tapajós basin, producing 1.8 million tons/year of concentrate, which are extracted from about 300 kg of gold and 400 tons of copper per year).

The oil and gas production is now concentrated in the sedimentary basin of Solimões, where gas was found in the Jurua trend (in 1977) and oil in the Urucu trend (in 1986). The Solimões Basin is the third gas reserve basin of the country , and the National Petroleum Agency - ANP believes that both this sedimentary basin such as the Acre River basin have high potential production.

- Vulnerable/sensitive areas, which are in necessity of special policies intended to assure its protection, whether by threats that are submitted (what stands out among them the axis of BR-163, the city of Apuí-AM and the large urban regions), whether by value or by environmental fragility (UPHs Submiddle Purus, Low Juruá, Middle Juruá, Jutaí and Curuçá, among others). The MDA has about 84.6% of its area covered by native vegetation[6] and 1.4% of waterbodies. The distribution of different types of vegetation[6] by UPHs of the MDA is present on Appendix 1, already cited. Among the areas of great environmental value, those corresponding to ombrophilous forests is emphasized (which constitutes 36.8% of MDA) and they are associated mostly to wetland areas.

Table 2.6 Burdened areas by mining rights in percentage of basins and inter-basins areas of the MDA

Basin or Hydrographic Inter-basin	Area (km²)	Régimes										Administrative act
		Concession/allowance				Permission		Licensing		Extraction		
		Research		Mining		PLG						
		Request	Authorisation	Req.	Port.	Req.	PLG	Req.	RL	Req.	RE	Availability
Javari	81,876	0.4	–	–	–	–	–	<0.1	–	–	–	–
Jutaí	78,893	1.0	0.25	–	–	–	–	–	–	–	–	–
Juruá	177,330	0.3	<0.1	–	–	–	–	<0.1	<0.1	<0.1	–	<0.1
Purus	354,051	1.6	1.1	<0.1	<0.1	–	–	<0.1	<0.1	<0.1	<0.1	0.8
Madeira	548,960	21.5	26.7	0.4	0.5	0.3	0.1	<0.1	<0.1	<0.1	<0.1	4.3
Tapajós	492,263	17.7	14.2	1.6	<0.1	0.1	<0.1	<0.1	<0.1	–	<0.1	4.9
Xingu	509,865	26.0	8.4	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	–	–	3.3
Tapajós-Madeira	95,136	41.0	12.9	-	0.7	<0.1	<0.1	<0.1	<0.1	4.1		5.4
Xingu-Tapajós	44,896	13.3	11.8	<0.1	–	–	–	<0.1	<0.1	<0.1	<0.1	29.9
Purus-Juruá	84,101	–	0.2	–	–	–	–	<0.1	<0.1	–	–	<0.1
Jutaí-Javari	24,426	4.7	–	–	–	–	–	<0..1	<0.1	–	–	<0.1
Total	**2,542,573**											

Legend: Req. - Application; Port. - Ordinance; PLG -Permissions for Independent Mining; RL - License Registration, and RE - Extraction Registration.
Source: DNPM (Ibram elaboration, 2009).

2.1 WATER RESOURCES SITUATION AND PERSPECTIVES IN THE MDA

The water resources were examined according to its availability, demands, vulnerability (especially in its quality) and management (particularly to management instruments and to operational institutional base). Illustration 2.6 provides an overview of the water availability distribution and rainfall in the MDA, showing where they are most noticeable.

Water resources, especially their management, were evaluated according to the role they play or will play in the future, in the following areas:

- Human supply and the effluents dilution.
- Meeting the needs of agriculture (irrigation) and livestock (watering animals);
- Exploitation of natural resources (hydroelectric power generation, mining, manufacturing industries);
- Navigation in the Amazonian rivers, whether for its logistics, or its access to cities and villages and connection among them or, still, related to the flow of grain production;
- To extractivism based on modern and effective production and commercial arrangement, as well as on technological innovation;
- To economical growth from tourism and fishery/aquaculture activities;
- To Environmental services.

Thus, the studies shows that:

- There is nowadays, in general, a comfortable situation as far as water availability is concerned, when total consuming demands are taken into account in the MDA.
- Only three UPHs have a relationship between total consuming demands and Q_{95} higher than 1%: Acre River, Ji-Paraná and High Guaporé. These UPHs have been undergoing intensive economic and demographic growth.

[6] ANA/SPR made a comparison between deforestation data ("anthropic use", in PERH-MDA) and the results of the Amazon's Deforastation Estimate Project/ National Institute of Spatial Research - Prodes/ Inpe, from 2006, to municipalities of MDA (adopting proportional areas for municipalities partially contained therein) and found approximately 13.2% of deforested area (near the value found in PERH-MDA: 14%). For the entire Legal Amazon, Prodes/INPE computed approximately 13.6% of deforested area until 2006 and 14.3% until 2009.

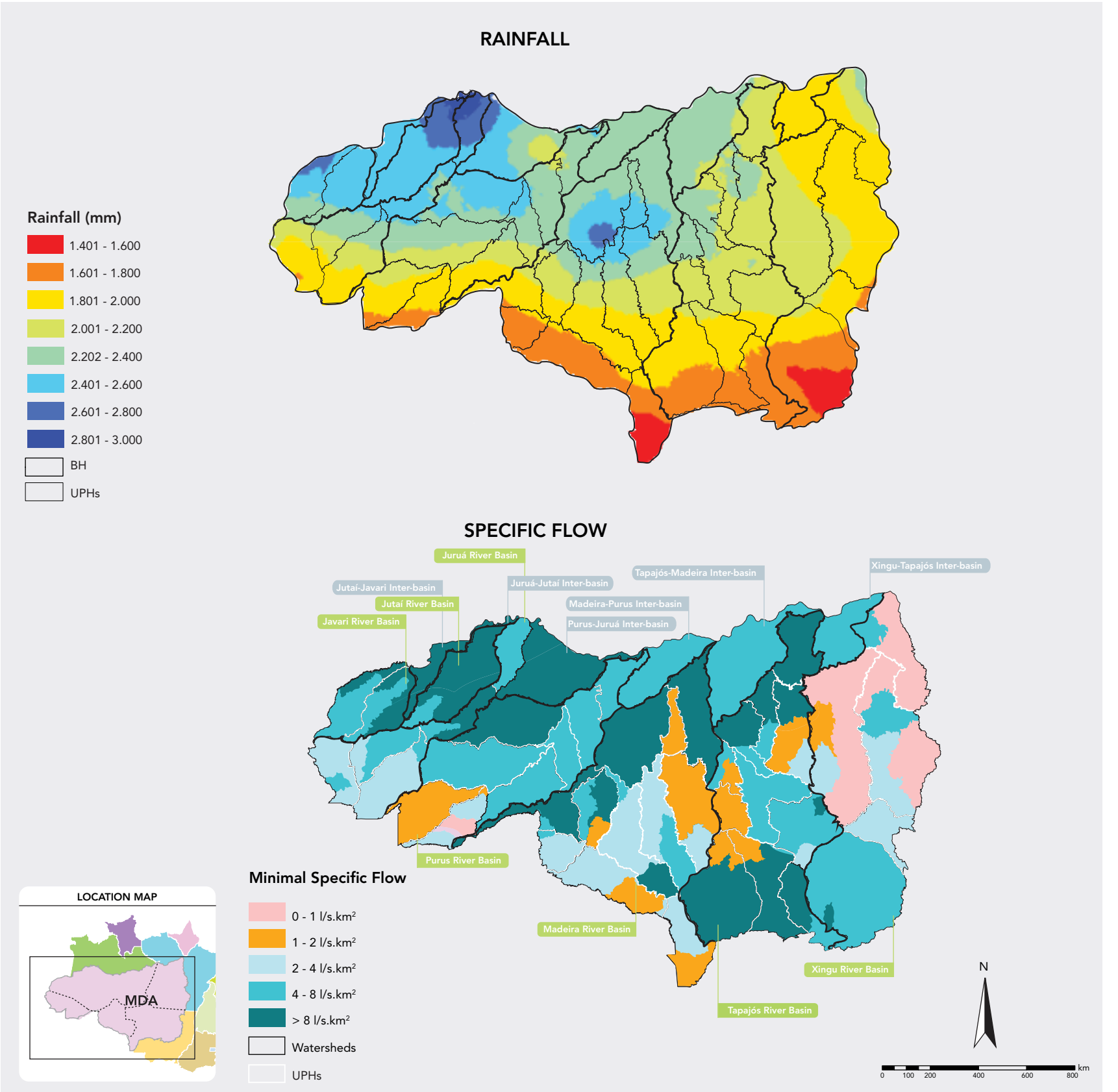


Illustration 2.6 Water Availability: rainfall (annual average) in the basins and UPHs and specific flow rate with 95% duration (Q_{95}) in the rivers of MDA

- Water abundance, previously mentioned, does not preclude the existence of higher pressure areas over the water resources, which will need differentiated monitoring. Illustration 2.7 presents Water Availability Indicator[7] (IDHidr) among rivers that are part of the MDA, allowing to identify and classify waterbodies in regard of its availability, and stretches that should be most observed.
- Local deficiencies, regarding the availability of water may occur (and will need to be faced off) specially in river's inlets and small watercourses which passes through populational nucleus and on treatment of riverside population in lack of basic sanitation.
- MDA rivers are classified as clear, white and dark waters, and are different concerning its hydrochemical characteristics, while the clear and white water rivers widely prevails.
- Water quality is good (Figure 2.8), overall, regardless uncertainties and lack of knowledge on biogeochemical processes and places that have showed, in the past, uncontrolled mining activity.
- The recognition of the previous item take us to the need of a better knowledge of Amazon region's water, as well as to understand its complex natural dynamics, as to know the effects caused by anthropogenic activities already established and being introduced in the region. The structuring of an efficient monitoring system should allow actions to control or mitigate unwanted changing in the chemical characteristics that may result from these activities.
- The presence of mercury (Hg) in aquatic environments, dark water and white water rivers (which presents different behaviors) might be investigated on its biogeochemical cycles and monitored by appropriate actions, particularly in reservoirs created by the construction of hydroelectric plants.
- Presence of vast wetlands, especially on the lower stretch of rivers Purus, Juruá and Javari, and its role of environmental protection and as "buffer" of Amazon Basin. These wetland areas on the lower stretches of the Purus, Juruá, Jutaí, Javari and part of Madeira Basins, in gereral, coincide with areas of dense rain forest.
- Although the MDA region is not very hydrogeological known, it counts with three important aquifers:
  - aquifers of Grupo Parecis, which flows mainly at the UPHs of High Juruena, Middle Juruena, Arinos, High Teles Pires and Middle Teles Pires;
  - Ronuro formation, restricted to Xingu Headwaters UPH;
  - Alter do Chão formation, which constitutes the Amazon's south-bank on the Tapajós and Xingu basins, as well as the Inter-basins Xingu-Tapajós and Tapajós-Madeira and it has great regional importance.
- The first two aquifers play an important role in regulating the natural flow of rivers that are born in Chapada dos Parecis and Xingu Headwaters UPH, where Rivers Juruena, Juína, Arinos, Sangue, Teles Pires and Xingu stand out. The areas where water sources are recharged on these aquifers are submitted to intense human presence and it is visible its need for protection. Not coincidentally, the UPHs High Juruena, Arinos and High Teles Pires are among those that show higher specific flows. These aquifers have also served to human water supply and agricultural activities. Also not well-known, the aquifers associated to formations Içá, Solimões and the High Tapajós UPH (these last ones with an important role in the flows of rivers Arinos, Crepori, Cururu-Açu/São Benedito, Jamanxim and in the lower course of the Teles Pires river), should be better studied in the future.
- The situation of MDA water resources availability and quality should not undergo major changes in the future, as shown on illustrations 2.9 and 2.10, which show, respectively, water availability (expressed by IDHidr) and water quality (expressed by the Organic Pollution Indicator - IPO, which reflects the relationship between the load of DBO- biochemical oxygen demand, and the released load assimilated by the waterbody referred to one quality class given) for Normative and Critical Scenarios[8] (this last incorporating the effects of global climate change).

[7] The Water Availability Indicator - IDHidr (LOTUFO; MARANHÃO; BURNETT; ANTUNES, 2009) represents a relationship between water availability and demand at each point of the basin.

[8] The Plan worked with three prospective scenarios: the Tendencial, the Normative and the Critical. The starting point is the current situation. Taking into account that the development process will continue in the future on the same way as in the present, in intensity and quality, we land in Trend Scenario. From this scenario, by changing the basic factors to generate alternative scenarios, we construct the ideal scenario, or Normative, in which all driving forces for the process of development of the region worked together to make it sustainable with the vision of the future forces involved in the comparison of scenarios. In the end, we construct the Critical Scenario, in which all driving forces contribute to maximize the pressure on the Plan's object - water resources.

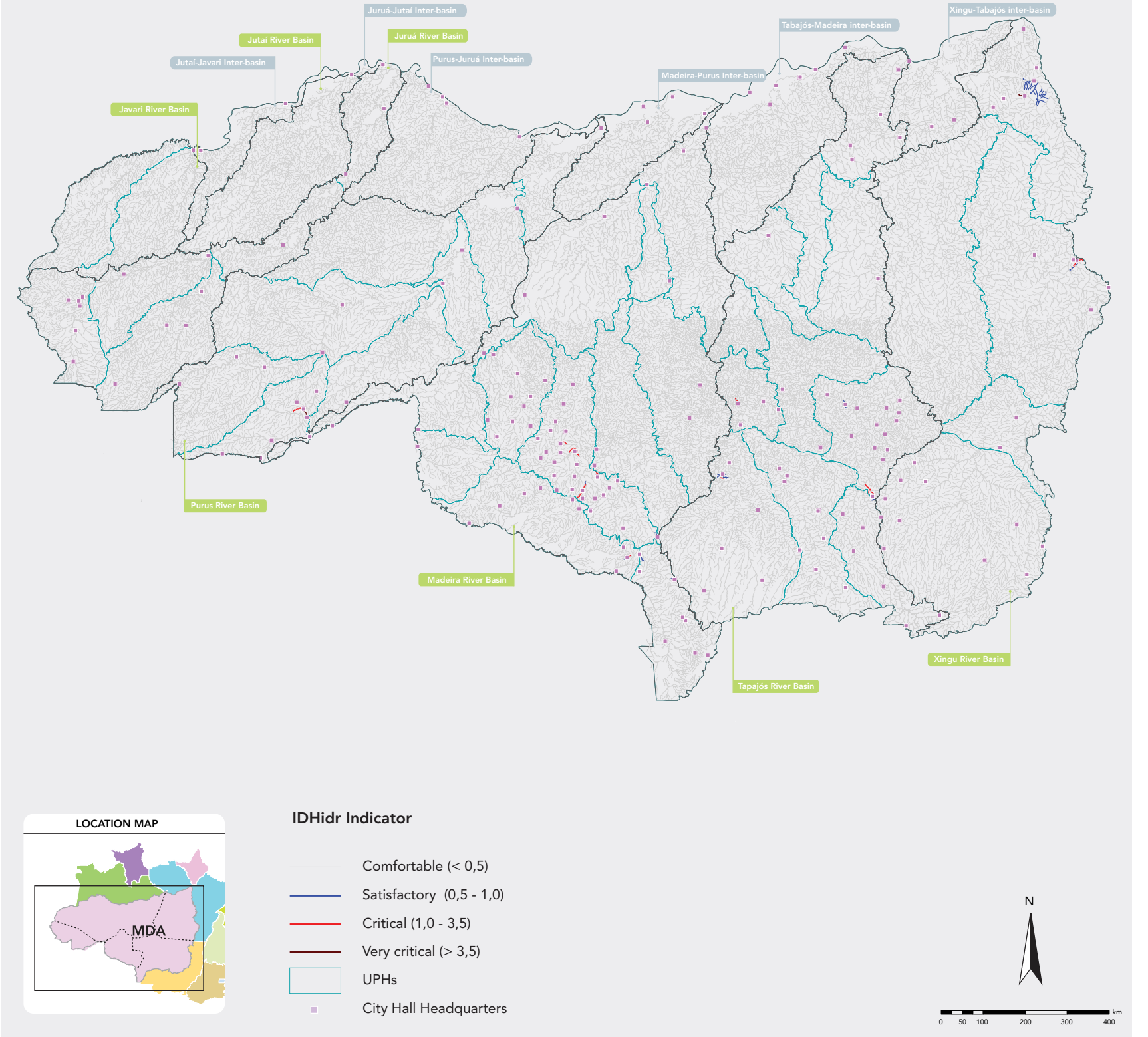


Illustration 2.7 Water availability in the MDA - present (2007)

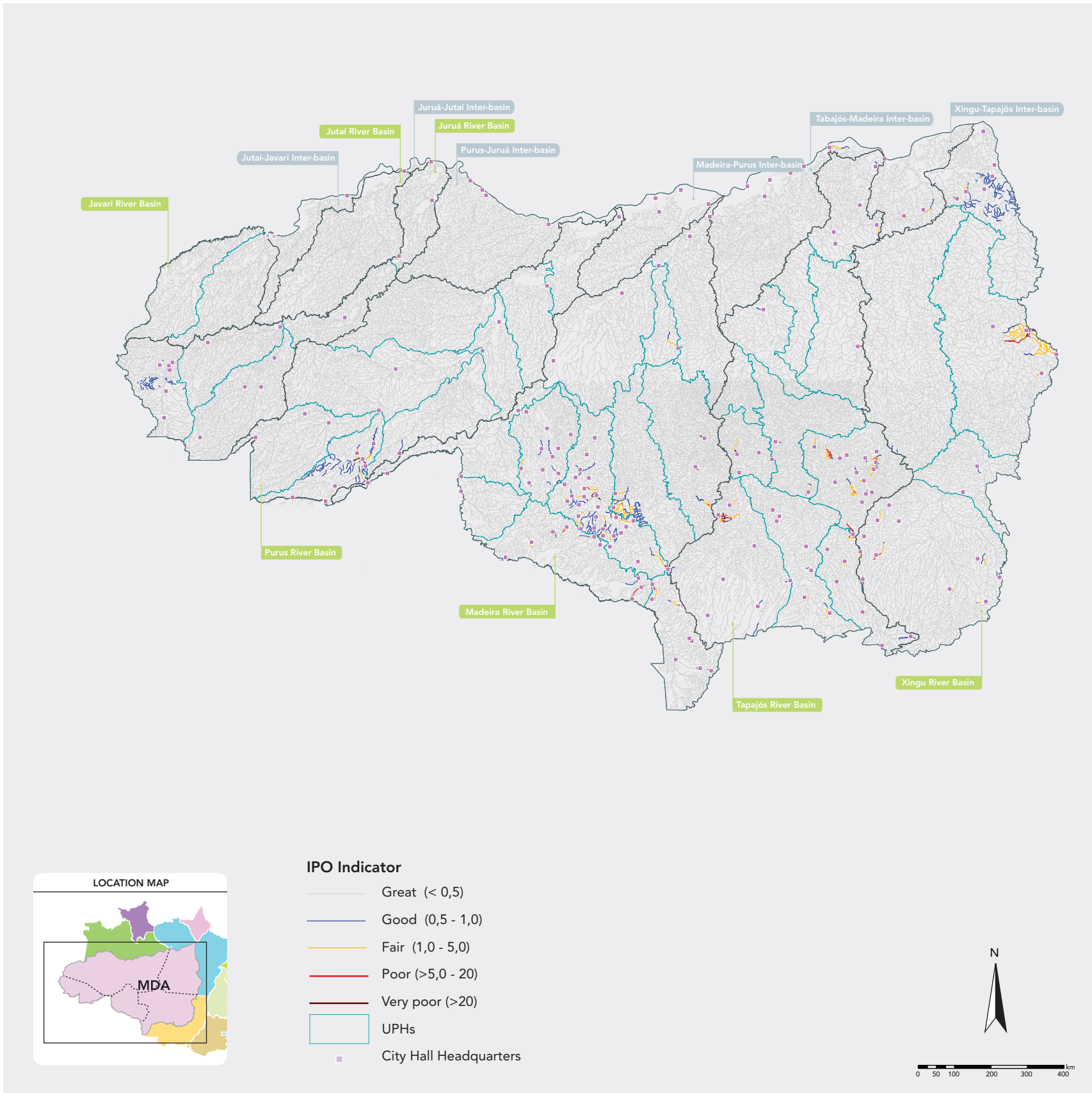


Illustration 2.8 Water Quality in the MDA - present (2007)

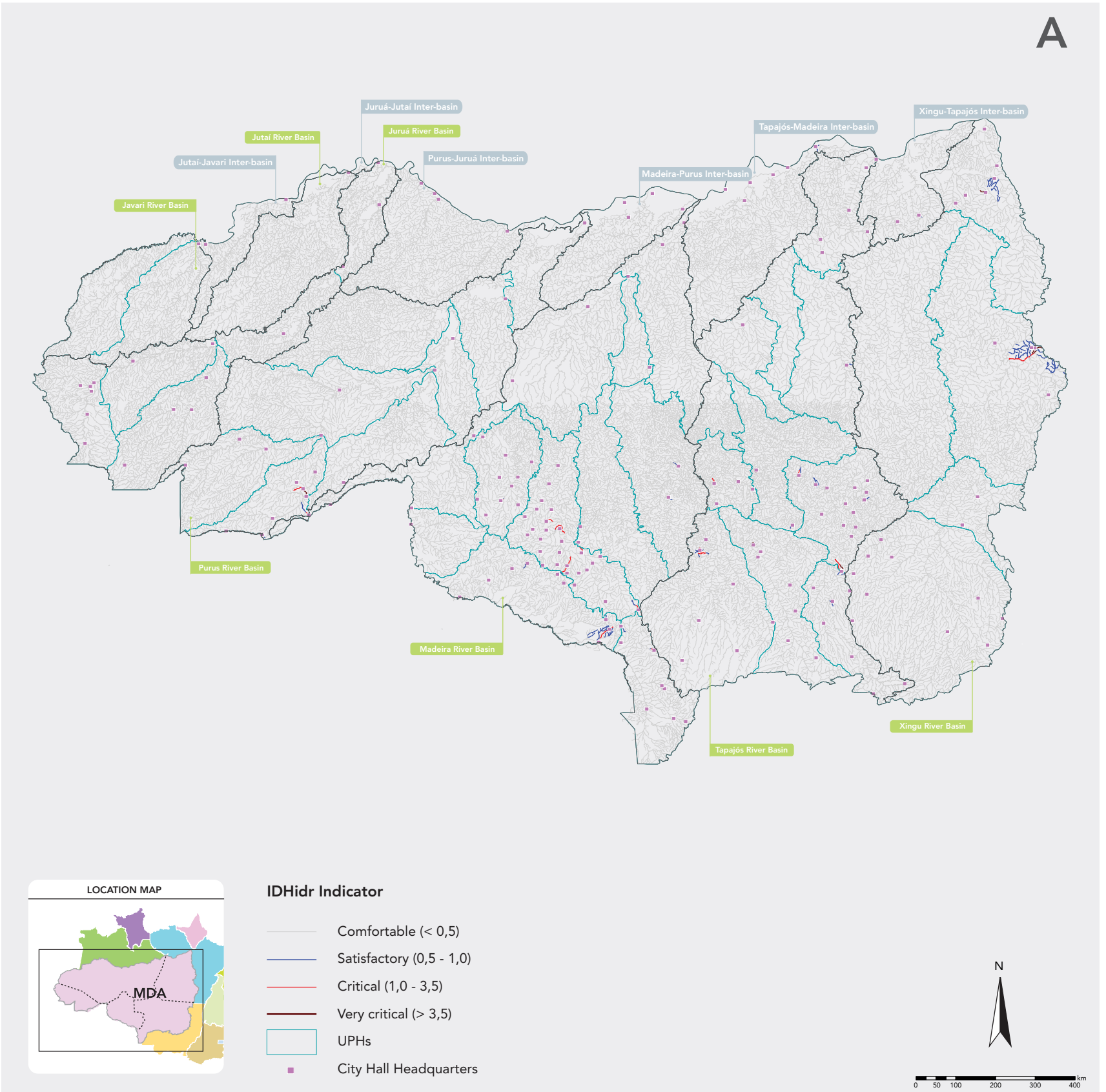


Illustration 2.9 Water availability in the normative scenario (A) and critical scenario (B) of the MDA

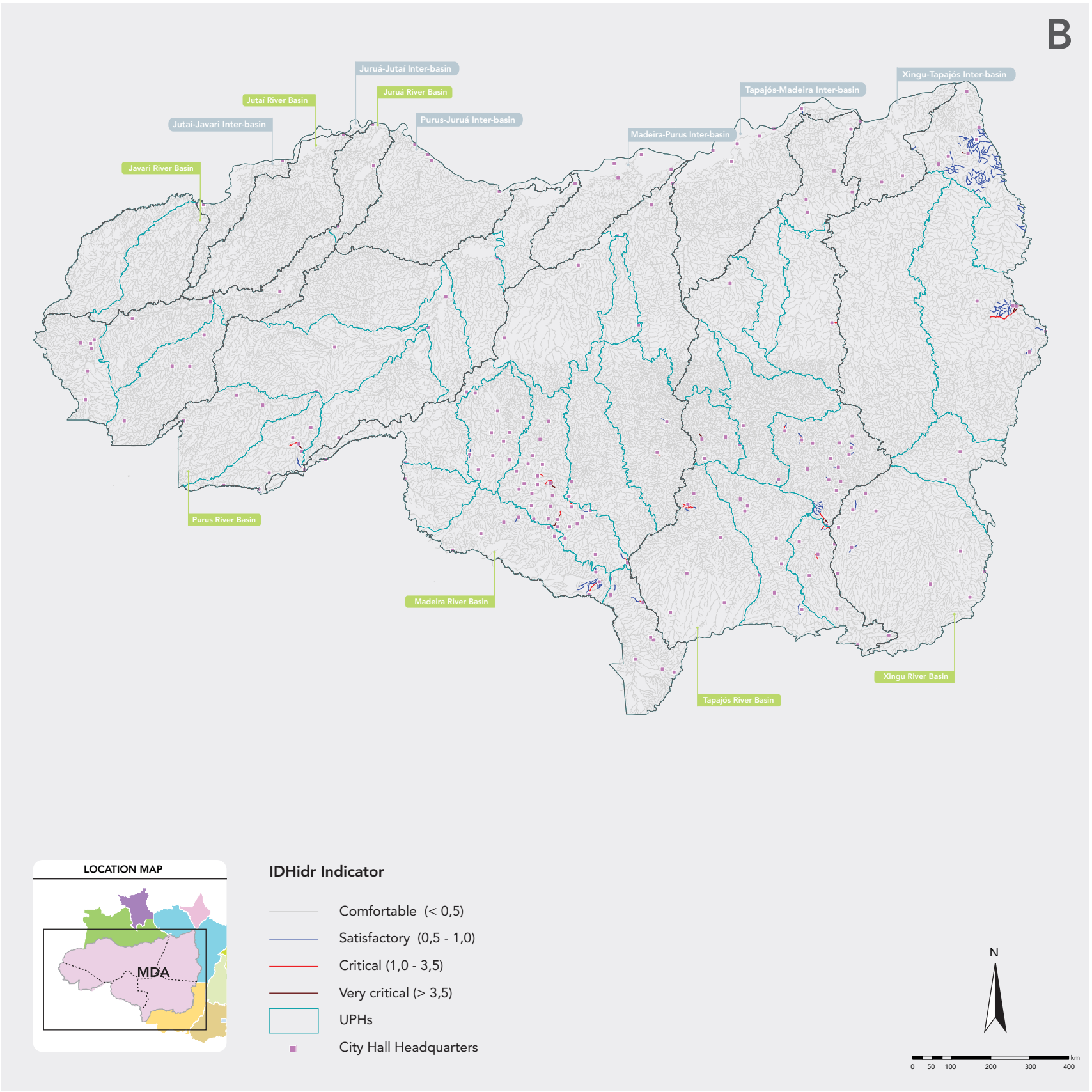


Illustration 2.9 Water availability in the normative scenario (A) and critical scenario (B) of the MDA

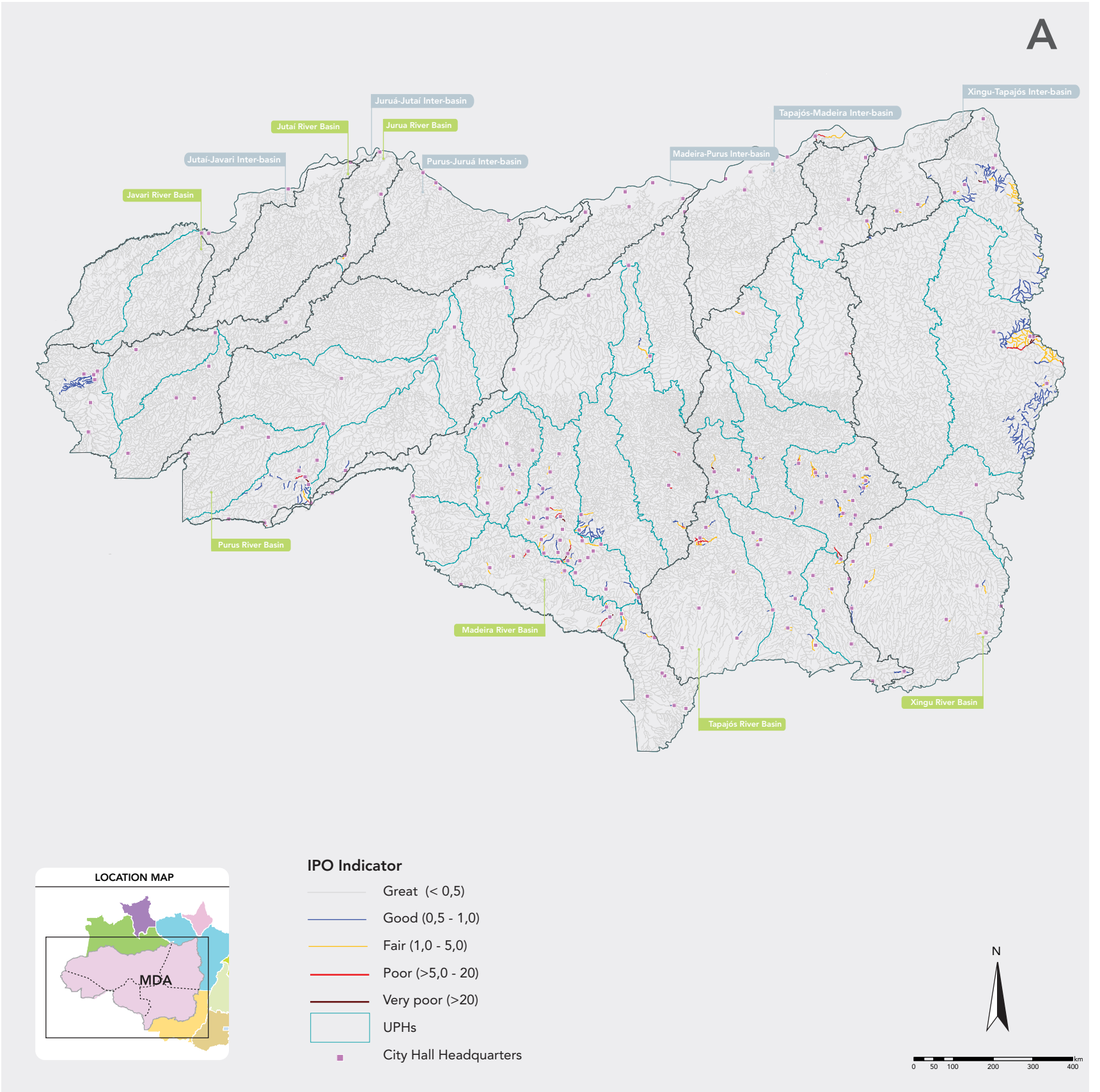


Illustration 2.10 Water quality in the normative scenario (A) and critical scenario (B) of the MDA

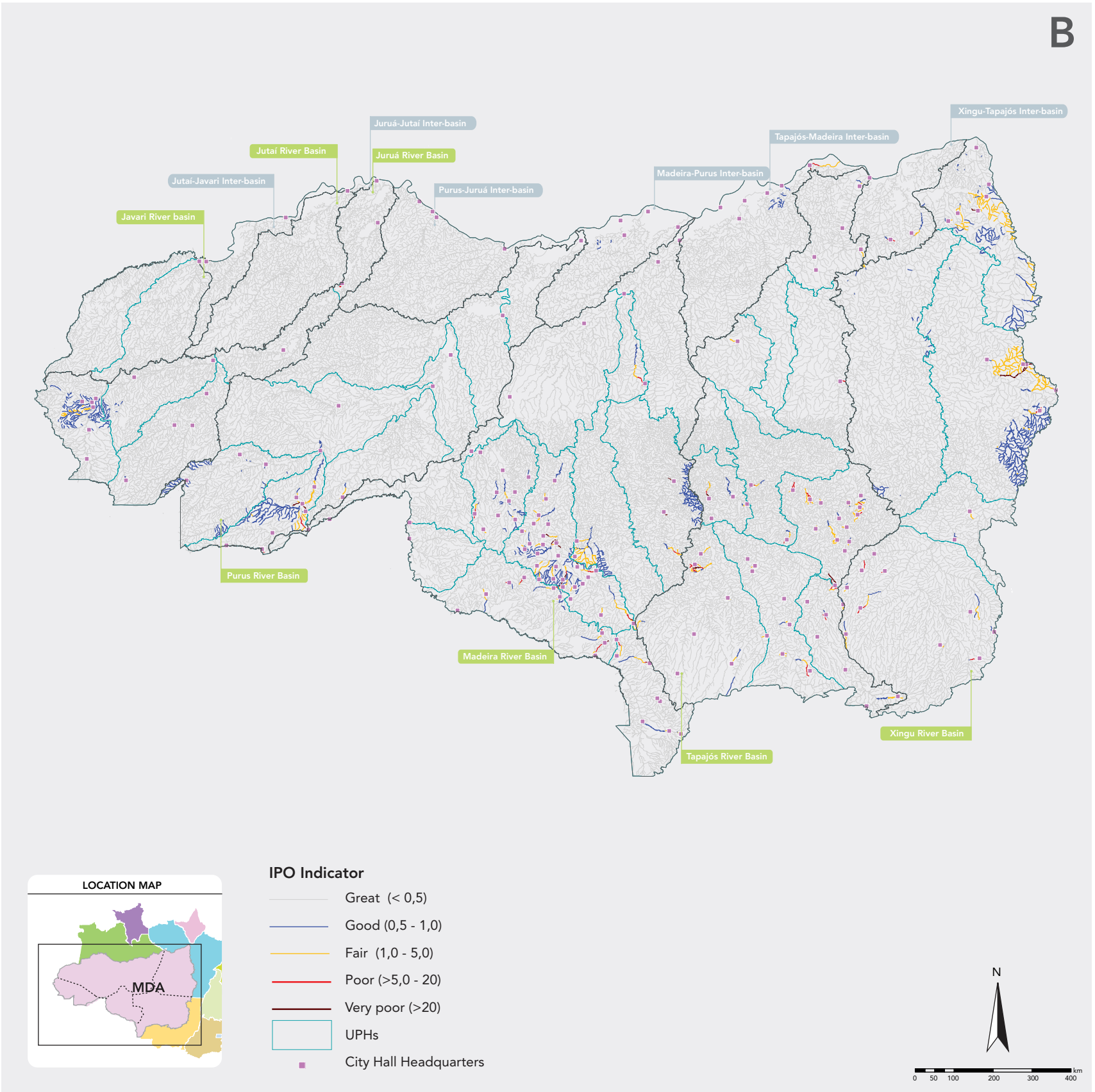


Illustration 2.10 Water quality in the normative scenario (A) and critical scenario (B) of the MDA

- The most important economic uses of water resources are human supply, effluents dilution, animal watering, irrigation, energy generation and river navigation. Other potentially relevant uses are fishery/aquaculture and tourism. Illustration 2.11 offers a distribution of the demands and water consuming in the MDA by different uses referred to the present as well as in 2030, for normative scenario, while table 2.7 brings together the total water demands per basin and UPH for the present and normative scenario; illustration 2.12, shows the total water demands per UPH and basin in the MDA.
- Among other uses of water resources may be found yet that they are employed to provide environmental services and habitat for several species.
- There are serious deficiencies in environmental sanitation (low sewerage treatment, water supply, destination of solid waste and urban drainage). Despite the loads of biochemical oxygen demand - DBO launched in major rivers does not constitute significant problems for large existing flow, some streams and smaller tributaries, that were not individualized in PERH-MDA scale, which passes through urban areas without proper sanitation systems, may be in degrading conditions, in this respect, it represents risk to human health.

  The main watercourses that have non-compliance in relation to DBO load proposed in this plan are listed on Appendix 3, indicating cities that contribute to this condition, and the affected river length on the current situation and elaborated scenarios.

Jutaí River Mouth on Solimões River – AM - Viviana Brandão - ANA Image Bank

Xingu River - PA - Rui Faquini/ANA Image Bank

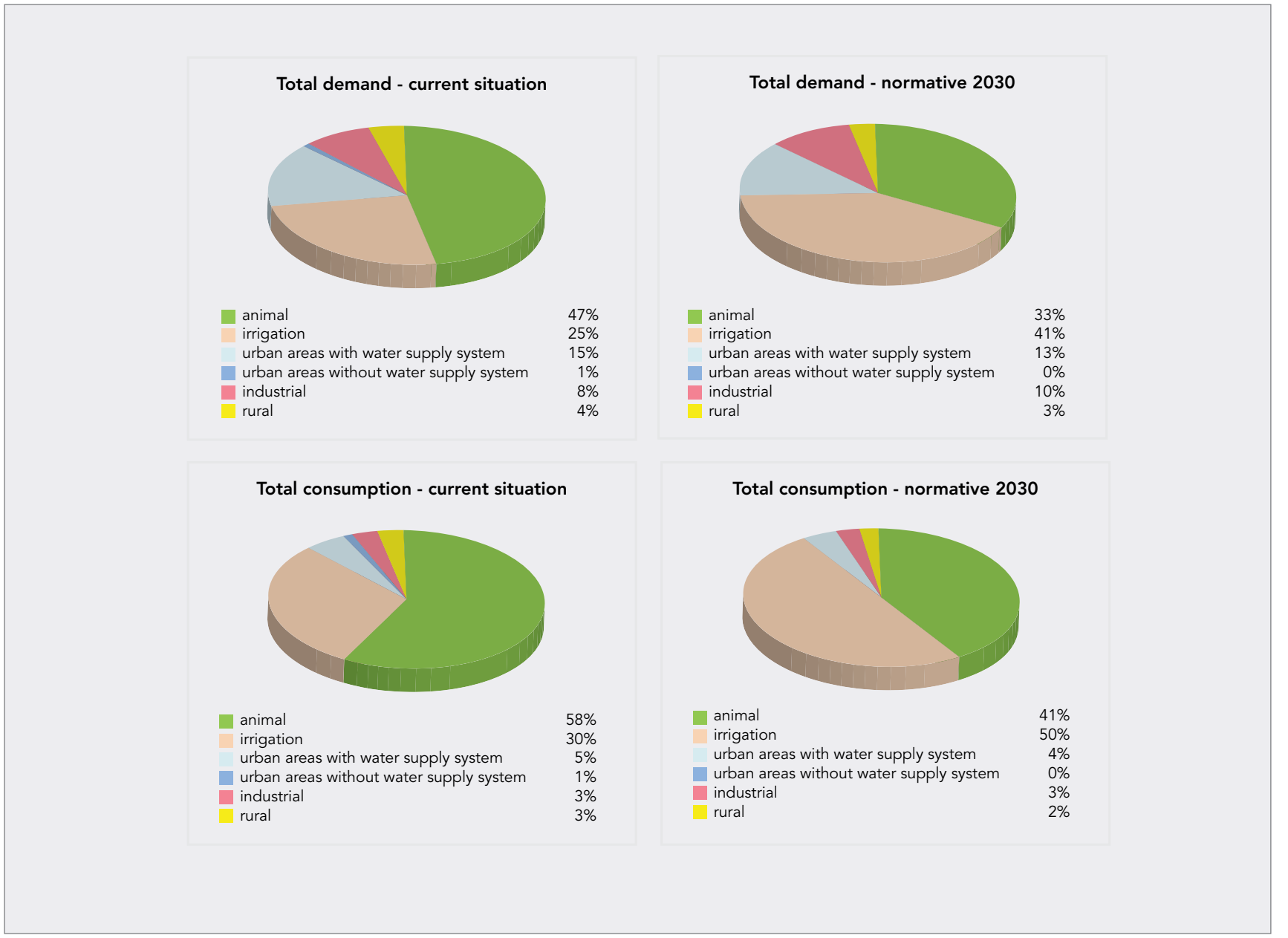


Illustration 2.11 Distribution of demands for consumptive use - current situation (2007) and normative scenario (2030)

- Tapajós, Madeira and Xingu basins must be a priority for the water quality monitoring due to the higher demands there required, especially on segments under influence of mining activities, high technificated agriculture and accelerated urbanization. Human expansion areas in theses basins should be monitored as well.

- Adequacy of agricultural activities to environmental legislation in the MDA and to international market requirements regarding the use of sustainable practices should involve important adjustment in these activities, especially high technified agriculture. In this sense, observing the current changes, it is reasonable to expect the irrigation growth in Tapajós Basin (UPHs High Teles Pires, Middle Teles Pires, Arinos and High Juruena) and in Xingu basin (Xingu Headwaters UPH). Theses changes need to be monitored by an effective administration capable of preventing unwanted effects over water resources.

Table 2.7 Total demands per UPH and basin of the different situations considered

HYDROGRAPHIC BASIN/UPH		TOTAL WATER DEMAND (m³/s)			
		Current situation	SCENARIOS		
			2030 Normative	2030 Trend	2030 Critical
Xingu	High Xingu	1.10	1.07	1.07	1.22
	Low Xingu	0.97	2.04	2.34	2.49
	Iriri	0.45	0.83	0.99	1.06
	Middle Xingu	1.59	2.60	2.56	2.61
	Xingu Headwaters	2.81	2.60	7.90	15.89
	Total Xingu Hydrographic Basin	6.92	17.02	14.85	23.26
Tapajós	High Juruena	3.74	10.81	10.45	14.72
	High Tapajós	0.04	0.12	0.13	0.17
	High Teles Pires	3.12	10.73	10.62	14.90
	Arinos	3.15	9.15	10.61	14.41
	Low Juruena	0.01	0.02	0.02	0.02
	Low Tapajós	1.01	2.64	2.47	2.65
	Low Teles Pires	0.64	1.18	1.42	1.61
	Jamaxim	0.18	0.59	0.82	1.07
	Middle Juruena	0.50	0.90	0.99	1.08
	Middle Tapajós	0.06	0.08	0.04	0.05
	Middle Teles Pires	3.10	4.26	4.50	5.13
	Total Tapajós Hydrographic Basin	15.54	40.49	42.05	55.80
Madeira	Abunã Madeira	1.91	2.75	2.95	2.95
	High Guaporé	1.44	2.67	2.92	3.16
	Aripuanã	0.68	1.66	1.64	1.89
	Low Aripuana	0.03	0.07	0.04	0.05
	Low Madeira Sucunduri	0.10	0.20	0.13	0.17
	Jamari	1.83	2.15	2.40	2.73
	Ji-Paraná	5.88	6.40	6.64	7.35
	Mamoré	0.25	0.30	0.34	0.37
	Middle Guaporé	1.64	2.45	2.46	2.23
	Middle Madeira	0.19	0.39	0.36	0.41
	Roosevelt	1.26	1.95	2.02	1.86
	Total Madeira Hydrographic Basin	15.20	20.95	21.89	23.16
Purus	High Purus I	0.27	0.54	0.52	0.69
	High Purus II	0.13	0.16	0.08	0.67
	Low Purus	0.03	0.05	0.06	0.59
	Ituxi	0.35	0.35	0.29	0.49
	Middle Purus	0.07	0.13	0.10	0.26
	Rio Acre	2.02	3.05	2.63	2.86
	Submiddle Purus	0.02	0.04	0.07	0.37
	Tapauá	0.01	0.02	0.09	0.64
	Total Purus Hydrographic Basin	2.91	4.33	3.83	6.56
Juruá	High Juruá	0.16	0.26	0.19	0.24
	Low Juruá	0.12	0.14	0.14	0.18
	Juruá Mirim	0.29	0.53	0.42	0.50
	Middle Juruá	0.02	0.02	0.01	0.03
	Tarauacá	0.20	0.50	0.38	0.48
	Total Juruá Hydrographic Basin	0.78	1.44	1.14	1.43
Jutaí	Jutaí	0.02	0.03	0.02	0.05
	Total Jutaí Hydrographic Basin	0.02	0.03	0.02	0.05
Javari	Curuçá	0.00	0.01	0.01	0.01
	Ituí	0.02	0.02	0.02	0.02
	Total Javari Hydrographic Basin	0.02	0.03	0.03	0.03
Inter-basins	Xingu-Tapajós	0.67	1.41	1.62	1.64
	Tapajós-Madeira	0.65	1.13	1.06	1.43
	Madeira-Purus	0.35	0.44	0.33	0.87
	Purus-Juruá	0.31	0.38	0.32	3.53
	Juruá-Jutaí	0.00	0.00	0.00	0.00
	Jutaí-Javarí	0.10	0.18	0.15	0.16
	Total Inter-basins	2.08	3.54	3.48	7.63
	Total of the MDA	**43.48**	**87.83**	**87.30**	**117.91**

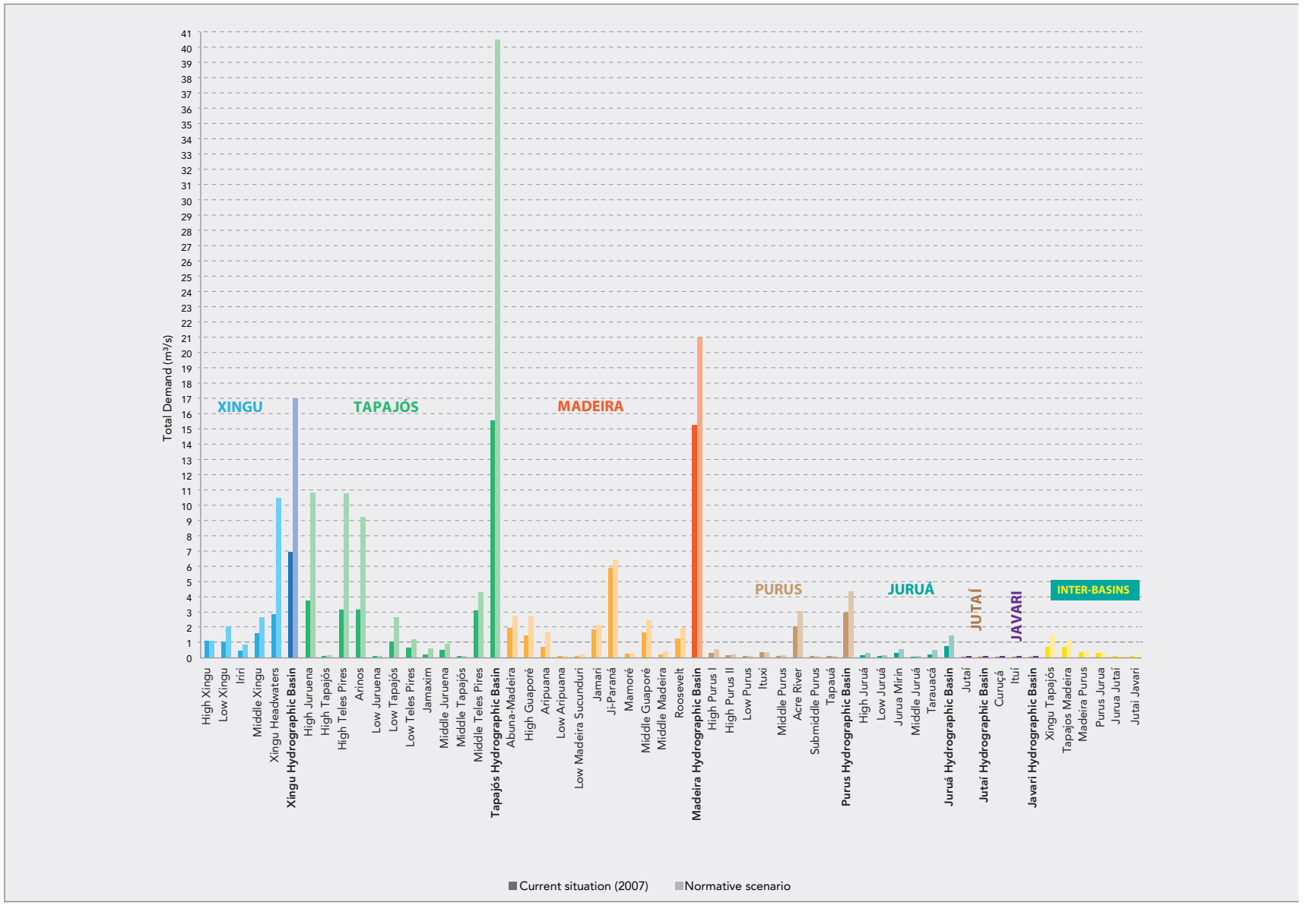


Illustration 2.12 Total water demands by hydric planning units and basins of MDA

- Nowadays, although in the early stages, if compared to other most intensive uses, industrial demands and industrial effluents are expected to grow, especially in urban areas, as consequence of Porto Velho growth (great infrastrucure constructions and navigation development) and Rio Branco (establishment of logistical axis linked to the Pacific Highway and navigation), as result of the MDA states economical development policies which will bring industrialization and growth for urban areas. Industries and cities, however, must provide collection and treatment of their effluents to prevent deterioration of the current situation.

- The region coexists with different conditions in low and high water. Floods are common phenomena in many cities. Floods forecasting systems , water falling and drought are a necessity for urban and rural populations normal life (especially for riverside communities), navigation, logistics and agricultural practices. Illustration 2.13 shows the MDA cities with records of flood and Illustration 2.14 shows the MDA cities where water supply rationing occurred.

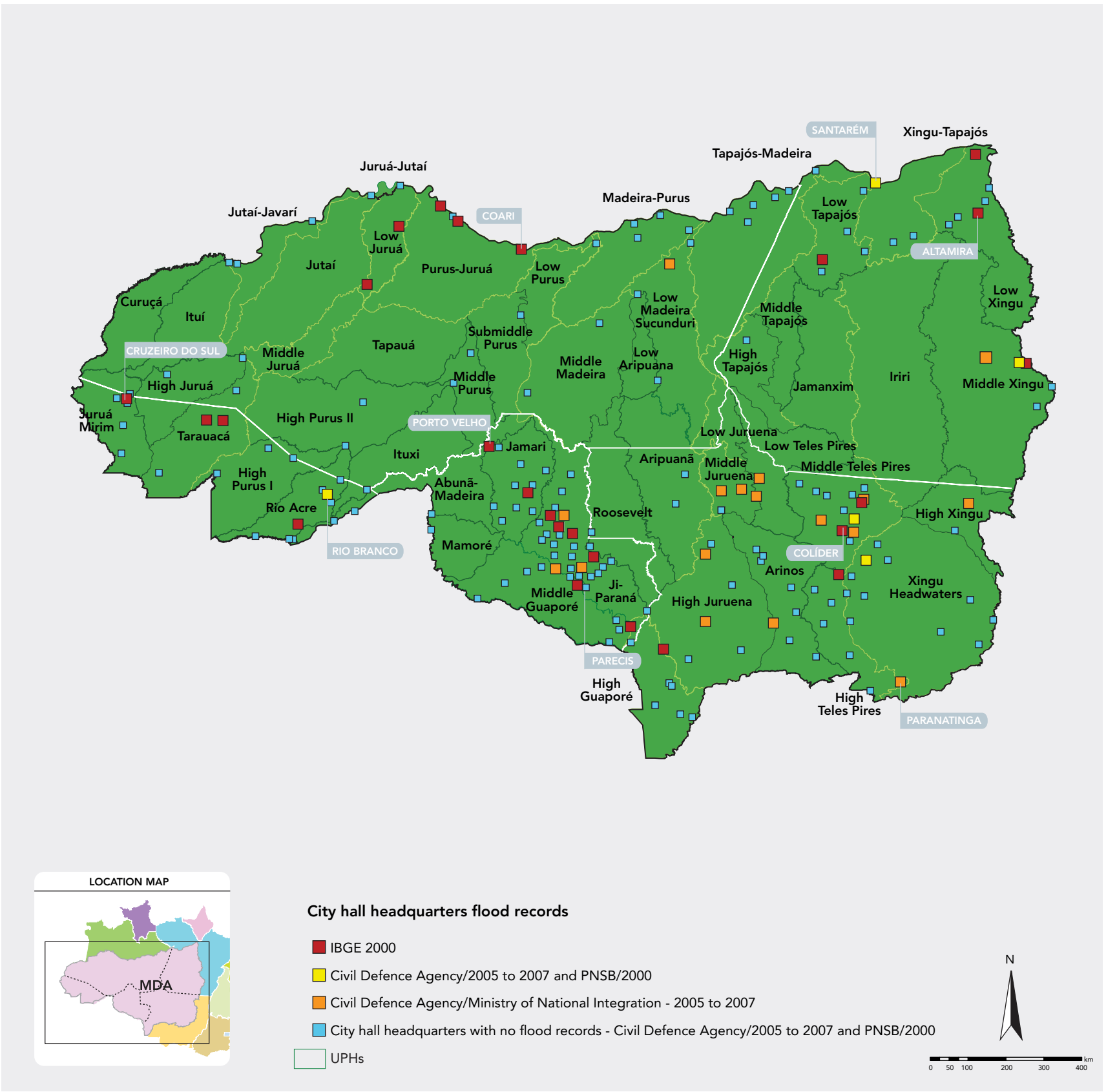
- Madeira and Tapajós Rivers may be important waterways. The first is already a commercial route, supplying Porto Velho and draining part of Rondônia's agricultural production and also from western Mato Grosso. The second might have the capability to drain Teles Pires basin and UPHs Arinos and Xingu Headwaters production and from (MT) up to Santarém (PA) or any others port between Santarém and Macapá, at the mouth of the Amazon River. From Colíder to Santarém (at the mouth of Tapajós River) it would be around 1,500km of waterway, whose viability depends on the construction of hydroelectric dams (predicted in Tapajós and Teles Pires rivers) and floodgates in these UHEs. For the remaining Amazon's tributaries, water navigation plays an important role of supplying and for passengers transportation; for that reason, operationalism and reliability will need to get to a higher stage as well as modernization. Illustration 2.15 shows the existing and planned waterway for the MDA.

- There are more than 40 GW hydroelectric potential[8] in the Basins of Xingu River, Tapajós and Madeira basins, in different stages of development: inventory studies in progress or completed; under licensing, already licensed and about to be auctioned; about to be built or under construction. These hydroelectric power plants were conceived to minimize water reservoir, avoid interference with protected areas and in existing infrastructure, reduce environmental impacts (particularly on protected areas) and expropriations. Appendix 4 shows characteristics of hydroelectric plants predicted until 2020 by Decennial Energy Expansion Plan (PDE 2010-2019).

- Although there are no acceptable quantitative predictions reliable on reduction of waterflow and other impacts due to installation of climatic changes, we must evaluate the needs of adaptive strategies and, periodically, examine previsions of Intergovernmental Panel on Climatic Change models - IPCC.

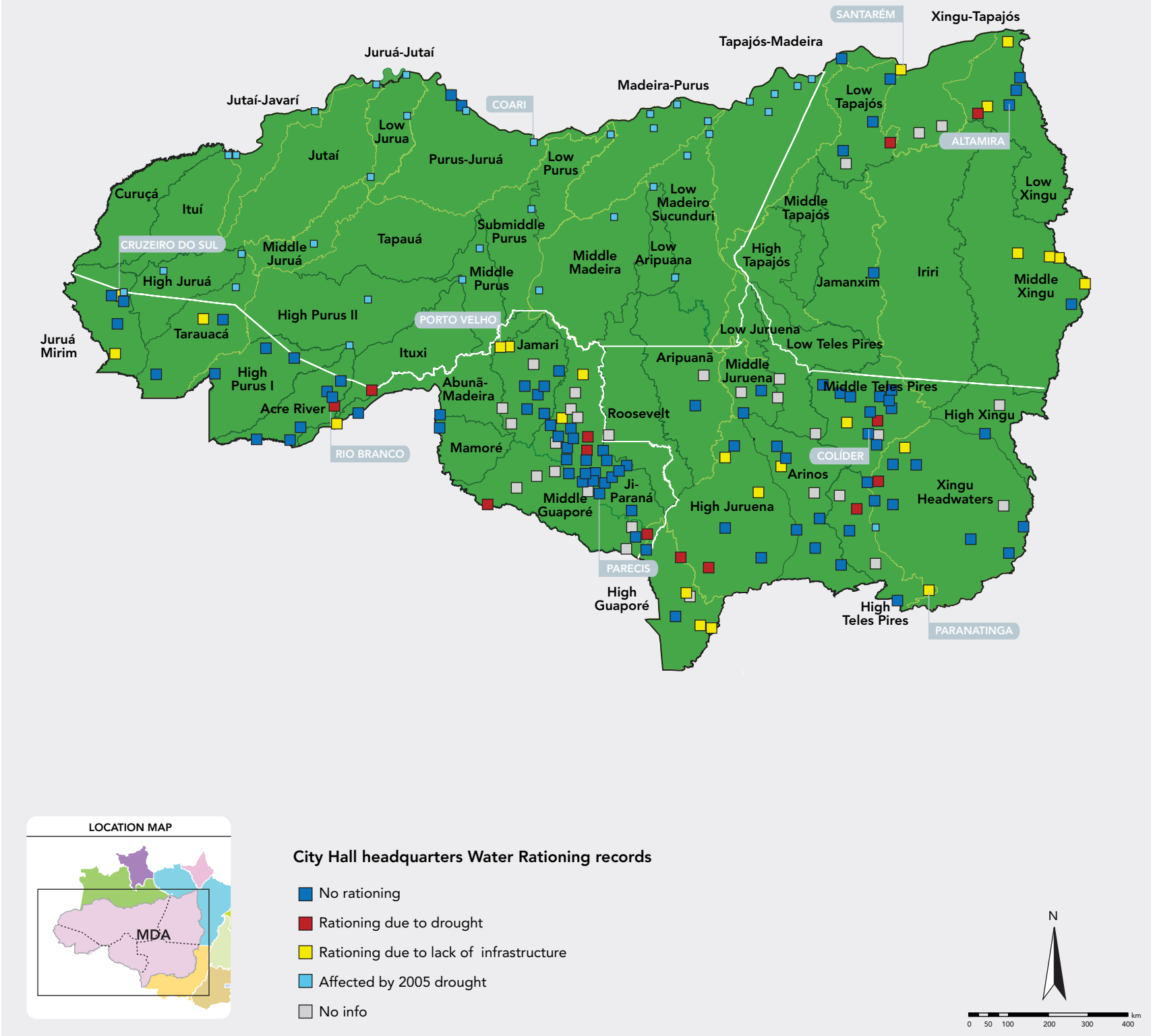
Rio Branco - RO – Viviane Brandão/ANA Image Bank

[8] In the estimation of 40 GW were not included the existence, construction or planning of small hydro power plants - PCHs (planned, under construction or already in operation). On July 20th, 2010, the total installed capacity of hydropower plants in Brazil and PCHs corresponded to 79.4 GW (representing 72% of the total installed capacity of electricity generation, equal to 111.9 GW). The hydroelectric potential of hydropower plants recorded in the three basins reaches, therefore, about 52% of the potential installed in Brazil in July/2010.



Source: Civil Defence National Secretariat/2008 (adapted SPR/ANA).

Illustration 2.13 City hall headquarters with records of flood in the MDA



Source: Civil Defense National Secretary/2008 (adapted SPR/ANA).

Illustration 2.14 City hall headquarter with records of water rationing supply in the MDA

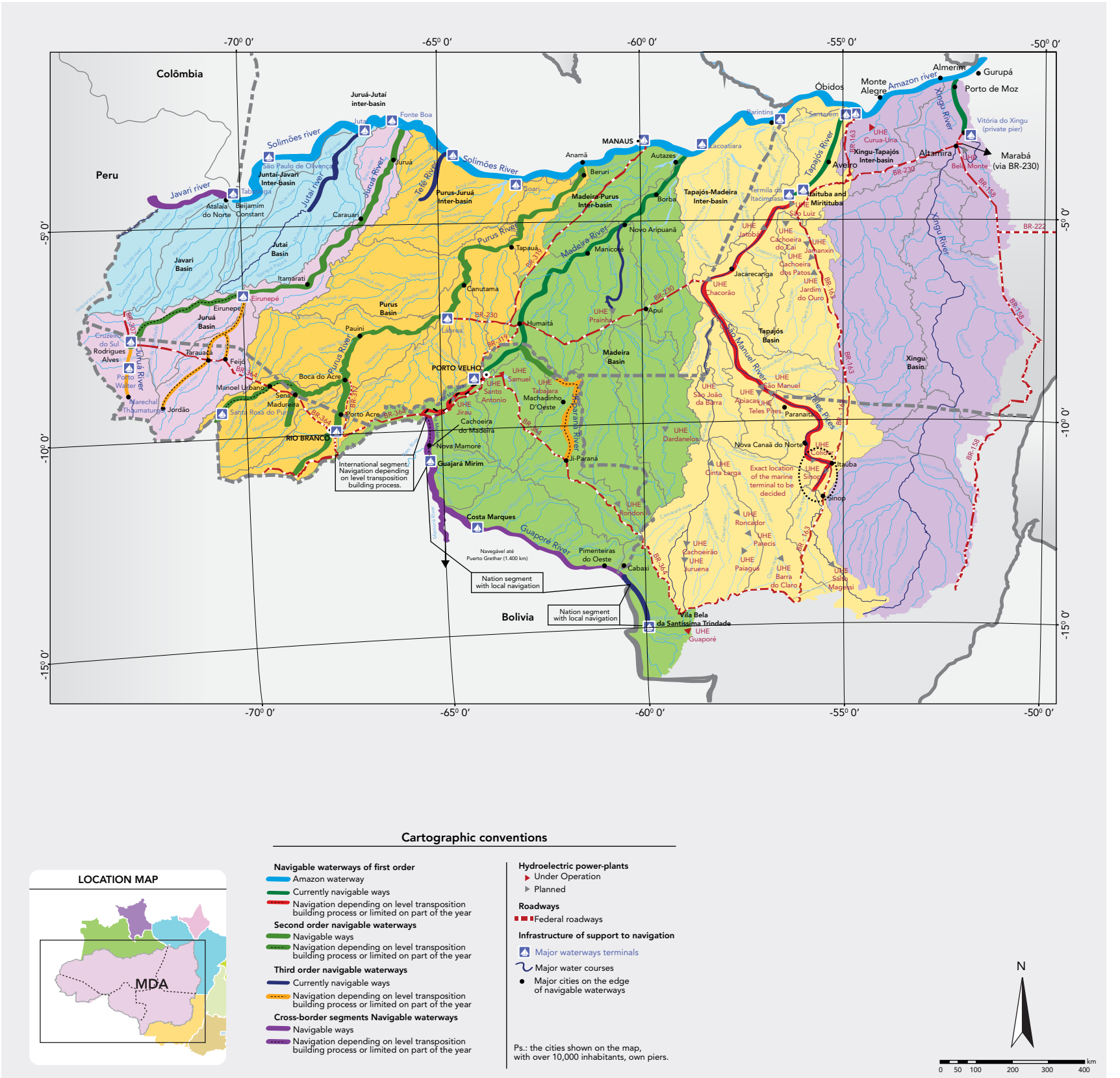


Illustration 2.15 MDA Waterway System

- It is necessary to decide whether and how the locks set out in the layouts of hydroelectric use power plants planned to the Tapajós and Teles Pires Rivers will be built. ANA articulated with the Ministry of Mines and Energy - MME and the Ministry of Transport - MT so that transposition structure level were incorporated into the general feasibility studies of Teles Pires river and into the power plants of Tapajós power plants inventory as well as computed in the investment budgets. This is one of the most critical points of PERH-MDA, due to the implementation schedule of hydroelectric ventures on the Teles Pires and Tapajós rivers, the discrepancy among the studies of the two sectors (there is not yet a technical-economic-environmental waterway feasibility study),of legal and institutional difficulties - to be overcome - and the need of others natural obstacles transposition projects (transportation sector responsibility).
- There are several conflicts - from different nature and expressions - among the MDA stakeholders concerning water resources. The conflicts are established primarily from the perspective of these actors, in relation to the access and use of water resources, as well as the impacts that projects may have or previously present on the water users and the region where they get settled. The electricity sector, whose entities, because of its size and features, has major spatial repercussions, presents itself as one of the most important stakeholder regarding the outbreak of conflicts and has a potential of "anchor" in relation to the actions needed for its success.

Table 2.8 presents a better detailed summary of described variables about the previous chapters. It contains information about UPH's area and its participation in the basin area, population, demographic density and urbanization stage; economical informations (aggregate value/total aggregate value of the MDA, the Human Development Index - IDH, agricultural production, cattle, industry added value); native vegetation covered area, relationship between the UPH area and level of anthropogenic impacts, information on water availability and demands, as well as the relationship between total demand and availability (Q_{95}), IDHidr and the IPO. These variables allow us to appreciate the set of UPHs of the southbank Amazon river seven integrating basins based on two basic axes: water availability and environmental change intensity (physical, biotic, and socioeconomic) experienced by the UPH.

In terms of water availability, it is possible to see that it is consistently high at all UPHs. Q^{95} values smaller than 100 m^3/s are only present in UPHs Iriri (71 m^3/s), Acre River (72 m^3/s) and Juruá-Jutaí inter-basin (28 m^3/s); values smaller than or equal to 200 m^3/s are found in the UPHs of High Purus I (110 m^3/s), High Guaporé (126 m^3/s), Aripuanã (141 m^3/s) and Tarauacá (170 m^3/s) and Xingu-Tapajós inter-basins (200 m^3/s) and Juruá-Mirim (146 m^3/s).

The total of higher consumptives demands are found in UPHs Ji-Paraná (5.88 m^3/s), High Juruena (3.75 m^3/s), Arinos (3.17 m^3/s), High Teles Pires (3.12 m^3/s), Middle Teles Pires (3.1 m^3/s), Xingu Headwaters (2.81 m^3/s), Rio Acre (2.02 m^3/s), Abunã Madeira (1.91 m^3/s), Jamari (1.83 m^3/s), Middle Guaporé (1.64 m^3/s), Middle Xingu (1.59 m^3/s), High Guaporé (1.44 m^3/s), Roosevelt (1.26 m^3/s), High Xingu (1.1 m^3/s) and Low Tapajós (1.01 m^3/s).

There is, however a comfortable global situation of availability versus consumptive total demands in all MDA. Only three UPHs are related (total consumptive demands/Q_{95}) above 1%: Acre River (2.8%), Ji-Paraná (2.2%) and Guaporé (1.1%).

From the environmental transformation perspective, the physical , biotic and socioeconomic variables lead to recognize - at the present - two blocks of UPHs: one whose representatives are the UPHs of High Teles Pires, Guaporé, Arinos, Low Tapajós and Xingu-Tapajós inter-basin, corresponding the UPHs which have undergone through a quick process of change in the territory occupation, anthropogenic impacts, and economic development; and another block consisting mainly of UPHs located in further west basins, where the changes are not noticeable or happens slowly.

Combining the level of water availability, pressure on water resources and the rate of environmental changes, it is possible to classify the UPHs that constitute the MDA basins into four groups:

- Those with a high rate of environmental change and increased pressure on water resources (Class AA) - for which it is necessary to set up licensing system, supported by a monitoring network compatible with the conditions and needs of the system, proposing targets for water quality objectives in addition to researching local critical situations and propose interventions for these cases. Two situations are recognized:
  - AA1 - Critical UPHs from an anthropic activity view (including the presence of conflicts or significant impacts) and by the perspective of water availability change rates or water demands. There are eight UPHs that fits into this class: Xingu Headwaters, High Teles Pires, Middle Teles Pires, Arinos, High Juruena, Ji-Paraná, Jamari and Acre River; and

- AAe - special areas due to human activity specificities that causes effect over water availability and demands. There are six recognized spatial areas: Porto Velho Metropolitan Region, Rio Branco area, Santarém, a strip of the BR-163 road, Apuí and Cruzeiro do Sul (AC).

- Those with significant environmental change rate, but without significant pressure on water resources, except located (Class AB) - for which it is found gradual increasing of demands, being an obligation for water resources management representatives to implement a progressive Integrated Water Resources Management System and strengthen the hydrometric and water quality monitoring system, to initiate studies for water quality objectives, as well as preparing the implantation of a water use authorization system. Two situations are recognized:

  - AB1 - UPHs with intense human activity and located degraded water resources: Low Tapajós, Xingu-Tapajós, Low Xingu, Middle Xingu, High Xingu, Abunã-Madeira e Middle Guaporé.

  - AB2 - UPHS with increasing human activity, but with no water resources compromised. UPHs Low Teles Pires, Mamoré and Roosevelt.

- Those with lower environmental change rates, although it is possible to identify pressure on water resources starting (Class BA) - for which it is expected a gradual increase in water demand, being the water resources managers to expand, subsequently and gradually, the Integrated Water Resources Management System installed in UPHs framed in classes AA and AB and strengthen the hydrometric and water quality monitoring system, planning water quality objectives studies, as well as the extension of water use authorization system. This class is verified in the UPHs where human expansion activity are present: Ituxi, Aripuanã and Middle Juruena.
- Those UPHs with low environmental change rates and reduced pressure on water resources (Class BB) - for which management should focus on following, observing and monitoring the situation of water resources evolution. Three situations are recognized:

  - BB1- UPHs with predominance of natural vegetation (not dense rainfall forest) and very low human activity: UPHs Juruá-Mirim, High Juruá, Tarauacá and Alto Purus, Jamanxim and Iriri. The Curuçá, Ituí and High Tapajós UPHs form a particular group because of the rare presence or anthropogenic activity. In the High Purus, Tarauacá , High Juruá and Juruá-Mirim UPHs, human presence and human activities have expressed preference for the axis of the BR-364 Road.

  - BB2 - The UPHs with predominance of dense rain forest and low human activity. It refers to Jutaí-Javari, Low Juruá, Middle Madeira, Low Aripuanã, Low Madeira-Sucunduri, Low Juruena and Tapajós-Madeira inter-basin.

  - BB3 - UPHs with a large predominance of dense rain forest and very low human activity. It refers to the Jutaí, Purus-Juruá, Middle Juruá, Tapauá, High Purus II, Middle Purus, Low Purus, Madeira-Purus and Middle Tapajós UPHs.

The panorama, now sketched, with a variety of threats, opportunities and challenges, must be treated according to the following guidelines:

- The use of water for social and economic purposes in harmony with the maintenance of aquatic ecosystems.
- The management of water resources aimed at anticipating and matching of this dual purpose.
- The MDA basins can be divided into two groups according to the level of socioeconomic development already achieved, and the Tapajós Basin emerges from PERH as the key-basin of the MDA.
- Some UPHs, among the 49 that constitute MDA, depending on the issues identified therein, should be prioritized in the management of water resources: Acre River, Ji-Parana, High Juruena, Arinos, High Teles Pires and Middle Teles Pires, Xingu Headwaters, besides six special areas that deserve attention: Porto Velho, Rio Branco, Santarém, BR-163 area, Apuí and Cruzeiro do Sul.
- In addition, there is still a huge knowledge gap to be filled to formulate better strategies for coping with water resources and aquatic ecosystems in the Amazon.

In conclusion, the most prominent point of the Plan should be to anticipate, prevent, guide and intervene, acting with greater emphasis on sensitive / vulnerable / endangered areas or where the demands now require monitoring and control. According to this proposal, the framework summarized here suggests three main lines of action:

- Observation, monitoring and tracking in areas where the presence / human activity is still rare, such as the dense rain forest areas or legally protected areas.

- Conservation[9] and/or preservation[10] of most vulnerable environmental areas, where human activity have no reached a critical level, ensuring environmental sustainability.

- Implementation and gradual progress of water management, aiming at increasing water usage rationalization[11] and the recovery of degraded human areas, where occupation shows irreversible characteristics, always giving priority to the multiple use of water resources. Management must be present at most critical UPHs, and gradually extended, spreading from them to other UPHs where human activity is expressive.

The representations of plant coverage/soil usage and integrated diagnosis of MDA UPHs for the management of water resources, presented on Illustration 2.16 and 2.17, allow the visualization of what has been exposed in this chapter.

Finally, regarding models of water resources management, it is worth noticing that the creation of hydrographic basins committees for basins with those MDA dimensions - the format provided by Law 9.433/1997 - may not be feasible immediately in some of them. Therefore, new models of basin organizations should be designed and thus, the Amazon may be a laboratory for new water management resources format , best suited to their dimensions and conditions.

Teles Pires River - MT - Viviane Brandão/ANA Image Bank

[9] Environmental Conservation: a set of guidelines designed for the management and sustainable usage of natural resources.
[10] Environmental Conservation : actions taken to ensure the maintenance of the characteristics of an environment and the interactions among its components.
[11] Rational use of Natural Resources: Adoption of measures directed to turn the use of natural resources more efficient (soil, water, and biota), by planning and using more adequate techniques.

Table 2.8 Summary of characteristics of Hydric Planning Units of MDA

Basin/UPH	Area (km²)	UPH area/ Basin area (%)	Population	Demographic density (inhab,/km²)	Degree of Urbanization (%)	Added Value/ MDA value (%)	IDH (Human development Index)	Agriculture (in thousand of reais)	Cattle Herd (in heads)
Abunã-Madeira	39,478	7	340,343	8.62	75	7.6	0.75	248,733	1,248,796
High Guaporé	40,744	7	101,422	2.49	63	2.3	0.74	232,464	2,024,228
High Juruá	35,969	20	62,325	1.73	44	0.5	0.55	63,706	75,857
High Juruena	93,092	19	112,611	1.21	69	7.2	0.77	1,109,978	1,582,627
High Purus I	48,847	14	50,772	1.04	46	0.8	0.63	112,032	341,424
High Purus II	78,377	22	28,886	0.37	24	0.3	0.56	70,498	177,636
High Tapajós	33,485	7	24,803	0.74	33	0.1	0.66	7,698	5,816
High Teles Pires	34,806	7	147,604	4.24	86	6.3	0.8	675,583	402,322
High Xingu	33,118	6	121,002	3.65	15	3.5	0.7	641,758	1,145,939
Arinos	58,734	12	93,426	1.59	64	3.8	0.77	722,543	1,265,011
Aripuana	70,832	13	42,179	0.6	50	1.0	0.71	156,557	863,609
Low Aripuana	16,345	3	15,702	0.96	70	0.2	0.65	18,327	19,770
Low Juruá	26,737	15	48,939	1.83	73	0.6	0.55	19,740	3,261
Low Juruena	16,992	3	807	0.05	0	0.0	0.68	6,136	16,334
Low Madeira-Sucunduri	59,923	11	59,373	0.99	62	0.7	0.62	50,275	50,490
Low Purus	26,912	8	18,545	0.69	49	0.2	0.58	11,773	2,701
Low Tapajós	43,078	9	348,001	8.08	75	4.5	0.72	106,412	274,483
Low Teles Pires	51,105	10	42,467	0.83	30	0.5	0.71	112,255	1,081,251
Low Xingu	65,070	13	159,856	2.46	61	1.8	0.7	131,748	964,525
Curuçá	39,419	48	3,391	0.09	0	0.0	0.56	2,987	113
Iriri	142,079	28	23,868	0.17	0	0.2	0.73	87,879	600,605
Ituí	42,456	52	11,289	0.27	8	0.1	0.62	17,300	2,530
Ituxi	43,857	12	26,019	0.59	19	0.5	0.67	114,687	355,767
Jamanxim	58,001	12	50,568	0.87	21	0.4	0.73	61,904	491,840
Jamari	39,977	7	231,103	5.78	58	4.4	0.72	346,688	2,100,866

Industry - added value (millions of reais)	Native forest (km²)	Native Forest preservation (%)	Human activity (%)	Hydric availability (Q_{med} m³/s)	Hydric availability (Q_{95} m³/s)	Total consumptive demands (Dt m³/s)	Dt/Q_{95}	IDHidr 2007	IPO 2007
289,384	29,836.2	75.6	22.0	20,214	4,846	1.91	0.04	0	0.01
146,155	19,533.4	47.9	52.1	441	126	1.44	1.14	0.04	0.09
12,619	34,535.4	96.0	1.9	1,829	324	0.16	0.05	0	0.04
214,039	60,841.5	65.4	34.6	2,421	1,491	3.75	0.25	0.01	0.05
20,577	47,588.5	97.4	2.6	1,497	110	0.27	0.25	0.01	0.1
4,366	77,411.8	98.8	1.2	4,573	708	0.13	0.02	0	0.01
5,985	31,668.8	94.6	2.2	9,014	3,225	0.03	0.00	0	0
303,116	12,685.4	36.4	63.6	819	352	3.12	0.89	0.03	0.12
128,043	22,598.6	68.2	31.4	2,664	861	1.1	0.13	0	0.01
149,169	32,998.7	56.2	43.8	1,332	489	3.17	0.65	0.02	0.15
44,810	63,579.4	89.8	10.2	1,446	141	0.68	0.48	0.02	0.12
6,654	15,098.4	92.4	5.2	3,501	403	0.03	0.01	0	0.01
18,709	25,086.1	93.8	1.1	5,693	965	0.12	0.01	0	0.01
-	16,128.4	94.9	1.7	4,749	2,068	0.01	0.00	0	0
21,812	57,245.3	95.5	1.3	33,602	7,881	0.1	0.00	0	0
5,426	26,452.7	98.3	0.4	10,499	2,332	0.03	0.00	0	0
268,805	36,019.5	83.6	8.7	12,434	4,148	1.01	0.02	0	0.05
11,623	43,393.3	84.9	13.3	3,417	867	0.64	0.07	0	0.02
42,240	50,860.8	78.2	17.9	8,548	1,184	0.98	0.08	0	0.03
-	39,312.1	99.7	0.3	2,744	653	0	0.00	0	0
-	134,002.1	94.3	4.6	2,704	71	0.45	0.63	0.02	0.14
532	42,429.9	99.9	0.1	1,998	590	0.02	0.00	0	0.01
11,965	40,636.9	92.7	7.3	816	278	0.35	0.13	0	0.02
19,604	53,287.0	91.9	8.1	1,673	281	0.18	0.06	0	0.07
300,687	28,535.8	71.4	28.3	1,391	350	1.83	0.52	0.02	0.09

Continues...

Table 2.8 Summary of characteristics of Hydric Planning Units of MDA

Basin/UPH	Area (km²)	UPH area/ Basin area (%)	Population	Demographic density (inhab./km²)	Degree of Urbanization (%)	Added Value/ MDA value (%)	IDH (Human development Index)	Agriculture (in thousand of reais)	Cattle Herd (in heads)
Ji-Paraná	63,910	12	146,152	11.68	68	16.3	0.73	1,047,030	5,238,908
Juruá Mirim	36,822	21	125,109	3.4	51	1.7	0.63	107,365	96,936
Juruá-Jutaí	1,362	100	992	0.73	0	0.0	0.53	1,231	117
Jutaí	78,853	100	31,248	0.4	28	0.2	0.54	14,602	3,824
Jutaí-Javari	24,426	100	49,654	2.03	52	0.4	0.6	26,852	3,146
Madeira-Purus	51,634	100	106,749	2.07	20	1.1	0.65	172,821	196,685
Mamoré	23,150	4	52,941	2.29	88	1.1	0.73	24,282	162,631
Middle Guaporé	57,060	10	160,252	2.81	41	2.9	0.7	446,684	2,143,308
Middle Juruá	25,917	15	10,022	0.39	30	0.1	0.53	12,112	4,490
Middle Juruena	21,402	4	33,010	1.54	55	0.6	0.72	58,353	594,564
Middle Madeira	77,697	14	67,208	0.87	56	0.8	0.65	79,289	45,960
Middle Purus	26,293	7	26,108	0.99	83	0.3	0.58	11,071	12,490
Middle Tapajós	25,573	5	14,523	0.57	0	0.1	0.7	19,752	105,617
Middle Teles Pires	55,996	11	258,607	4.62	74	5.7	0.77	412,654	3,100,277
Middle Xingu	130,865	26	90,758	0.69	44	1.7	0.71	310,016	2,715,189
Xingu Springs	138,554	27	25,718	0.19	53	0.5	0.76	145,982	2,272,658
Purus-Juruá	84,101	100	177,376	2.11	64	4.5	0.64	143,535	10,612
Acre River	31,032	9	413,239	13.32	81	8.5	0.73	305,294	1,336,650
Roosevelt	59,844	11	46,563	0.78	11	0.9	0.73	250,435	1,292,119
Sub Medium Part of Purus River	35,999	10	10,155	0.28	39	0.1	0.54	10,753	13,932
Tapajós-Madeira	95,136	100	276,705	2.91	51	2.5	0.67	199,859	269,677
Tapauá	62,734	18	8,601	0.14	0	0.0	0.5	13,511	1,466
Tarauacá	51,884	29	81,677	1.57	47	1.0	0.55	61,943	129,196
Xingu-Tapajós	44,896	100	151,952	3.38	25	1.1	0.7	148,667	544,764

Industry - added value (millions of reais)	Native forest (km²)	Native Forest preservation (%)	Human activity (%)	Hydric availability (Q_{med} m³/s)	Hydric availability (Q_{95} m³/s)	Total consumptive demands (Dt m³/s)	Dt/Q_{95}	IDHidr 2007	IPO 2007
945,893	35,965.4	56.3	43.7	1,516	265	5.88	2.22%	0.07	0.42
54,236	35,011.9	94.9	5.1	1,089	146	0.29	0.20%	0.01	0.2
-	1,043.4	76.6	1.0	74	28	0	0.00%	0	0
6,817	78,687.3	99.8	0.2	3,859	1,453	0.02	0.00%	0	0.01
12,332	22,787.2	9.3	0.5	1,245	475	0.1	0.02%	0	0.02
22,658	46,987.1	91.0	4.9	1,354	342	0.35	0.10%	0	0.007
31,386	21,959.6	94.9	5.1	9,028	1,599	0.24	0.02%	0	0
64,451	44,247.5	77.5	22.5	8,026	1,367	1.64	0.12%	0	0.01
2,046	24,335.9	93.9	0.0	4,694	755	0.02	0.00%	0	0
34,880	16,485.0	77.0	22.7	4,423	2,014	0.5	0.02%	0	0.01
21,954	74,038.0	95.3	2.8	26,728	6,528	0.19	0.00%	0	0
10,366	25,553.4	97.2	2.8	6,132	1,178	0.07	0.01%	0	0.01
-	24,457.8	95.6	1.7	9,708	3,454	0.06	0.00%	0	0
386,071	27,763.1	49.6	50.4	2,198	630	3.1	0.49%	0.02	0.11
63,057	100,043.2	76.4	21.0	5,236	1,079	1.59	0.15%	0	0.05
3,863	98,255.6	70.9	29.0	1,952	787	2.81	0.36%	0.01	0.11
941,837	80,960.6	96.3	0.3	3,525	929	0.31	0.03%	0	0.03
452,955	24,055.7	77.5	22.5	664	72	2.02	2.81%	0.09	0.75
11,321	53,290.4	89.0	11.0	1,711	225	1.26	0.56%	0.02	0.05
2,805	35,293.4	98.0	2.0	9,592	2,095	0.02	0.00%	0	0
77,354	87,238.1	91.7	3.3	2,356	559	0.66	0.12%	0	0.11
-	62,714.0	100.0	0.0	2,508	669	0.01	0.00%	0	0
29,913	50,465.7	97.3	2.7	1,477	170	0.2	0.12%	0	0.1
43,504	38,198.4	85.1	12.1	580	200	0.67	0.34%	0.01	0.15

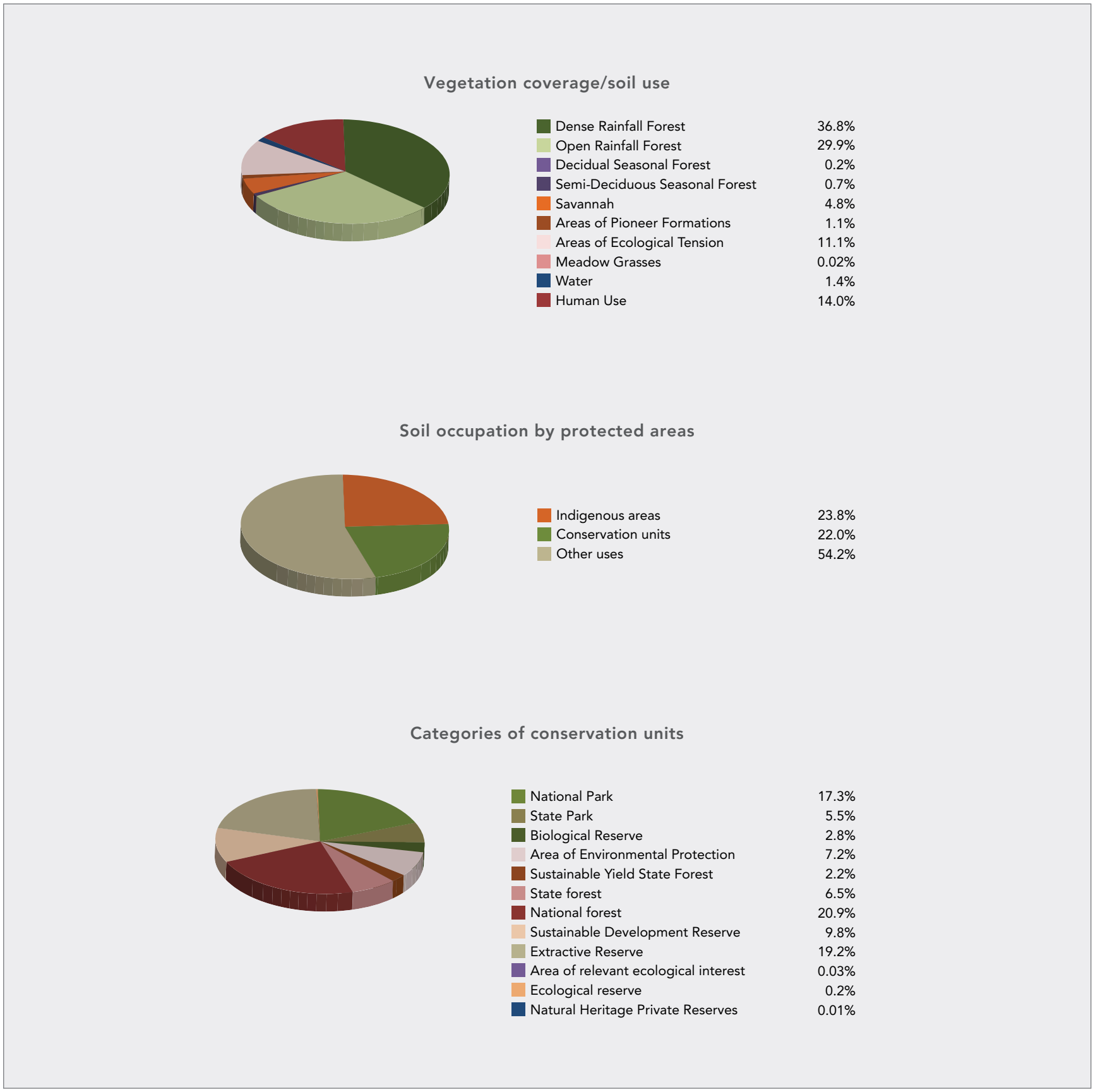
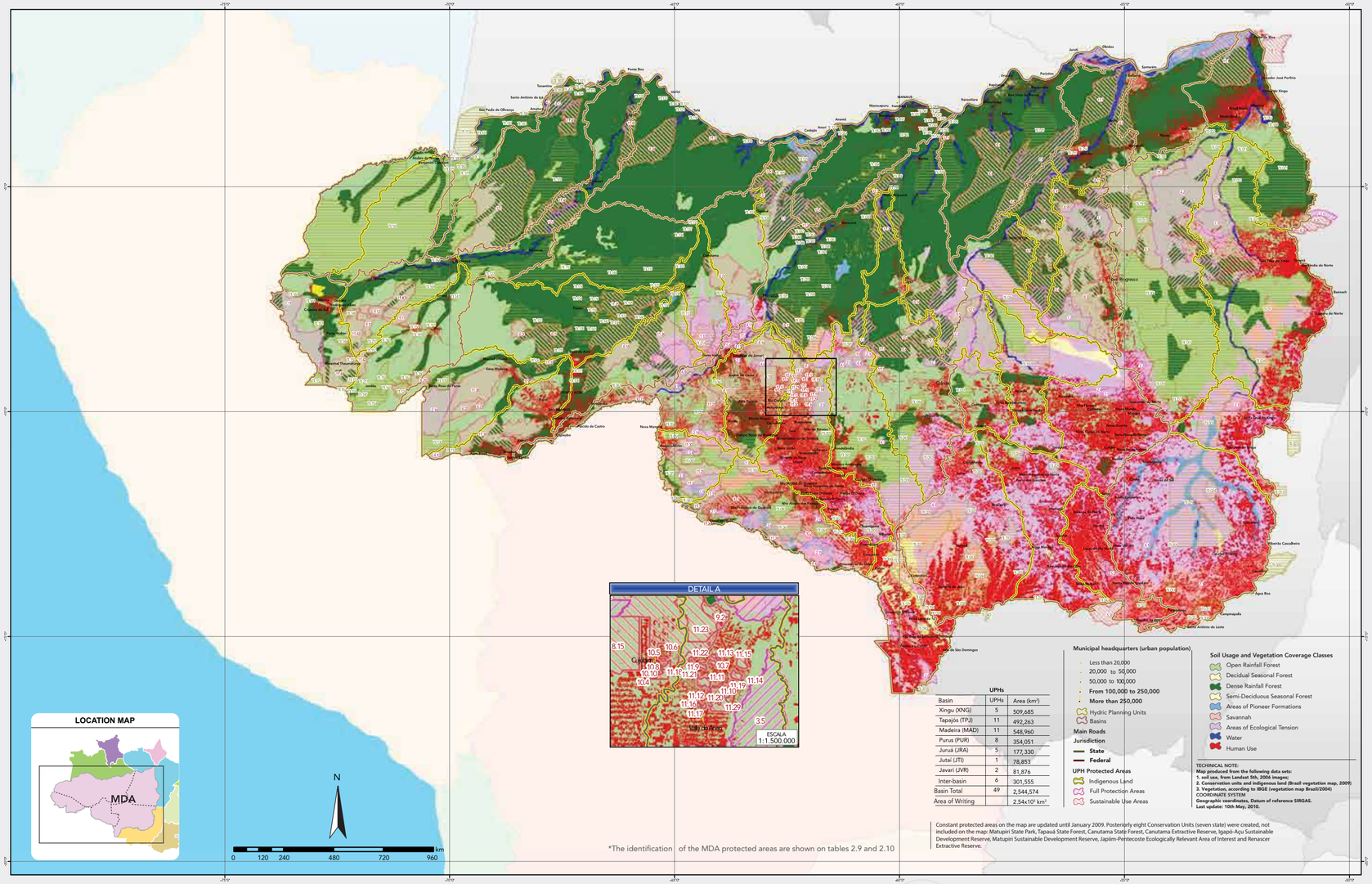


Illustration 2.16 Vegetation cover/soil use in the MDA

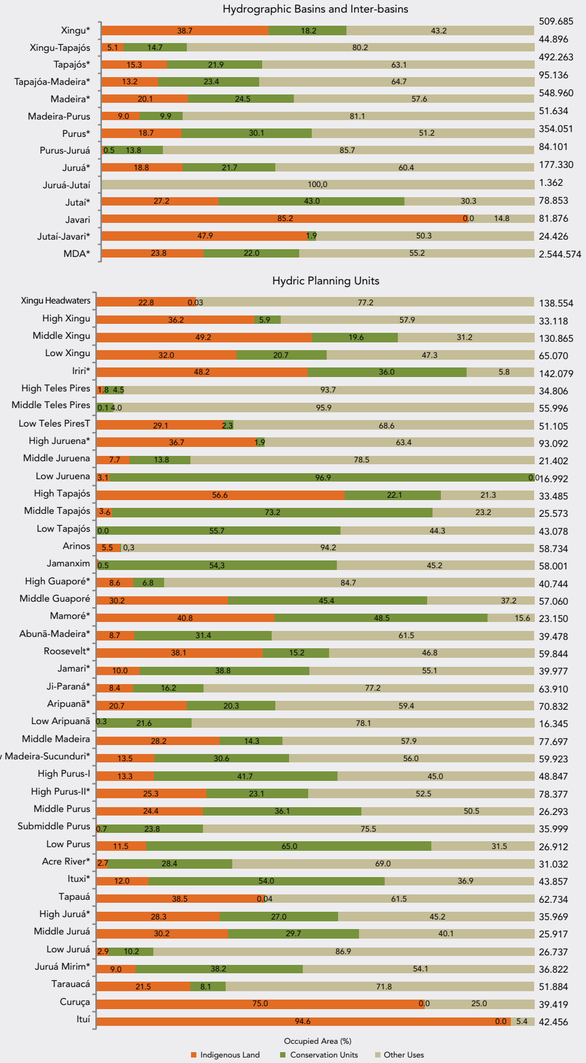


UPHs		
Basin	UPHs	Area (km²)
Xingu (XNG)	5	509,685
Tapajós (TPJ)	11	492,263
Madeira (MAD)	11	548,960
Purus (PUR)	8	354,051
Juruá (JRA)	5	177,330
Jutaí (JTI)	1	78,853
Javari (JVR)	2	81,876
Inter-basin	6	301,555
Basin Total	49	2,544,574
Area of Writing		2.54x10⁶ km²

Constant protected areas on the map are updated until January 2009. Posteriorly eight Conservation Units (seven state) were created, not included on the map: Matupiri State Park, Tapauá State Forest, Canutama State Forest, Canutama Extractive Reserve, Ipapó-Açu Sustainable Development Reserve, Matupiri Sustainable Development Reserve, Japiim-Pentecoste Ecologically Relevant Area of Interest and Renascer Extractive Reserve.

Source: SPR/ANA.

Illustration 2.16 Vegetation and soil used in the MDA



* Hydrographic Basin, inter-basin and Hydric Planning Unit that present UCs and TIs overlap. In these cases the sum of the percentages of each category exceeds 100%.

Table 2.9 Indigenous land present in MDA

Indigenous Land	
Code	Name
Approved and Registered	
Xingu and Xingu-Tapajós	
TI.001	Apyterewa
TI.002	Arara
TI.003	Araweté Igarapé Ipixuna
TI.004	Badjônkôre
TI.005	Batovi
TI.006	Baú
TI.007	Capoto-Jarina
TI.008	Chão Preto
TI.009	Kararaô
TI.010	Kayapó
TI.011	Koatinemo
TI.012	Karuaya
TI.013	Maraiwatsede
TI.014	Marechal Rondon
TI.015	Menkragnoti
TI.016	Paquiçamba
TI.017	Parabubure
TI.018	Paraná
TI.019	Parque do Xingu
TI.020	Pimentel Barbosa
TI.021	Trincheira Bacajá
TI.022	Ubawawe
TI.023	Urubu Branco
TI.024	Wawi
Tapajós and Tapajós-Madeira	
TI.025	Andirá-Marau
TI.026	Apiaká-Kayabi
TI.027	Bakairi
TI.028	Coatá Laranjal
TI.029	Enawenê-Nawê
TI.030	Erikpatsa
TI.031	Escondido
TI.032	Irantxe
TI.033	Japuíra
TI.034	Juininha
TI.035	Menku
TI.036	Munduruku
TI.037	Nambikwara
TI.038	Paresi
TI.039	Pirineus de Souza
TI.040	Rio Formoso
TI.041	Sai-Cinza
TI.042	Santana
TI.043	Tirecatinga
TI.044	Utiariti
Madeira and Madeira-Purus	
TI.045	Apipica
TI.046	Arara do Rio Branco
TI.047	Aripuanã
TI.048	Ariramba
TI.049	Boa Vista
TI.050	Cuia
TI.051	Diahui
TI.052	Fortaleza do Castanho
TI.053	Gavião
TI.054	Igarapé Laje
TI.055	Igarapé Lourdes
TI.056	Igarapé Ribeirão
TI.057	Ipixuna
TI.058	Itaitinga
TI.059	Karipuna
TI.060	Karitiana
TI.061	Kaxarari
TI.062	Kwazá do Rio São Pedro
TI.063	Lago Capanã
TI.064	Lago do Beruri
TI.065	Lago Jauari
TI.066	Lagoa dos Brincos
TI.067	Massaco
TI.068	Miguel/Josefa
TI.069	Natal/Felicidade
TI.070	Nove de Janeiro
TI.071	Padre
TI.072	Pakaá Nova
TI.073	Paracuhuba
TI.074	Parque do Aripuanã

Indigenous Land	
Code	Name
Approved and Registered	
Xingu and Xingu-Tapajós	
TI.075	Patauá
TI.076	Pequizal
TI.077	Pinatuba
TI.078	Pirahã
TI.079	Recreio/São Félix
TI.080	Rio Branco
TI.081	Rio Guaporé
TI.082	Rio Jumas
TI.083	Rio Manicoré
TI.084	Rio Mequéns
TI.085	Rio Negro/Ocaia
TI.086	Rio Omerê
TI.087	Roosevelt
TI.088	Sagarana
TI.089	São Pedro
TI.090	Sararé
TI.091	Sepoti
TI.092	Serra Morena
TI.093	Sete de Setembro
TI.094	Taihantesu
TI.095	Tenharim do Igarapé Preto
TI.096	Tenharim Marmelos
TI.097	Trincheira
TI.098	Torá
TI.099	Tubarão/Latundê
TI.100	Uru-Eu-Eau-Wau
TI.101	Vale do Guaporé
TI.102	Zoró
Purus and Purus-Juruá	
TI.103	Acimã
TI.104	Água Preta/Inari
TI.105	Alto Rio Purus
TI.106	Alto Sepatini
TI.107	Apurinã do Igarapé São João
TI.108	Apurinã do Igarapé Tauamirim
TI.109	Apurinã do Km 124 BR 317
TI.110	Barreira da Missão
TI.111	Boca do Acre
TI.112	Cabeceira do Rio Acre
TI.113	Caititu
TI.114	Camadeni
TI.115	Camicuã
TI.116	Catipari/Mamoriá
TI.117	Deni
TI.118	Guajahã
TI.119	Hi Merimã
TI.120	Igarapé Capanã
TI.121	Igarapé Grande
TI.122	Isla del Camaleón
TI.123	Inauini/Teuini
TI.124	Jaminawa/Envira
TI.125	Jarawara/Jamamadi/Kanamanti
TI.126	Juma
TI.127	Kanamari do Rio Juruá
TI.128	Kumaru do Lago Ualá
TI.129	Lago Aipuá
TI.130	Mamoadate
TI.131	Marajaí
TI.132	Méria
TI.133	Miratu
TI.134	Paumari do Cuniuá
TI.135	Paumari do Lago Manissuã
TI.136	Paumari do Lago Marahã
TI.137	Paumari do Lago Paricá
TI.138	Paumari do Rio Ituxi
TI.139	Peneri/Tacaquiri
TI.140	São Pedro do Sepatini
TI.141	Seruini/Marienê
TI.142	Tumiã
TI.143	Tupã-Sapé
TI.144	Zuruahã
TI.145	Alto Tarauacá
TI.146	Arara/Igarapé Humaitá
TI.147	Cacau do Tarauacá
TI.148	Campinas/Katukina

Code	Name
Approved and Registered	
Juruá and Juruá-Jutaí	
TI.149	Igarapé do Caucho
TI.150	Jaminawá/Arara do Rio Bagé
TI.151	Jaminawá do Igarapé Preto
TI.152	Kampa do Igarapé Primavera
TI.153	Kampa do Rio Amônea
TI.154	Kampa e Isolados do Rio Envira
TI.155	Katukina/Kaxinawá
TI.156	Kaxinawá da Colônia Vinte e Sete
TI.157	Kaxinawá do Baixo Jordão
TI.158	Kaxinawá do Rio Humaitá
TI.159	Kaxinawá do Rio Jordão
TI.160	Kaxinawá Nova Olinda
TI.161	Kaxinawá Praia Carapanã
TI.162	Kaxinawá/Ashaninka do Rio Breu
TI.163	Kulina do Igarapé do Pau
TI.164	Kulina do Médio Juruá
TI.165	Kulina do Rio Envira
TI.166	Mawetek
TI.167	Nukini
TI.168	Poyanawa
TI.169	Vale do Javari
Jutaí, Javari and Jutaí-Javari	
TI.170	Bom Intento
TI.171	Espírito Santo
TI.172	Estrela da Paz
TI.173	Evaré I
TI.174	Evaré II
TI.175	Lauro Sodré
TI.176	Macarrão
TI.177	Nova Esperança do Rio Jandiatuba
TI.178	Rio Biá
TI.179	São Leopoldo
TI.180	Tikuna de Santo Antônio
TI.181	Tikuna Feijoal
TI.182	Tikuna Porto Espiritual
TI.183	Vui-Uatá-In
Homologated	
Madeira and Madeira-Purus	
TI.184	Cunhã-Sapucaia
Purus and Purus-Juruá	
TI.185	Itixi Mitari
Jutaí, Javari and Jutaí-Javari	
TI.186	São Francisco do Canimari
TI.187	São Sebastião
Declared	
Xingu and Xingu-Tapajós	
TI.188	Arara da Volta Grande do Xingu
TI.189	Cachoeira Seca do Iriri
TI.190	Pequizal do Naruvôtu
TI.191	Xipaya
Tapajós and Tapajós-Madeira	
TI.192	Kaiabi
TI.193	Manoki
TI.194	Uirapuru
Madeira and Madeira-Purus	
TI.195	Lago do Marinheiro
TI.196	Setemã
TI.197	Tabocal
TI.198	Tenharim Marmelos (Gleba B)
Purus and Purus-Juruá	
TI.199	Apurinã do Igarapé Mucuím
TI.200	Banawá
TI.201	Riozinho do Alto Envira
Jutaí, Javari and Jutaí-Javari	
TI.202	São Domingos do Jacapari e Estação
Identified/Approved	
FUNAI/Subject to complaint	
Xingu and Xingu-Tapajós	
TI.203	Kawahiva do Rio Pardo
Tapajós and Tapajós-Madeira	
TI.204	Batelão
TI.205	Ponte de Pedra
Madeira and Madeira-Purus	
TI.206	Arary
TI.207	Portal do Encantado

Indigenous Land	
Code	Name
Approved and Registered	
Xingu and Xingu-Tapajós	
Purus and Purus-Juruá	
TI.208	Cajuhiri Atravessado
Juruá andJuruá-Jutaí	
TI.209	Arara do Rio Amônia
TI.210	Rio Gregório
Indigenous domain	
Juruá	
TI.211	Kaxinawá Seringal Independência
Reserved/Registered SPU	
Xingu	
TI.212	Terena Gleba Iriri
Wood usage restriction	
TI.213	Tanaru
Purus and Purus-Juruá	
TI.214	Jacareúba/Katawixi
Demarcated by INCA	
Tapajós	
TI.215	Praia do Índio
TI.216	Praia do Mangue
On Identification	
Xingu and Xingu-Tapajós	
TI.217	Ikpeng
TI.218	Juruna do Km 17
TI.219	Kapotnhinore
TI.220	Pacajá
TI.221	Pimental
TI.222	Rio Arraias
TI.223	Taquara
Tapajós and Tapajós-Madeira	
TI.224	Aningalzinho
TI.225	Baixo Tapajós
TI.226	Baixo Tapajós II
TI.227	Borari de Alter do Chão
TI.228	Bragança
TI.229	Brinco das Moças
TI.230	Cobra Grande
TI.231	Estação Parecis
TI.232	Km 43
TI.233	Marituba
TI.234	Mirixipi
TI.235	Muratuba do Pará
TI.236	Nova Vista
TI.237	Rio Maró
TI.238	São João
TI.239	São Luis do Tapajós
Madeira and Madeira-Purus	
TI.240	Capivara
TI.241	Guapenu
TI.242	Igarapé Paiol
TI.243	Jauary
TI.244	Lago do Limão
TI.245	Lago Grande
TI.246	Muratuba
TI.247	Murutinga
TI.248	Pacovão
TI.249	Picina
TI.250	Ponciano
TI.251	Puroborá
TI.252	Rio Muqui
TI.253	Tracajá
TI.254	Vista Alegre
Purus and Purus-Juruá	
TI.255	Caiapucá
TI.256	Jamamadi do Lourdes
TI.257	Jaminawa da Colocação São Paulino
TI.258	Jaminawa do Guajará
TI.259	Jaminawa do Rio Caeté
TI.260	Lago do Barrigudo
TI.261	Machineri do Seringal Guanabara
Juruá and Jutaí-Javari	
TI.262	Guanabara
TI.263	Kaxinawá do Seringal Curralinho
TI.264	Nawa
TI.265	Riozinho
TI.266	Sururuá

Chart 2.10 Conservation Units present in MDA

Code	Name	Code	Name
National Park		State Forest	
1.1	Sierra del Prado	9.1	Laranjeiras
1.2	Rio Novo	9.2	Rio Preto-Jacundá
1.3	Jamanxim	9.3	Iriri
1.4	Amazônia	9.4	Maués
1.5	Juruena	9.5	Apuí
1.6	Campos Amazônicos	9.6	Aripuanã
1.7	Pacaás Novos	9.7	Sucunduri
1.8	Sierra de la Cutia	9.8	Manicoré
1.9	Nascente do Lago Jari	9.9	Antimari
1.10	Mapinguari	9.10	Liberdade
1.11	Sierra del Divisor	9.11	Rio Gregório
State Park		9.12	Mogno
2.1	Xingu	Sustainable Yield State Forest	
2.2	Sucunduri	10.1	São Domingos
2.3	Igarapé do Juruena	10.2	Rio Mequéns
2.4	Cristalino I	10.3	Rio Roosevelt
2.5	Cristalino II	10.4	Tucano
2.6	Santa Bárbara	10.5	Periquitos
2.7	Tucumã	10.6	Gavião
2.8	Serra del Parecis	10.7	Cedro
2.9	Candeias	10.8	Araras
2.10	Guariba	10.9	Rio Machado
2.11	Serra de Ricardo Franco	10.10	Mutum
2.12	Serra do Reis	10.11	Rio Abunã
2.13	Serra do Reis A	10.12	Rio Vermelho-A
2.14	Guajará-Mirim	10.13	Rio Vermelho-B
2.15	Corumbiara	10.14	Rio Vermelho-C
2.16	Chandless	10.15	Rio Vermelho-D
Biological Reserve		10.16	Rio Madeira-A
3.1	Tapirapé	10.17	Rio Madeira-B
3.2	Nascente da Serra do Cachimbo	10.18	Rio Madeira-C
3.3	Traçadal	Extractive Reserve	
3.4	Rio Ouro Preto	11.1	Verde para Sempre
3.5	Jaru	11.2	Rio Xingu
3.6	Guaporé	11.3	Rio Iriri
3.7	Abufari	11.4	Riozinho do Anfrísio
Ecological Station		11.5	Tapajós-Arapiuns
4.1	Rio Ronuro	11.6	Lago do Cuniã
4.2	Terra do Meio	11.7	Guariba/Roosevelt
4.3	Rio Flor do Prado	11.8	Guariba
4.4	Rio Roosevelt	11.9	Sucupira
4.5	Rio Madeirinha	11.10	Seringueiras
4.6	Samuel	11.11	Roxinho
4.7	Iquê	11.12	Piquiá
4.8	Sierra de lo Tres Hermanos	11.13	Mogno
4.9	Ântonio Mujica Nava	11.14	Massaranduba
4.10	Rio Acre	11.15	Maracatiara
4.11	Cuniã	11.16	Jatobá
4.12	Jutaí-Solimões	11.17	Itaúba
Environmental Protection Area		11.18	Ipê
5.1	Triunfo do Xingu	11.19	Garrote
5.2	Salto Magessi	11.20	Freijó
5.3	Cabeceiras do Rio Cuiabá	11.21	Castanheiras
5.4	Tapajós	11.22	Angelim-Jequitibá
5.5	Lago do Cuniã *	11.23	Rio Preto-Jacundá
5.6	Rio Madeira	11.24	Pedras Negras
5.7	Igarapé do São Francisco*	11.25	Rio Pacaás Novos
5.8	Lago Amapá *	11.26	Curralinho
Area of Relevant Ecological Interest		11.27	Rio Jaci-Paraná
6.1	Seringal Nova Esperança	11.28	Estadual Rio Cautário
6.2	Javari-Buriti	11.29	Aquariquara
Ecological Reserve		11.30	Rio Ouro Preto
7.1	Culuene	11.31	Federal do Rio Cautário
7.2	Apiacás	11.32	Barreiro das Antas
National Forest		11.33	Catuá-Ipixuna
8.1	Caxiuanã	11.34	Lago do Capanã Grande
8.2	Tapirapé-Aquiri	11.35	Purus Medio
8.3	Itacaiunas	11.36	Ituxi
8.4	Pau-Rosa	11.37	Arapixi
8.5	Crepori	11.38	Cazumbá-Iracema
8.6	Amaná	11.39	Chico Mendes
8.7	Jamanxim	11.40	Rio Gregório
8.8	Tapajós	11.41	Bajo Juruá
8.9	Itaituba I	11.42	Alto Tarauacá
8.10	Itaituba II	11.43	Riozinho da Liberdade
8.11	Trairão	11.44	Alto Juruá
8.12	Altamira	11.45	Rio Jutaí
8.13	Humaitá	11.46	Juruá Medio
8.14	Jatuarana	Sustainable Development Reserve	
8.15	Jamari	12.1	Bararati
8.16	Jacundá	12.2	Juma
8.17	Bom Futuro	12.3	Rio Madeira
8.18	Iquiri	12.4	Rio Amapá
8.19	Purus	12.5	Canumã
8.20	Mapiá-Inauini	12.6	Aripuanã
8.21	Balata-Tufari	12.7	Piagaçu-Purus
8.22	Macauã	12.8	Uacari
8.23	São Francisco	12.9	Cujubim
8.24	Tefé		
8.25	Santa Rosa do Purus		

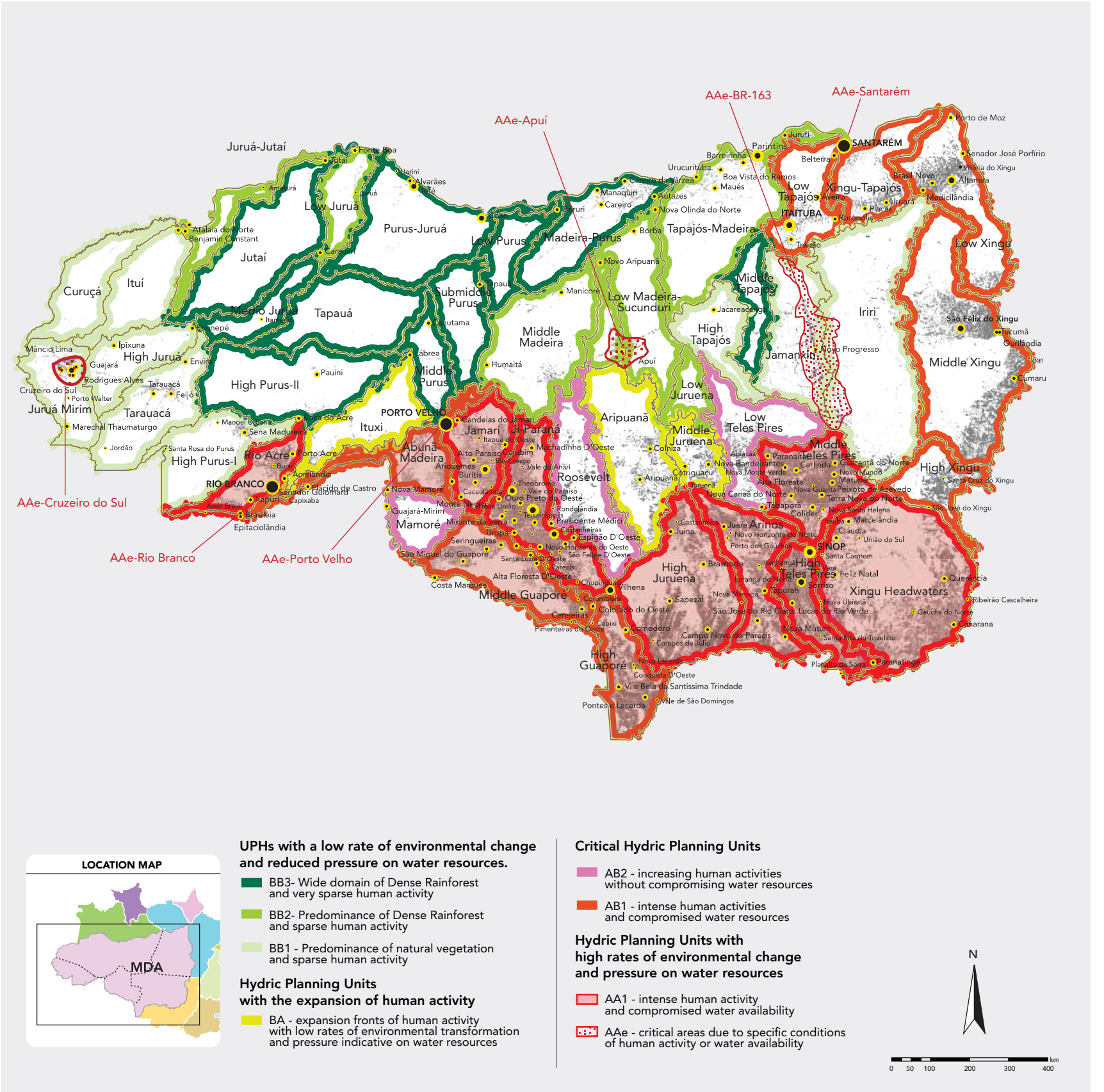
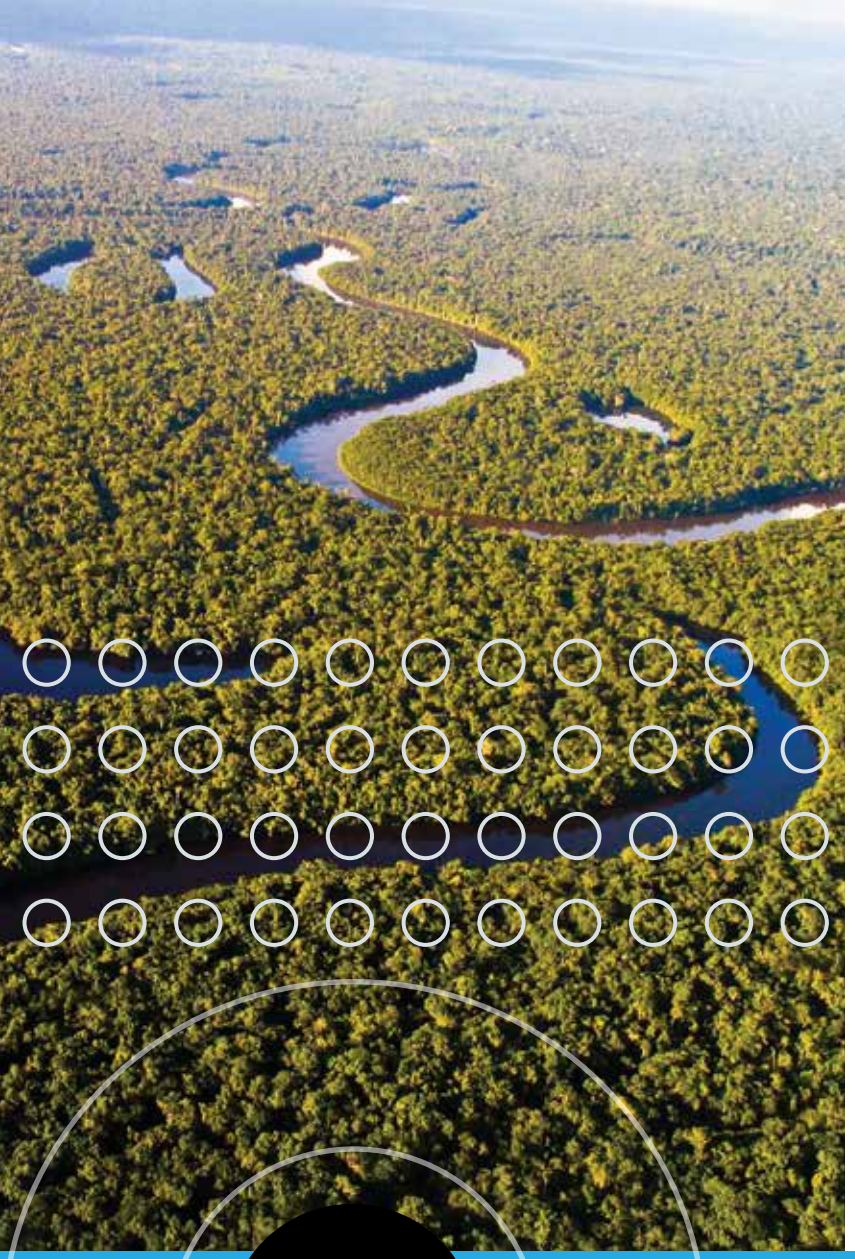


Illustration 2.17 Integrated diagnosis of the MDA - Classification of the UPHs for water resources management

Amazon River - Strait of Breves - PA - Rui Faquini/ANA Image Bank



3

GOALS AND LINES OF ACTION FOR WATER RESOURCES USE BASED ON THE DIAGNOSIS AND SCENARIOS OF THE PERH-MDA

The Amazon attracts great national and worlwide attention. However, much is left to be discovered and understood regarding its functioning, its natural resources and the existing biodiversity. Structural interventions will demand meticulous studies to certify that its environmental impacts are acceptable and define what mitigating/compensatory actions will be implemented.

Despite the land properties issue being the most acute problem in the Amazon today – deforestation and forest fires being two of its more threatening faces – there is a population that experiences the State absence and lack of opportunities, which requires a response from the government defining its policies in Brazilian Amazon territory.

This chapter weaves commentaries about the most relevant aspects of the third stage of the PERH-MDA content, which deals with the following basic elements:

- Goals;
- Interventions and Investments, organized in programs;
- Guidelines for management instruments;
- Recommendations for users;
- Institutional Agreement;
- Plan Implementation.

3.1 GOALS, STRUCTURING OF THE INTERVENTIONS AND INVESTMENTS

For being the first water resource plan for the region, a number of interventions were proposed (actions numbered in 17 programs and 58 subprograms) to meet the needs identified in the Diagnosis and Scenarios of the PERH-MDA. They were allicated according to each case, in one of the Plan components (illustration 3.1 and appendix 5).

The components of the plan are:

- Component A – consisting of non-structural actions directed to the water resources management, planning and studies. Component A is composed of eight programs and 25 sub-programs.
- Component B – consisting of structural actions involving studies, projects and works necessary for the utilization of water resources. Component B is composed of three programs and 14 sub programs.
- Component C – consisting of actions directed towards applied research activities. The component C is composed of nine programs and 19 sub-programs.

The latter component is outstanding because of the uniquiness among water resource plans of hydrographic basins. However, it is justified by the large gaps and discontinuities of the knowledge regarding Amazon water resources and ecosystems, by prevailing biogeochemical processes in these ecosystems and their susceptibility to natural or artificially imposed disturbances; by the dimension and diversity of the Amazon; by the decisions to be made and by the numerous opportunities that must exist, but cannot be fully assessed. Without getting paralyzed, the PERH-MDA identifies in this component, to be conducted by a pool of actives scientists in Amazon region, the engine for its further investigation and its future revisions.

Component B meets the basic and executive structural projects, environmental sanitation works and water infrastructure as well as related services.

Component A is the most important for the success of the PERH because it includes all the actions for water resources management.

COMPONENT A NON STRUCTURAL ACTIONS	COMPONENTE B STRUCTURAL ACTIONS	COMPONENT C SCIENCE AND TECHNOLOGY
PROGRAM A1 Implementation and Operation of Water Resources Management Institutional Arrangement	**PROGRAM B1** Studies and Projects related to the Infrastructure and Environmental liabilities with impact over water resources	**PROGRAM C1** Identification and characterization of the Amazonian Aquatic Ecosystems
PROGRAM A2 Institutional Development-Reinforcement of Water Resources Management Organs	**PROGRAM B2** Environmental Sanitation	**PROGRAM C2** Major Biogeochemical Cycles Studies
PROGRAM A3 Technical Basis for Management	**PROGRAM B3** Water Infrastructure works and services	**PROGRAM C3** Impacts of Global Climate Change over Water Resources Availability Studies
PROGRAM A4 Water Resources Planning		**PROGRAM C4** Developing studies and qualitative and quantitative research about groundwaters
PROGRAM A5 Implementation of Water Resources Management Tools.		**PROGRAM C5** Applied Studies in Aquaculture and Fisheries
PROGRAM A6 Articulation and Compatibility of the PERH-MDA with actions and sectorial plans for rational and multiple use of water resources		**PROGRAM C6** Applied studies in basic sanitation for riverside population
PROGRAM A7 Management of border and transboundary water resources located on the southbank of the Amazon River		
PROGRAM A8 Environmental Education and Social Communication		

Observation: See Appendix 5 for a complete relation of the programs and its subprograms.

Illustration 3.1 Structuring of Proposed Interventions on the PERH-MDA

Appendix 5 of this document reunites, as a summary table, the programs and subprograms of the Plan, with contents, range, objectives, goals, actions, investments, main possible resources sources and executors.

In the framework of every component, each one of the programs and subprograms is described by using data sheets that enclose the following information:

- Summary Technical Files of the Programs: background, justifications, objectives, organization of sub-programs and cost estimates.
- Summary Technical Files of the Programs: background, justifications, objectives, scope, approach, guidelines and / or recommendations for the development of the subprograms, actions, cost estimates, main sources, executor, articulation with programs and subprograms of the PERH-MDA, PNRH and other applicable water resources plans , besides the goals.

The Plan actions will be implemented progressively, according with horizons 2020 and 2030.

The estimated investment necessary to implement the PERH-MDA, until 2030 is about 103.2 billions of Brazilian real, this amount includes all the hydropower ventures of the electrical sector envisaged in the 10 year Plan of Energy Expansions 2019 as well as the navigation sector, so that it is possible to have an integrated vision of all the interventions that might take place in the MDA. In case that any of these planned enterprises does not get to obtain the permits required or that any of this enterprises is not executed, for any reason, the amount designated for investment will be reduced proportionally.

Table 3.1 presents, by component, the summary of those investments.

Table 3.1 Summary of the planned investments for the PERH-MDA implementation, by component

Component	Estimated Costs (R$)
Total Amount	103,193,957,219.00
A - Non-Structural actions	137,979,700.00
B - Structural actions	102,942,137,519.00
C - Science and technology	113,840,000.00

Illustration 3.2 allows to evaluate the participation of each interventions component in the total of the planned investments. Due to the absolute preponderance of Component B, it was divided into three programs, evidencing that the electrical sector must make accountable for the 93.71% of the total PERH-MDA investments.

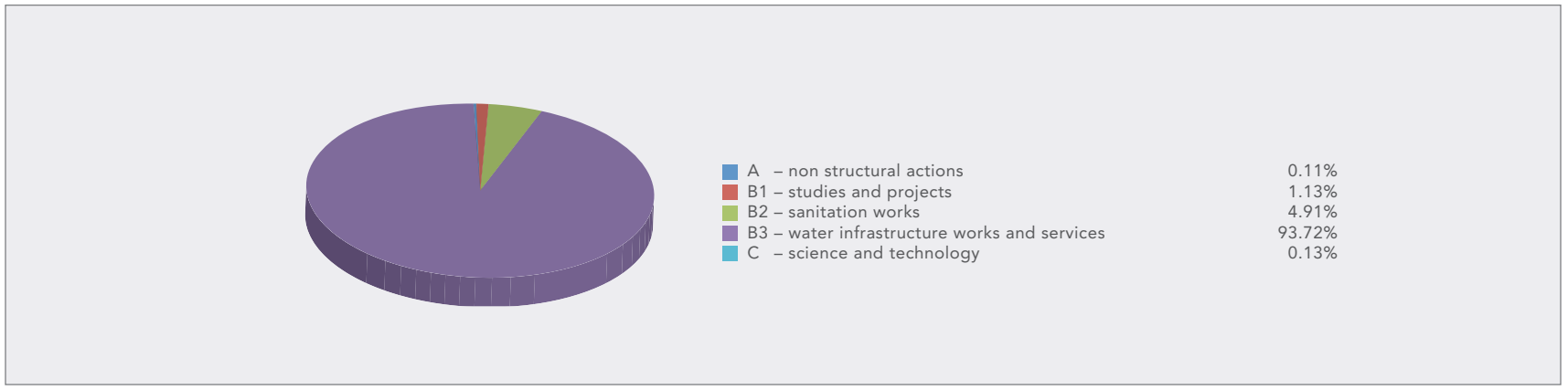


Illustration 3.2 Percentage distribution of total investment planned for the PERH-MDA implementation by component

3.2 INTERVENTIONS AND RECOMMENDATION TO THE DIFFERENT USERS

Studies conducted in the PERH-MDA indicate that for set of interventions proposed by the Union, in partnership with state government, local governments and regulatory agencies, the actions that deserve recognition and promotion are those aimed at:

- Environmental sanitation;
- Extreme events forecast;
- Waterways transport (navigation);
- Energy Generation;
- Irrigation;
- Fisheries and aquaculture;
- Water bodies surveillance;
- Institutional development;
- Interinstitutional articulation;
- Transboundary rivers;
- Environmental education.

In the sequence, these actions will be briefly discussed, highlighting that some of them reach multiple competition and therefore, their full development should mobilize and interest many stakeholders.

3.2.1 Environmental sanitation

It includes actions aimed at ensuring the water supply, the collection, removal and sewage treatment, the adequate final solid waste disposition and urban drainage measures originated in two - individualized programs of component B: structural actions focused on the development of projects to allow national services and relevant works and the other one related to the implementation of these works and services.

PERH-MDA inventoried water supply systems needs, sewage and solid waste collection and disposal, identifying the necessary investments to meet the following goals:

- Coverage of water supply and sewage systems in urban areas:
  - in 2020: goal of 1.5 times current levels, having a minimum of 45% coverage, and;
  - in 2030: goal of 2.25 times current levels, having a minimum of 90% coverage.
- Water treatment in urban areas: 100% of water distributed.
- Sewage treatment: 100% of sewage collected.

With that, it offers a reference for municipalities and institutions in charge of those services in order to organize their investment sectors. Illustrations 3.3 and 3.4 show the expected benefits of the basic sanitation measures advocated by PERH-MDA to the water quality in normative scenario in the UPHs (in which the coverage of sewage treatment rises from present modest levels to a minimum of 90% of the sewage collected at the end of plan).

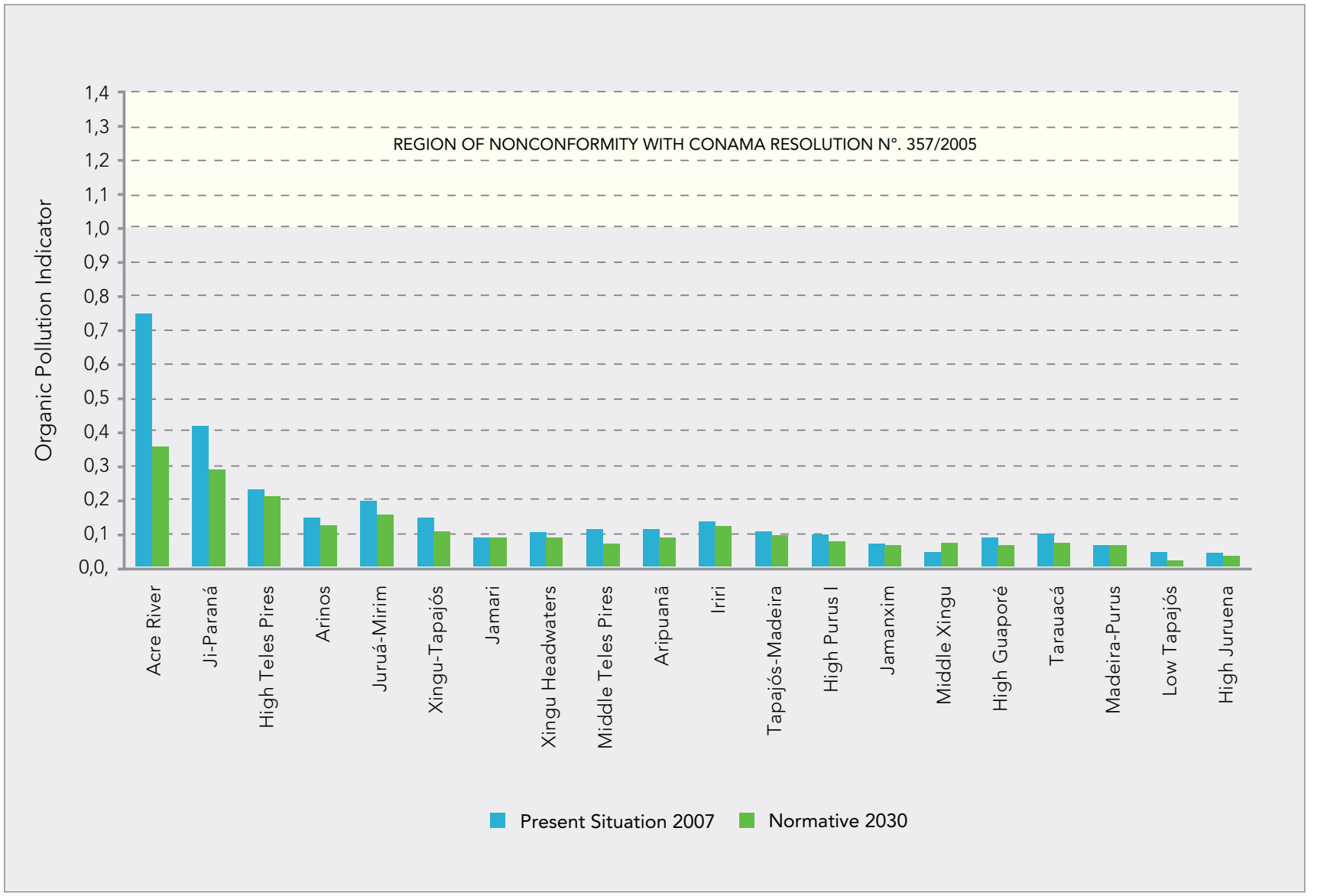


Illustration 3.3 UPHs with Organic Pollution Indicator – IPO

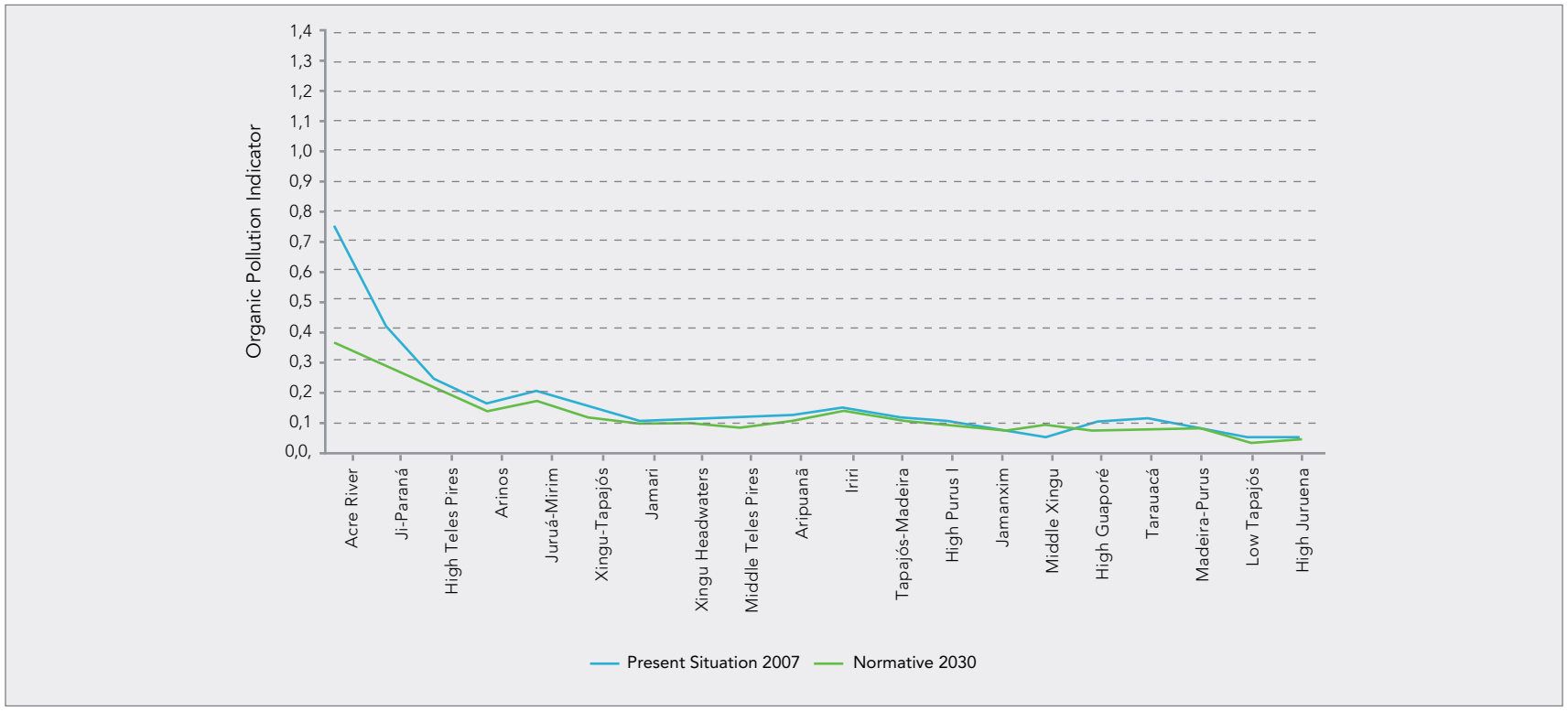


Illustration 3.4 UPHs with Organic Pollution Indicator – IPO

Municipalities or municipal consortia must be trained to plan, implement, operate and maintain environmental sanitation systems (water supply, sanitary sewer, collection and solid waste disposal). Such services may be made either directly or by concession, in which municipalities should be able to supervise and monitor them.

In the case of small prefectures which cannot afford to keep staff to meet sanitation services required or without capacity to invest in the sector , the State and the ministries involved must act:

- To evaluate technical capacity of municipalities and investment, identifying those which need state/federal support.
- To create a program of support and training to make sure that theses municipalities have their sanitation system implemented and able to operate in satisfactory condition.

In this sense, the Atlas of Urban Supply of Metropolitan and Brazilian Areas covers all municipalities in the MDA and provides a starting platform for these initiatives, since it identifies watersheds, catchment and water supply needs in relation to current systems, including preliminary budgets.

In the case of rural populations, especially the riverside and traditional commmunities, the Plan provides a special program of component C - Science Technology and Innovation, to search for innovative solutions tailored to wetlands in the region.

The PERH-MDA proposes the establishment of sewage sanitation systems, with sewage treatment, preferably at the secondary level, in all municipalities, avoiding the release of raw sewage in small rivers and streams whose assimilative capacity is reduced. Other options for sewage treatment should be evaluated in the municipalities identified as critical in scenarios made.

For rural populations, the Plan recommends encouraging the construction of septic tanks and sinks where local conditions permit. Studies specific to these populations consist of program included in the component C.

In the final disposal of solid waste must be selected sites with suitable geological and topographical conditions and make sure the "manure" does

not compromise the water courses. The direct release of solid waste in waterbodies should not be allowed under any circumstances.

For urban drainage structural actions, the PERH-MDA provides competitive fund for which the municipalities must compete with their projects. The responsible municipal secretaries must not allow the sewage release in the rain drainage system.

3.2.2 Extreme Events Forecast

Floods and droughts occur throughout the Amazon, with repercussions on person's lifes and properties, State services provided, navigation and fuel supplies, medicines or drinking water supplies, as well as the displacement of people. In all cases, it is necessary to implement on a flood and drought forecasting and warning besides a climatological forecast system that guide actions intended to prepare the population, prevent the effects, monitor the events, evolution by managing them properly, to minimize consequences.

Forecasting systems of this sort already exist in the Amazon such as the systems of Manaus (Amazon River), Porto Velho (Rio Madeira) and Rio Branco (Acre River). The PERH-MDA identifies the need for such plans to extended and cover other Amazon basins where such events are recorded with recurrence, besides evaluating the resources required to do so.

3.2.3 Water Transportation

In the Amazon, the rivers are the main ways of transport, operating as "liquid highways." Along them there are great movement of people and goods otherwise they could only reach many cities by air.

There is great expectation for the formulation and implementation of a new national policy for the inland navigation development in the Amazon, according to the directions of the National Transportation and Logistics Plan - PNLT and focus directed to:

- Enhancement of waterways, providing them with modern facilities traffic, security systems and inland navigation protection.
- People Transportation.
- Modernization and development of the Amazonian shipbuilding industry, making it the reference in inland and able to generate and export technology.
- Amazon fleet modernization, particularly in terms of equipment navigation.
- Expansion and improvements in port infrastructure, especially the network of Amazonian cities located along the main rivers.
- Training and professional development of crew members navigating in the Amazonian rivers, in order to increase their efficiency and technical quality.
- Development of specialized courses and graduation in marine engineering in the Amazon.
- Strengthening the presence of Brazilian Navy in the Amazon rivers and supervision of regulatory agencies responsible for the sector and for water resources (as to specific and competing uses, respectively).

In the case of PERH-MDA, this water plan supports as priorities:

- Implementation of the waterways of the Tapajós-Teles Pires, taking advantage the construction of hydroelectric plants to be built or already existing[12].
- Improvements in the Madeira waterway [13].

These priorities establish the need for an intense articulation of the electrical and navigation sectors, with mediation of the ANA and the intervening of the National Agency of Electrical Energy - ANEEL.

3.2.4 Energy Generation

The energy sector plans to run a significant number of enterprises in the MDA, and is supposed to be the sector that holds more investments in the region. The PDE 2010-2019 lists a series of them, whose conclusions are scheduled for the period 2010 to 2020, totaling 32,416 MW. Appendix 4 lists these works, reporting on power,

[12] Included in a program of the PERH-MDA
[13] Works for improvement of Madeira waterway and Tapajós River between Santarem and Itaituba listed on the Growth Acceleration Program 2 - PAC 2.

location, status, prediction of generation beginning, area of reservoirs and relation installed power per reservoir area (MW/km²). It should be noted that the figures presented there may vary, since the designs are still on progress.

The works envisaged in PDE 2010-2019 may represent more than 70 billion dollars of direct investments in the region from private sources and governmental. Only UHE Belo Monte, according to calculations made by the Energy Research Company - EPE, represent about 19 billion of Brazilian reais.

Thus, considering that the power sector will still run two major inventories in MDA region and other basins that form the left bank of the Amazon Basin, it is recommended to intensify the dialogue on development criteria of the hydroelectric potential of rivers in the region and its application to inventories.

3.2.4.1 The Xingu River Basin and the Belo Monte Hydroelectric Plant

The National Energy Council - CNPE, through Resolution No. 6, July 3, 2008, decided that Xingu River Basin would have only one hydroelectric plant, Belo Monte, with 11,233 MW of installed capacity. The plant will occupy part of the area of five municipalities in Pará (Altamira, Anapu, Brasil Novo, Senator Jose Porfirio and Vitória Xingu). Altamira is the most developed and has the largest population among these cities, with 98,000 inhabitants. The remaining municipalities have between 10,000 and 20,000 inhabitants.

The project has already been auctioned, and entrepreneurs have begun the works. It is about an hydroeletric use that will have important economic and social impact on the region and strong resistance from indigenous peoples, the Catholic Church (Indigenous Missionary Council - CIMI), environmental organizations, being expected demonstrations in the most critical phases of construction (mobilization of the contractor, the river diversion, reservoir filling and the beginning of the generation).

3.2.4.2 Tapajós Basin

In the basin was identified exploitations with a total potential of 17,898 MW (considering only the exploitations located in the Tapajós, Apiacás, Teles Pires and Jamanxim rivers since the Juruena found himself under approval of hydroelectric inventory by Aneel) and 14,509 MW are planned in PDE 2019.

The exploitations located in Teles Pires River began to be auctioned in the year 2010, since the completion of the feasibility studies and obtaining of environmental permits.

While making the PERH-MDA, whose basic premise is the consideration of water resources multiple use, the ANA has identified that the electrical and water transport sector were developing their plans without integrating them.

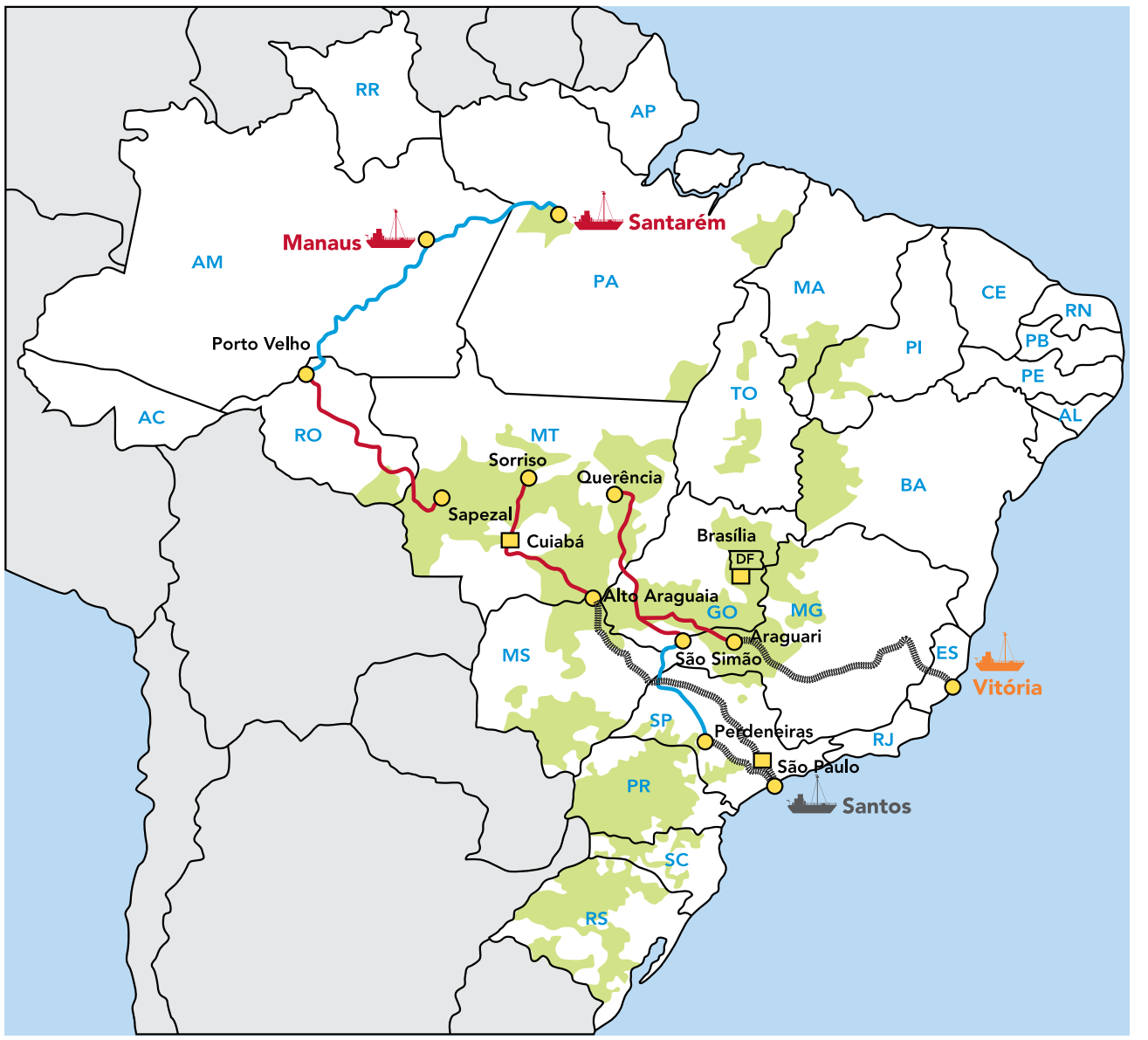
During the preparation of the Plan diagnosis it was demonstrated the following situation at Tapajós River Basin:

- Two water resources users sectors planned hydroelectric uses in the same river, independently of each other.
- The two sectors operate under different schedules of project implementation, which also are at different stages of study.
- A sector could benefit from the initiatives of others, but differ regarding the costs responsibility to be incurred and about schedules deployment of the respective works.
- Fundamental to the implementation of the waterway is the construction of hydropower uses inventoried in the Tapajós and Teles Pires rivers.
- Reciprocally, some benefits offered by the waterway (reduced consumption of nonrenewable fossil fuels per unit of cargo transported and relief of pressure on the highways of the region) are of interest for environmental management and may represent positive impacts resulting from the construction of hydroeletric plants, possibly offsetting other negative.
- The Ministry of Agriculture has declared his interest in the waterway (predicted in the National Plan for Transportation and Logistics - PNLT) for transporting the grain harvest from the state of Mato Grosso, now in the order of approximately 16 million tons per year. Nowadays, it is held by the Port of Santos and Paranagua and, from there by sea route, to the Northern Hemisphere, what inflates the cost of the product at $113 per tonne at the Port of Paranaguá, compared to the same product originating in Ponta Grossa, Parana. The current disposal routes of soy production in Mato Grosso for the Northern Hemisphere causes that the production of the Teles Pires River Basin, besides traveling a terrestrial distance greater than it would traveled if it took the North, has to sail five days longer to reach the equator (Illustration 3.5).

• The ANA recommended that the feasibility studies of hydropower plants in the Tapajós and Teles Pires rivers include locks, in which was attended by Aneel and that transportation sector should promote the feasibility study of the waterway. The Colíder UHE was already auctioned and the others hydroelectric plants in Teles Pires River begin their cycle of licensing and approvals to include locks on their general arrangements. Now it is imperative to synchronize the planning sector (energy and navigation) and overcome the institutional and economic difficulties to secure and consolidate a common strategy so that the transposition level works are executed at the right time and waterway may be constructed once demonstrated its viability;

• The UHE São Luiz, Tapajós River, is essential to the operation of the Tapajós-Teles Pires waterway (Figure 3.6);
• The UHE Chacorão, at Tapajós River, will overflow 121.37 km ² of the Indigenous Land Munduruku (0.5% of its total area and 19.7% of the reservoir of the UHE).

Appendix 4 provides a list of projects in operation and feasibility studies of hydropower plants under construction or about to initiate in the MDA.



Source: PNLT/MT

Illustration 3.5 Present Routes flow of grain production in the state of Mato Grosso

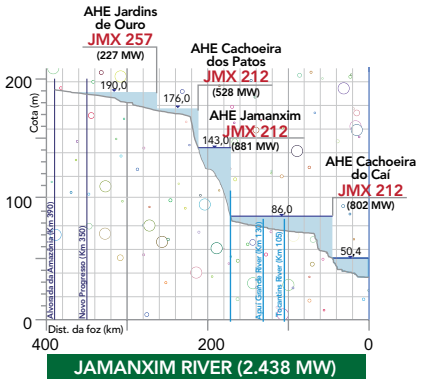
HYDROPOWER USE OF TAPAJÓS, TELES PIRES, JAMANXIM AND APIACÁS RIVER

Teles Pires

Utilization	N.A. Maximum Upstream Level	N.A. Downstream Level	Power Installed [MW]	Reservoir Area km²
Magessi	358.0	341.0	53	60.0
Sinop	300.0	268.5	461	329.6
Colider	268.5	244.7	342	123.3
Teles Pires	220.0	161.0	1,820	123.4
São Manoel	161.0	136.6	746	53.0

Apiacás

Utilization	N.A. Maximum Upstream Level	N.A. Downstream Level	Power Installed [MW]	Reservoir Area km²
API-006	185.0	140.2	275	68.7

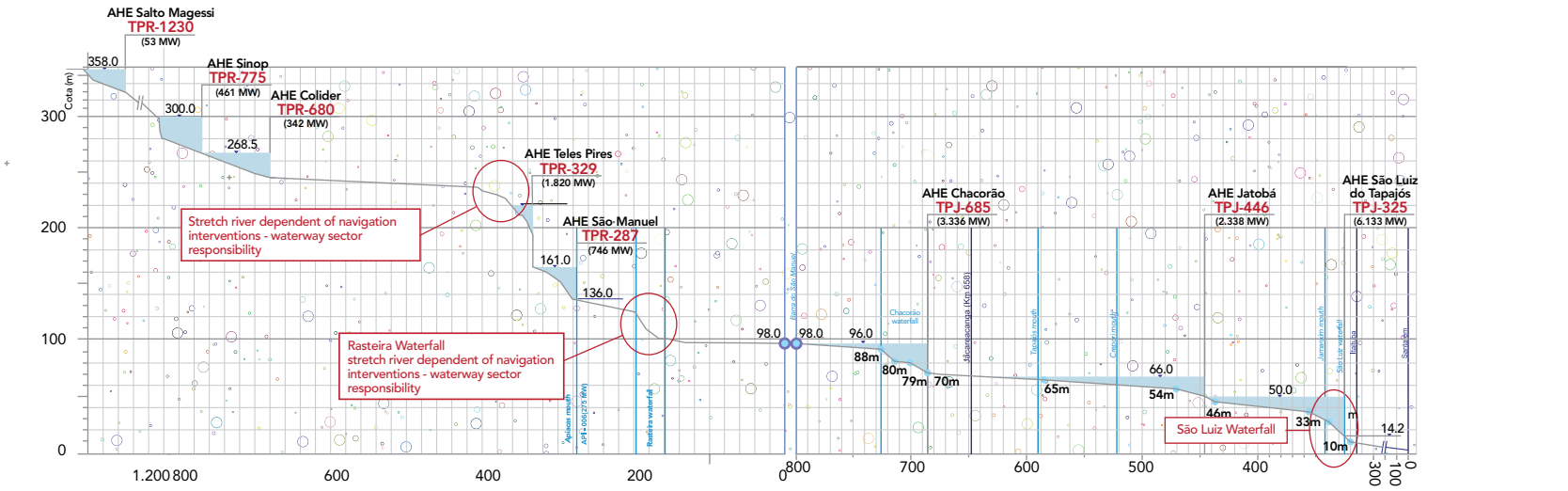


Tapajós

Utilization	N.A. Maximum Upstream Level	N.A. Downstream Level	Power Installed [MW]	Reservoir Area km²
Chacorão	96.0	71.9	3,336	616.2
Jatobá	66.0	50.0	2,338	646.3
São Luiz do Tapajós	50.0	14.2	6,133	722.2

Jamanxim

Utilization	N.A. Maximum Upstream Level	N.A. Downstream Level	Power Installed [MW]	Reservoir Area km²
AHE Cachoeira do Caí	85.4	50.4	802	420.0
AHE Jamanxim	143.0	85.4	881	74.4
AHE Cachoeira dos Patos	176.0	143.0	528	116.5
AHE Jardins de Ouro	190.0	176.0	227	426.1



Furnas, Eletrobrás/ Engevix **Hydroelectric Inventory of the Teles Pires.** (2005) and Eletronorte - CCCC. **Inv, and Tapajós rivers Hydroelectric Jamanxim**. (2008), EPE (2008).
San Manuel and Teles Pires: Phase III of the feasibility study - surveys, basic studies and alternatives (EPE presentation, 10/28/08).
Locks on the Teles Pires, chambers of 34 x 210m, Locks in the Tapajós, chambers of 44 x 330m. Draft of 3.5 m. (Data provided by MT in 2008).

Illustration 3.6 Longitudinal profile of the Tapajós and Teles Pires rivers with the location and information about navigation and power generation

3.2.4.3 Madeira basin

It is the hydrographic basin whose utilization of hydroelectric potential is advanced, due to construction of Jirau hydropower plants (3450 MW) and Santo Antônio (3,150 MW), with generation planned for 2012. Jirau and Santo Antonio represent an important experience around the electric power generation in the Amazon, for that reason, the works, compensatory mitigation measures and their effects should be carefully monitored and evaluated not only on completion of the works, but every five years until 2030.

Besides these two great works, it is worth quoting:

- The Mamoré River, where is foreseen the construction of a plant, even without no specific studies or intergovernmental understandings in this regard.
- The UHE Tabajara with 350 MW installed in Ji-Parana River, a tributary of Madeira (in the licensing process), which if provided with locks, would allow navigation along that river from its confluence with the Madeira to the city of Ji-Paraná and whose reservoir would flood part of a protected area (Fields Amazon National Park).

Additionally, the second phase of the governmental Program for Accelerated Growth- PAC 2 foresees the hydroeletric plants inventory studies in the Aripuanã and Sucunduri rivers, which may result in the identification of new hydroelectric projects.

3.2.5 Industrial Activities

Industrial development in the Amazon region is recent and primary products processing is still incipient.Until the mid - 1960s, the industrial complex in the Amazon region summed up the industry of food / beverage, textile / apparel, forestry and construction, besides mining activities. In recent decades, it has been set up industrial projects in the region's most modern and dynamic segments, leading to a diversification of the regional industrial park, especially in the state of Amazonas, which has the Manaus Industrial Pole - PIM the largest and most modern industrial center in the region .

With the expansion of agriculture technified in Mato Grosso, especially of soybean, crushing industries are emerging and already start poultry and swine, due to the proximity of food sources (corn and soybeans, primarily), and will be followed by the meat processing industry and animal feed industries.

The industry sector is traditionally an important user sector of water in basins more economically developed. It is expected that water used by industry grow gradually, partly due to programs of economic and social development (where government goals and social aspirations are materialized), partly due to large infrastructure works, which should be deployed in the MDA and will certainly require the support of an industrial base that will need to be built. Another impulse for industrial growth should come from mineral developments and agro-industrial establishments.

The mineral projects are distributed throughout the Amazon, from prospecting mines to mines and deposits in the process of exploitation - with different sizes and different deposits classes. In all cases, these businesses are licensed and supervised in state and federal sphere, both in terms of mineral, by the National Mining Production - DNPM, whether from the environmental and water resource use view - even after the depletion of the deposit, with the decommissioning of the mine.

Thus, it would be appropriate to encourage measure for water rational use, regardless of local water availability. The industrial units, when not avail themselves of the public system, should avoid the overload of small rivers and streams, both as a source of water abstraction, and as a point of effluent discharge, aligning them with municipal master plans (where required) and the content of PERH-MDA.

The release of industrial effluents - either in the public systems where there is treatment, either through its own treatment system - must comply with the limits corresponding to the water quality class of the receptor. In the latter case, it can be admitted the consortium sewage treatment by the companies, especially when the municipalities predict industrial waste.

3.2.6 Agriculture and Irrigation

The intensification of surveillance, which requires farmers to adapt to the environmental restrictions imposed on the region, together with the opportunity to increase profits, made that farmers seek higher input alternatives to increase productivity, especially in the plains and plateaus of the MDA, located in the state of Mato Grosso, which accounts for approximately 92% of the irrigated area in the region, especially in the Tapajós River Basin (UPHs High Juruena, High Teles Pires and Arinos) and and Xingu River (UPH Xingu headwaters). In this context, irrigation emerged and established itself as an alternative to increase production without increasing the cultivated area, allowing

the cultivation intersazonal with up to five harvests every two years in a region where dry and rainy periods are well defined. The PERH-MDA scenarios worked with the growth irrigation tendence.

It is known, generically considering the existing irrigation in MDA, the main crops and equipment used and the location and size of areas. However, because it is the most significant consumptive use of water resources, it is necessary to know the way these equipments work and to promote actions for their rational use, whether for economic, environmental, or simply by ensuring the multiple water use in MDA.

For installed agricultural activity in MDA, the following recommendations are made:

- To adopt conservation practices in the use and management of soils, without burning and deforestation.
- To use pesticides only supported by recommendation and technical monitoring and realize the proper disposal of packaging.
- To maintain riparian forests where they exist and recover deleted or degrated ones.
- To proceed in soil fertilization and correction always with technical advice, after physico-chemical soil analyzes.
- To adopt irrigation practices, thus saving water, electricity, fertilizers and pesticides, and avoid, where possible, the irrigation schedules of high temperature, low relative humidity, and especially strong winds.
- To use only irrigation equipment to apply pesticides and fertilizers if recommended and supervised by qualified technician.
- To perform regular maintenance of pumping equipment, distribution and application of irrigation water.
- To sponsor, through producer associations and in cooperation with the competent organs of the Ministry of Agriculture, the genetic improvement of seeds so that they are more productive and better adapted to climatic conditions.

For livestock, it is recommended that:

- To treat the pasture as a crop planted, correcting soil acidity, fertilizing and controlling pests and diseases;
- To use stocking rate of animals compatible with the carrying capacity of the pasture;
- To adopt conservation practices in the use and management of soils, without burning and deforestation;
- To recover degraded pasture areas;

- Plan and undertake the progressive recovery of APPs and legal reserves.

The PERH-MDA includes a program that addresses irrigation by deepening existing knowledge about irrigation in the region and promotes techniques that facilitate the rational water use. This program aims to optimize water consumption and constitutes an alternative to increase agricultural productivity and water use efficiency and hence the prevention of future conflicts.

3.2.7 Fisheries and aquaculture

The Amazon has great potential of fishing activity, receiving prominent sport fishing - a fishing activity which, although modest in front of the existing potential, has raised disputes and the need for fisheries agreements.

About fishing, traditional activity in the region, it is necessary to organize it, discipline it and modernize it, to strengthen its technological and scientific grounds. Actions in this direction are being conducted and should be intensified and expanded under the guidance of the Ministry of Fisheries and Aquaculture - MPA, with the participation of state agencies.

As for aquaculture, the Amazon requires a paradigm shift - Guided by comprehensive proposal for aquaculture / fish farming, involving native species - covering:

- The research development on the management of those species.
- The integration, organization and income raising of riverside communities.
- The creation of credit lines for investment on infrastructure for fish breeders and cooperatives.
- Mounting a network of extension and technical assistance to producers.
- The creation of infrastructure for nursery production processing and marketing, by encouraging the local production arrangements.
- The identification of potential sites for the implementation of aquaculture projects.
- An effort of creating and marketing Amazonian brands.

The abundance of rivers, streams, wetlands and lakes facilitates the creation of a diffuse network and diversified production and the inclusion of large numbers of producers, with a strong positive impact on job creation and income improvement in the region. Moreover, such a program would ensure the sustainability of the activity.

The PERH-MDA includes a program of support and coordination with federal and state agencies responsible for the integration of the various actions related to the success and development of fisheries and aquaculture in the Amazonian rivers. The construction of this program, which covers all stages of the production and the relationship between the various institutions that participate in its implementation is critical to its success, but transcends the boundaries of a water plan: it is necessary that the MPA, with the support the Amazonian states, take the lead in this initiative and bring it to the desired results.

In the same direction, the implementation of proposed water quality objectives for major waterbodies, associated with water quality monitoring and programs of component C - Science and Technology, will contribute substantially to the maintenance of favorable conditions for this activity. Similarly, the emphasis on water multiple use can support sustainable aquaculture in reservoirs of hydroelectric plants that will be built in the Amazon region.

3.2.8 Monitoring of MDA waterbodies (hydrometeorogical and water quality)

The lack of an effective system of hydrological monitoring in the tributaries of the southbank of the Amazon drainage network and their basins is evident and accounts for some identified knowledge gaps in PERH-MDA. In addition, there are structural differences between the water management and monitoring systems of water in the different states of MDA.

Programs to structure an integrated and standardized monitoring of qualitative and quantitative aspects of water resources in the basins of MDA, prioritizing an optimized dynamic and periodic data collection are essential, and the PERH-MDA includes two subprograms targeted for this purpose in its component A (included in the program A3).

Such programs should be built from specific studies that indicate the best arrangement of a monitoring network for the MDA (this arrangement must be continually reassessed), densification of the network and diversification of parameters to be analyzed. It is interesting that , whenever possible, the actions are decentralized, involving different operators (academia, state and municipal, federal and private), in order to promote greater involvement, knowledge, disclosure and accountability of all with the theme, allowing an optimization efforts and dialogue of information between the parties.

Moreover, it is expected that the development of the National Assessment of Water Quality Program - PNQA may grant special attention to the PERH-MDA area, producing an intersection between them that will benefit both with regard to standardization, control quality and certification of laboratories to analyze water quality.

3.2.9 Institutional Development

The unique characteristics (demographics, logistics, economics, environment, rivers, etc), coupled with the incipience of water resources management in the Amazon region, propel the search for feasible alternatives for the precepts implementation established by Law 9.433/1997 in the MDA . The needs of water resource management and the characteristics of the region are not conventional, so the solutions may well not be.

There is an urgent need to support the expansion and improvement of structural and human capacities of water resource management agencies of the MDA states, without which it is impossible to foresee advances in management. Not less important is the need to enter into partnerships focused on the water resources management among MDA states and between them and the Union. It should be noted at this point, the existence in MDA, of numerous rivers in the states domain.

3.2.10 Articulation of water resources management with environmental management

As already mentioned, water resources management and environmental management in the Amazon, follow paths endowed with many overlaps. So the first recommendation is towards a permanent dialogue by these two types of management and to articulate their actions, especially the supervision.

Regarding the area and the subject, the following recommendations to the governing bodies apply to:

- To protect areas classified as BB2 and BB3 on the map of UPHs classification for the water resources management (Figure 2.17) and identified as the critical level in levels of vulnerability map (Figure 3.7) in the Purus, Juruá, Jutaí and Javari river basins, which do not correspond to protected areas, especially where they coincide with wetlands.
- Encourage, or even sponsor (in the form of demonstration projects), local production arrangements and their supply chains in the riverside cities on a sustainable basis, interesting Amazon products (food, dietary, cosmetic, pharmaceutical, etc..) and aquaculture activities, to ensure environmental protection in the region and the conditions of economic and social development of these cities and their inhabitants.
- Supporting studies and projects of degrated areas, recovery of legal reserve and soil rational management in agricultural activities.
- Combating the degradation of recharge areas of MDA major aquifers.
- To develop association models and own environmental certification for Amazon products.
- To design and create new categories of protected areas for specific purposes.
- To consider, for large ventures implemented in the MDA, the licensing per basin, according to a threefold focus - the site, the basin and the MDA as a whole, with the possibility of trade-offs.[14] Likewise, consider environmental compensation in the three levels in order to boost local production arrangements in basins where the emphasis is on environmental conservation.
- To consider inclusion of indigenous communities and protected areas to be in receipt of compensation for the use of water resources uses and environmental services providers
- Inducing high entrepreneurs with a commitment to sustainable development in the region where its projects are located.

Mouth of Bia River in Jutaí River - AM. Viviane Brandão/ANA Image Bank

[14] It is understood trade-off for reciprocal concessions in negotiations.

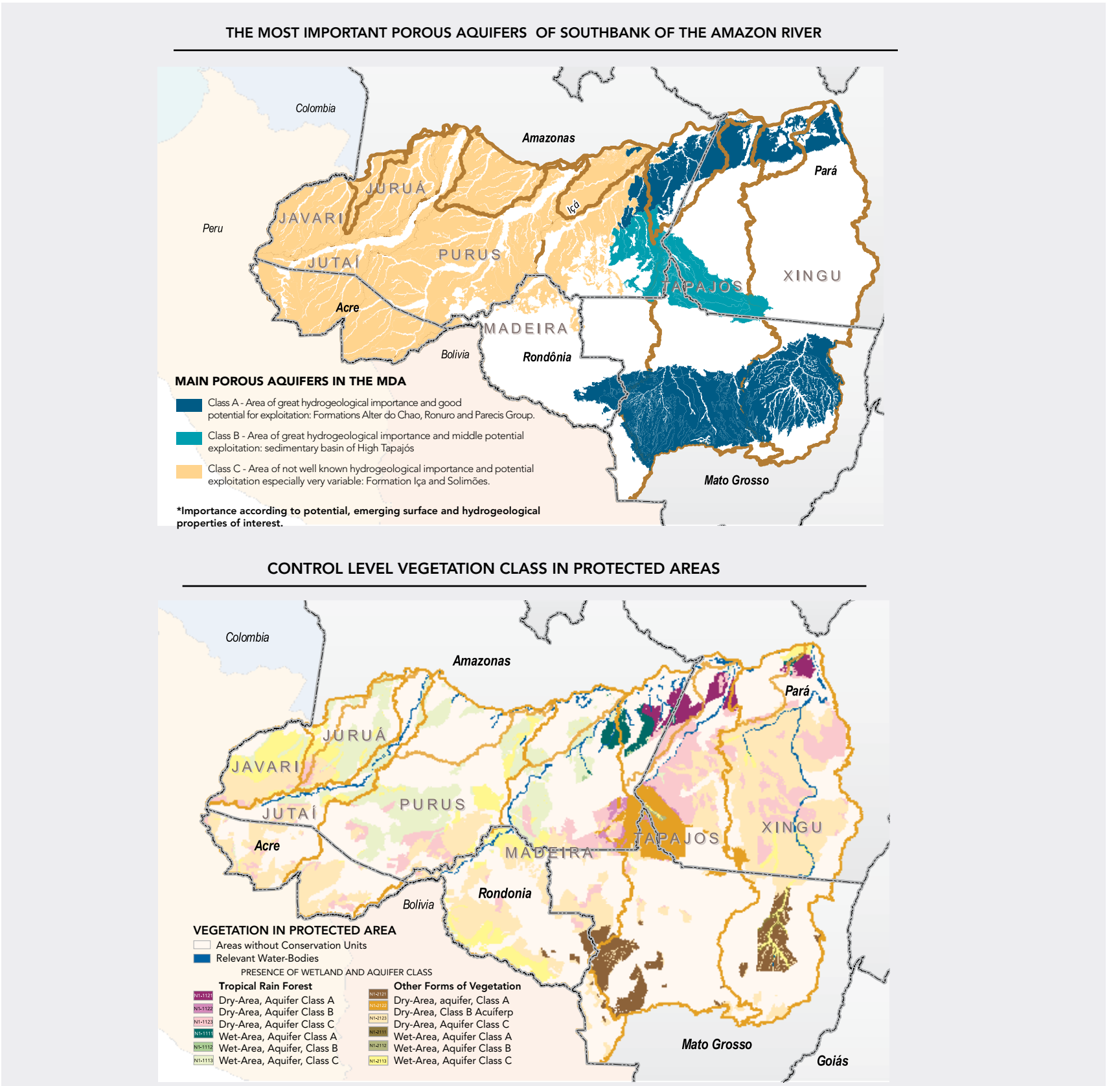
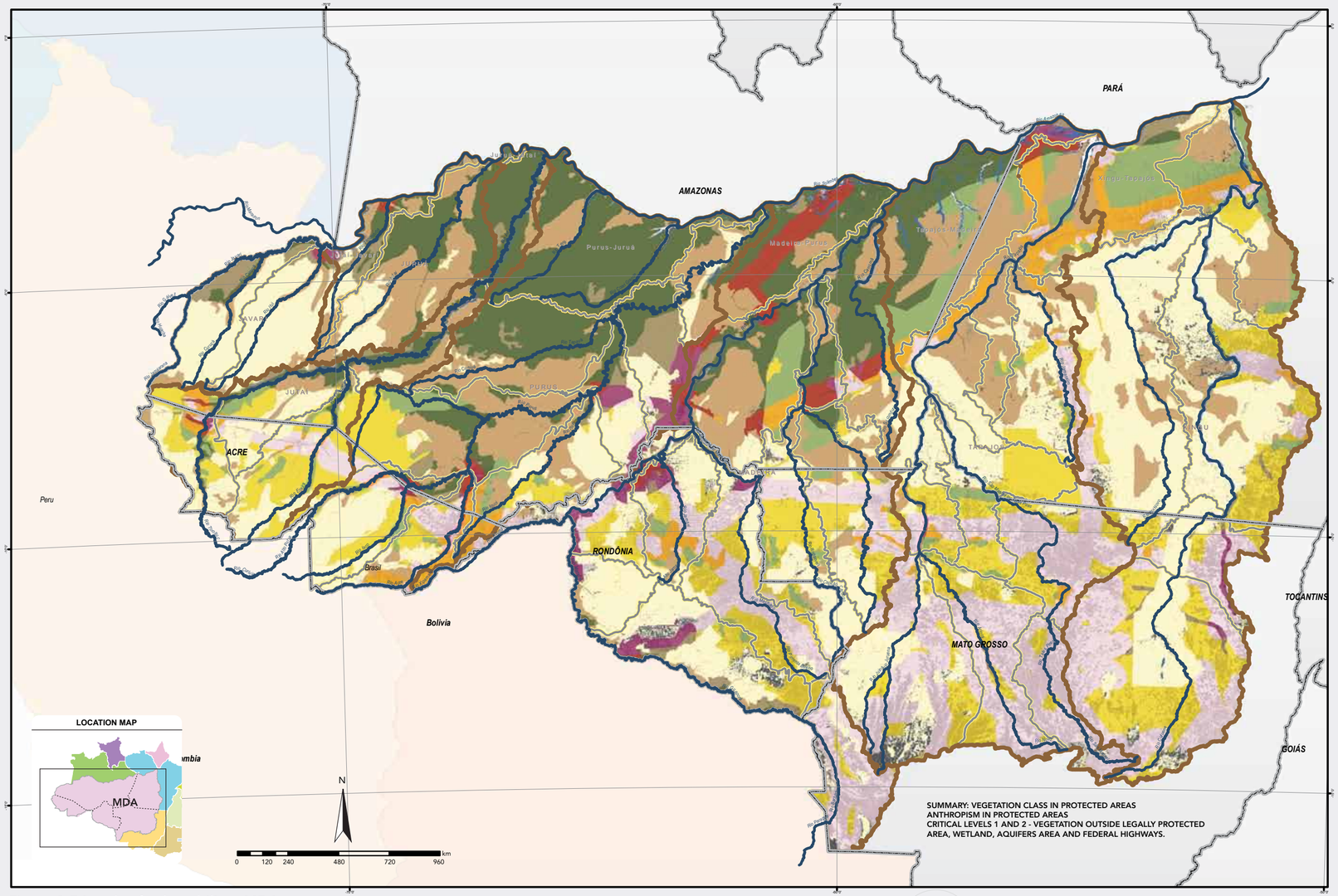


Figure 3.7 Levels of vulnerability - MDA



MDA - VULNERABILITY LEVELS KEY CLASSIFICATIONS

VEGETATION	TROPICAL RAIN FOREST						OTHER FORMS OF VEGETATION						
Presence of wetland	Expressive presence			Away or Restricted			Expressive presence			Away or Restricted			
Presence of Major Aquifers	Class A	Class B	Class C	Class A	Class B	Class C	Class A	Class B	Class C	Class A	Class B	Class C	Note-The colors of the type of aquifer correspond to "MDA-Most Important Aquifers"
CONTROL LEVEL	N1-1111	N1-1112	N1-1113	N1-1121	N1-1122	N1-1123	N1-2111	N1-2112	N1-2113	N1-2121	N1-2122	N1-2123	No evidence or vestige of Use cartografable remaining anthropogenic use or degradation
ATTENTION LEVEL	N2-1111	N2-1112	N2-1113	N2-1121	N2-1122	N2-1123	N2-2111	N2-2112	N2-2113	N2-2121	N2-2122	N2-2123	With or trace evidence of use cartografable remaining anthropogenic use or degradation
CRITICAL LEVEL	N3-1211	N3-1212	N3-1213	N3-1221	N3-1222	N3-1223	N3-2211	N3-2212	N3-2213	N3-2221	N3-2222	N3-2223	without / less than 25 km
													with
	N3-1311	N3-1312	N3-1313	N3-1321	N3-1322	N3-1323	N3-2311	N3-2312	N3-2313	N3-2321	N3-2322	N3-2323	without / less than 25 km
													with

IN THE PROTECTED AREA

OUTSIDE THE PROTECTED AREA

ANTHROPIZATION STATES	DISTANCE OF FEDERAL ROADS

CONVENTIONS: Types of Aquifers

Class A-area of great hydrogeological importance in good potential for exploitation.
Class B-Area of hydrogeological importance and median potential for exploitation.
Class C-area of hydrogeological importance poorly known and exploitation potential spatially variable.

Figure 3.7 Levels of vulnerability - MDA

3.2.11 Intersectoral Coordination between systems and sectoral plans

A special management model for projects of national interest in the MDA needs to be established to allow that the set of opportunities envisioned in PERH-MDA can benefit from a specially formatted intersectoral model for formulation, addressing, licensing and implementation of these projects, which should always promote the multiple and sustainable water resources uses.

This intersectoral management system would include:

- The identification and matching of interdependent projects or the ones with intersections between them;
- The articulation with complementary projects located in the same geographical area (river basin or sub-basin);
- The creation of a route for fast track administrative measures within government for such projects without jeopardizing the quality and depth of the studies;
- Its following by a formal and high level executive working group, whose arrangement would be based on the nature and location of projects.

This fast track model for government projects, leaded by a special working group, would be initially applied to the projects identified in the Tapajós Basin, which by its characteristics, resources and geographical conditions, was considered a key watershed in the PERH-MDA region. Subsequently, this model could be extended to other basins of the MDA, considering its proper characteristics, always focused on actions and projects with national interest and involving water resources use.

3.2.12 Border and Transboundary Rivers[15]

Among the seven basins that comprise the MDA, four are either border or transboundary rivers which have among its main tributaries: Madeira, Purus, Juruá and Javari, all with significant portions of its basins from outside Brazil, located in Bolivia and Peru. It should be noted that in all cases, Brazil is located further downstream in these basins.The planning and implementation of large projects that will use the waters of these rivers already require from the governments of these three countries, a closer dialogue in order to the management of shared water resources. In this sense, PERH MDA oriented that, under the coordination of the Brazilian Ministry of Foreign Affairs - MRE and supported by the purposes of the Amazon Cooperation Treaty, should be implemented actions aimed at:

- The implementation and operation of a hydrometeorological monitoring and water quality network, to support the equipment acquisition and operators training.
- Strengthening the exchange and technical cooperation for water resource management through training programs, workshops and multilateral events.
- Support the organization and operation of binational and / or trinational bodies focused on water resource management on border and transboudary, defining, initially, priority areas and the institutional model to be implemented.
- The integration of legal and institutional instruments for border and transboundary water resource management of Brazil, Peru and Bolivia, by the development and consolidation of required documents for the legal procedures required by each partner country.

3.2.13 Environmental Education

Several stakeholders (with different socioeconomic and cultural profiles) live in the MDA basins. Many are installed on specific regions according to the land occupation dynamics and geoenvironmental characteristics of the region, and have also a particular condition as water users.

The PERH-MDA contains a program for environmental education whose focus will be on water resources conservation, adopting different methods, respecting the social groups profiles. This will offer different approaches, according to reality and culture of each one, without losing sight of the environmental sustainability of the region.

[15] ANA Resolution Nº. 467 of October 30, 2006, defines in its Article 2:
I - border river: the river in a given section or throughout its length, forms the boundary between two or more National States;
II - transboundary river: the river flowing through the territories of two or more National States;

3.2.14 Component C - Science, Technology and Innovation

Finally, but not less important, it should be noted that the PERH-MDA introduces a third component, centered on the subject of science and technology, oriented:

- To improve knowledge and fill gaps directly connected with water resources, Amazon aquatic environments and biogeochemical cycles related to them.
- Water uses for food security, economic support and for population supply.
- Developing solutions adapted to the Amazonian characteristics, particularly those associated with the reorganization and exploitation of natural resources on a sustainable basis, forming production chains.
- To monitor and evaluate the impact of climate change, its consequences and adaptive measures applicable.

For this component programs to be successful, it will be essential the participation of the Ministry of Science and Technology - MCT (to manage the whole process, especially the assembly of research networks) in addition to research institutions and Amazonian Universities (on projects research and networking).

3.3 GUIDELINES FOR IMPLEMENTATION OF WATER RESOURCE MANAGEMENT INSTRUMENTS

Includes the proposed guidelines for water allocation and water quality objectives for the main MDA basin waterbodies, as well as directions to the national information systems of water resources. There will be no directions about charging for the use of water resources, since the necessary conditions for the implementation of this instrument in MDA are not foreseen in the planning horizon of this Plan.

3.3.1 Granting and water quality objectives

The MDA has good water availability, as stated above, and its IDHidr signals problems only in small rivers stretches, usually associated with areas of headwater basins or local areas of increased anthropogenic presence, there are not, therefore, major concerns with allocating water. The PERH-MDA shows guidelines for the management instruments of water resources and, therefore, provides general guidelines on water delivery conditions between states or from a tributary to a main course, especially when the tributary is in state domain and the main course is in federal domain, taking into account the normative scenario adopted by the Plan.

These criteria should, after studied effectively, be negotiated with the water users and states of MDA and consolidated under the program A5, along with guidelines for water quality objectives definitions to the main waterbodies. It represents an important reference for the analysis of grants applications by the governamental organs in charge of these rivers management.

The PERH-MDA offers, for initiating these studies and lead to further development, a contextualization of the allocating water management and a water allocation simulation of delivery points, upstream consumptive water uses and net water availability in these points. Figure 3.8 provides an overview of the main points considered in these preliminary studies, while Appendix 6 provides guidelines and elements to be considered at the time for water quality objectives establishment studies of the MDA main rivers.

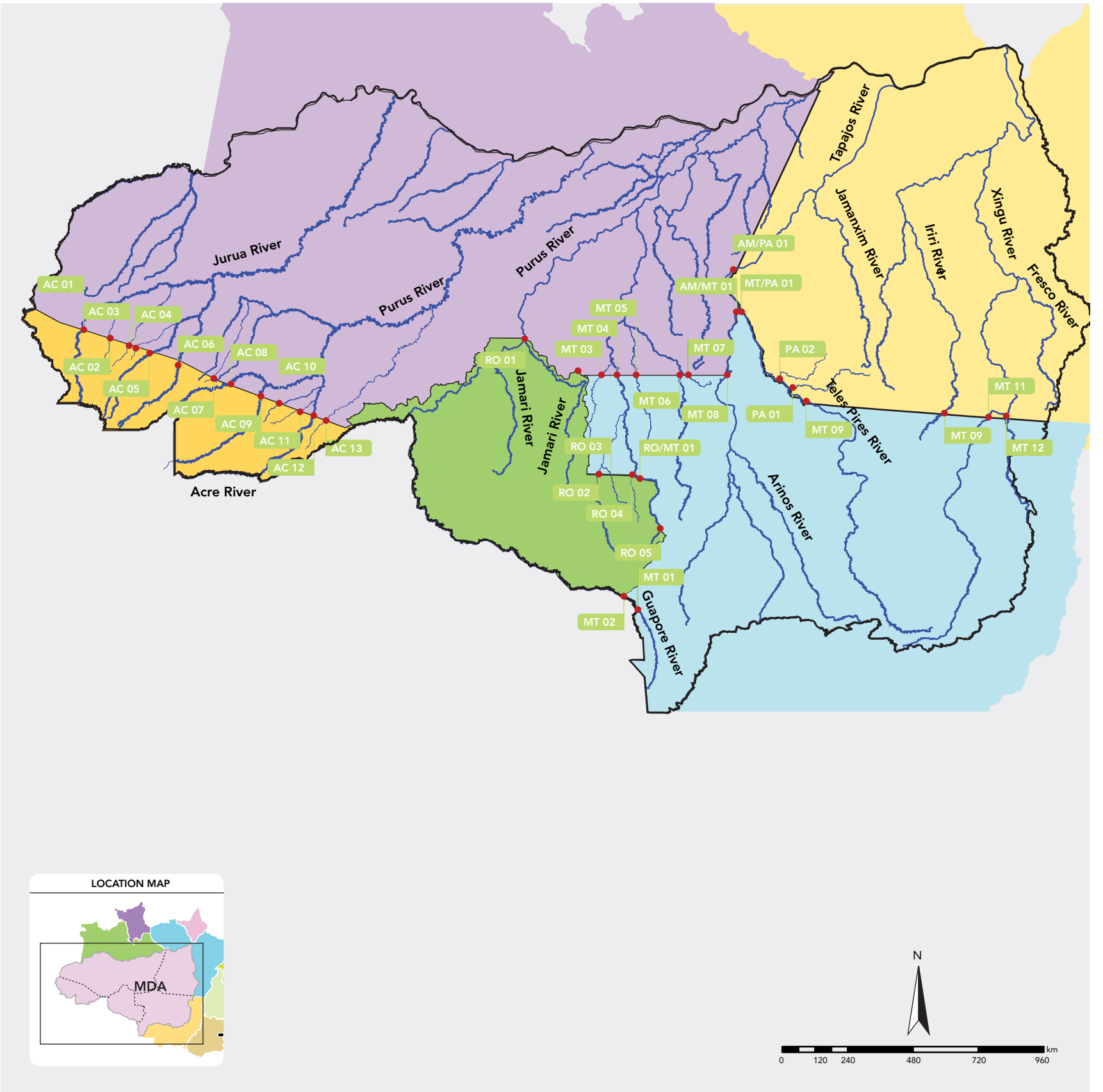


Illustration 3.8 Preliminary studies for water allocation in the MDA - control points considered

3.3.2 Information System for Water Resources

The PERH-MDA foresees the need of building an information system on water resources geared towards the collection, treatment, storage and retrieval of information able to guide the water management resources and allow communication between managers and decision-making on the same database. Such a system, properly integrated, is essential to support hydrological monitoring systems and of water quality, assessing the implementation of plans, the granting and the effectiveness control of water quality objectives proposed.

The Plan proposes a specific program, contains general guidelines for standardization/ integration of information systems to be used to monitor its progress and recommends that management organs may have knowledge of the actions of other basins of the MDA in order to allow monitoring the progress of the PERH-MDA and decisions that may bounce on other MDA rivers or states.

3.4 INSTITUTIONAL ARRANGEMENT

To coordinate actions aimed at institutional development, and especially the articulations necessary for the effective implementation of the PERH-MDA, we propose an institutional arrangement inspired by what has been implemented in the Strategic Plan for Water Resources of the Basin of the Araguaia and Tocantins rivers (PERH-TA).

A Collegiate Manager of the PERH-MDA, with competence over all the MDA should be composed of Government Representatives and Water Resources Councils - CERHs of the five states of MDA and the federal government, which shall be indicated by the National Council of Water Resources - CNRH. The board is responsible for articulating and coordinating broader actions, involving more than one basin of the MDA. Figure 3.9 illustrates the proposed arrangement and composition of this Collegiate Manager of the MDA.

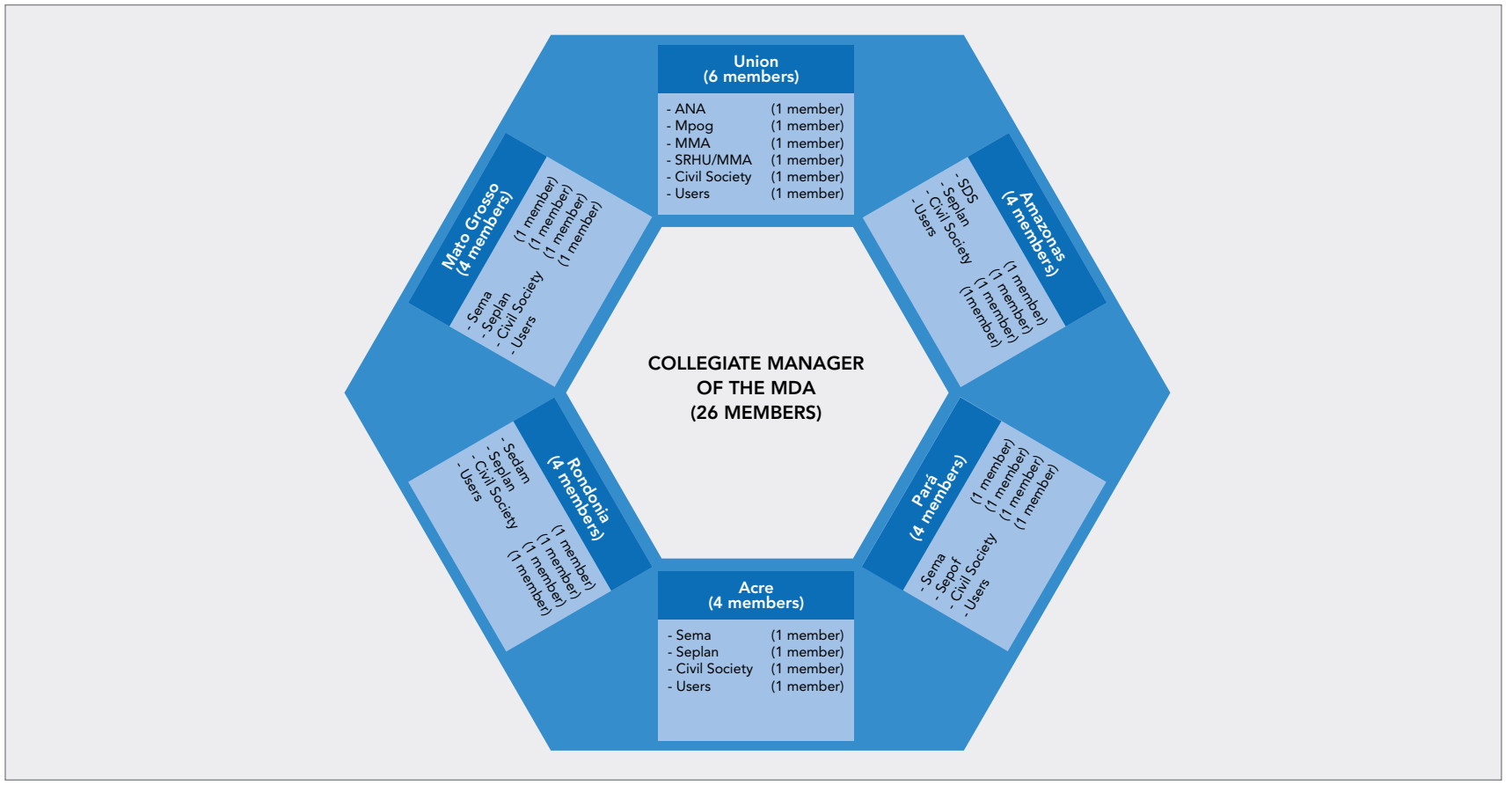


Illustration 3.9 Schematic representation of the PERH-MDA Collegiate Manager composition

The purpose of this institutional arrangement, based on the creation and operation, at first glance, on an executive board for PERH - MDA management, is also justified by the following requirements:

- To anticipate measures about the economic occupation of the region, already at an advanced stage in some hydric planning units, and , thus, also about the installation of larger conflicts related to water resources;
- To promote the water resources management of the MDA together with the states that make up the Federation.
- To include the perspective of water users and ensure the water resources multiple use, not consenting to an water user sector the usage imposition upon others.
- To recognize that, immediately, it s not possible to create basin committees, but it's necessary to work with the prospect of establishing the conditions for their creation and installation in the region, particularly where the water demands and problems reported already exist.
- To approach and dialogue with social movements that act according to the conservation of water resources and protection of the environmental sustainability of the region.
- Preparing for the possibility that profound local, regional and global changes - reach the region, interfering directly in the uses and the availability of water, and take appropriate measures to address them.

The collegiate proposed must be understood as transitory and should build up the institutional conditions for installation of the more complex mechanisms of organization provided by Law 9.433/1997, where applicable. It is recalled that in the preparation of the PERH-MDA were identified water planning units deemed "critical" with regard to management of water resources, which are close to meet conditions for a second stage of the institutionalization process of the proposed model, that is the river basin committees creation.

Lake Tefé - AM - Viviane Brandão/ANA Image Bank

Confluence of Iriri River with Xingu River - PA - Rui Faquini/ANA Image Bank

4

PERSPECTIVES / CONCLUSIONS

The management of Amazonian waters, which the PERH-MDA intends to focus in their main lines, has one of its axes in the human/ water relation, which presents historical, intense and pervasive. This water management, in addition to its prime objectives, is envisioned as an opportunity by, throughout the implementation of the Plan programs, mobilize the people living in Amazon, creating jobs, providing improvements in family income and integrating them into the process of regional sustainable development.

The Plan recognizes the high water availability in the region. Nevertheless, and despite the scale that it was conducted as the first water plan focusing Amazon region basins, we identified some areas where water availability is lower (due to local characteristics), which should be granted differential treatment. The water quality of the MDA also deserves attention, both to understand its complex natural dynamics and to monitor the anthropogenic effects impacts already existing or introduced in the MDA .Local deficiencies in water availability, quantitative or qualitative, may occur and must be administered, especially in small streams or water bodies on the edge of settlements and small streams in the headwaters of watersheds with low specific flow. Also riverside communities generally in lack of basic sanitation, should receive attention.

A set of strategic subjects emerges from PERH-MDA, which proposes guidelines and interventions for its routing, are summarized in Table 4.1.They have significant potential to transform the reality and are, able to support the creation of new conditions and prospects for sustainable development of the Amazon in areas of greater complexity. Its characteristics allow regional and thematic modulation, continued implementation, experimentation, innovation, design and distinctive creation of networks that will be able to grow and connect so far these initiatives move forward.

The PERH-MDA represents an important movement performed on the southbank tributaries of the Amazon river. As such it consists of a global look, integrated, covering the seven basins, identifying differences and similarities between them, establishing guidelines for action and pointing out where they should happen.

It highlights, above all, the need for an evolutionary and progressive management of water resources in MDA, adjusting the nature and pace of their implementation to conditions in each basin and UPH; opens a dialogue with environmental management and encourages articulation with the latter, and, moreover, let it clearly the essentiality of a consistent and integrated proposal of economic and social development to be built in the Amazon, along with a system of governance, essential to the success of this Plan.

The PERH-MDA provides a structural axis for the integration and alignment of other thematic plans of the Ministry of Environment - MMA and other existing sectoral plans, all taken into account in its construction, allowing thus that the water resources management, environmental management and sectoral actions aimed at the regional socioeconomic development on sustainable bases shall be integrated from a different treatment for each basin of the MDA region, according to their characteristics, especially their vulnerabilities and potentialities.

In this sense, in addition to the particular traits identified in each basin divided on hydric planning units for study purposes, the Plan recognizes three different situations and proposes proper measures.

For the first category - areas where the presence of human activity is still rare or banned, because they are legally protected (conservation units and indigenous lands) and are distributed in all MDA basins - the recommended actions is to protect, monitor and surveille.

The second guideline is applicable to more sensitive areas not yet protected, where human presence has not been structured on a large scale and can still be organized according to the territory carrying capacity, ie regions of the MDA in which human activity has not reached a critical level. For these areas, which are distributed predominantly in Purus, Juruá, Jutaí and Javari River Basins, the Plan suggests: (i) the conservation and/ or environmental preservation of environmentally valuable areas, including the creation of new protected areas in places most vulnerable, such as areas of dense rain forest, (ii) the management of protected areas, and (iii) promoting the local production arrangements established from existing riverside cities, using the waterway modal, interesting forest or water products, and thus ensuring the sustainability of these areas. From this perspective, populations and urban centers of these areas could act as guardians of the forest.

Finally, in the basins where human occupation shows irreversible features, marked by agricultural activities and proliferation of urban centers linked to colonization projects of the 1970s - as the basins of the Madeira, Tapajós and the Xingu rivers, always favoring the use of multiple water resources - the Plan recommends the implementation and the progressive increase of management, aimed at rationalizing the increasing use of water resources and the recovery in existing disturbed areas. In the latter case, management must be installed in the UPHs more critical and extended gradually, spreading from them to other UPHs where human activity is expressive.

To account for this proposal, the Plan formulates programs to be implemented, which focus on water management in its multiple aspects and interfaces with environmental management in the structural interventions planned by the various water resources user sectors or in the needs of the region (the case of environmental sanitation) and research issues of great relevance for understanding the water resources functionning and aquatic ecosystems dynamics.

The Tapajós, Madeira and Xingu basins should be treated as priority for the management of water resources in the region, due to their potential mining and energy, being there the highest recorded water demands, the major hydropower projects planned, the mining activities, the agriculture high technification and the highest urbanization rates. Among them, the Tapajós Basin emerges as MDA basin-key, either by their location, either by economic activities that are already deployed, or even for projects that will be installed there. Large enterprises designed for the MDA, involving the appropriation large water volumes or significant changes to the river dynamics, should be examined by a broad perspective, supported by detailed studies licensed / granted by basin, taken together, in an integrated way, analyzing the set of them into the basin they are situated, always considering all other intended uses for water in this basin, the aquatic ecosystems and the synergistic effect involved or the possible *trade-offs* in relation to other basins of the MDA. Similarly, compensation must be made to meet the affected site, the basin and the set of MDA basins. Entrepreneurs are, right now, urged to take a role as an development agent according to this perspective.

The keynote of PERH-MDA is that the Amazon should be approached with caution, understanding it at first, listening to its people and investing in research in care of this extraordinary heritage. Proposes, in addition, investments in research and studies of aquatic ecosystems, in biogeochemical cycles that take place there and hydrometeorological and water quality monitoring.

The PERH-MDA represents a contribution to the debate on the Amazon and on the formulation of a national water policy designed for a wider horizon, based on the resumption context of a national development from a water resource management concept underpinned by scientific basis. Interconnected, the management of water resources and environmental policy for the Amazon serve as a seed for a state policy for the region and at the same time, will provide a reunion of the Federal State with the Amazonian society, exploring sustainable development through a MDA global vision, negotiated with the stakeholders on a national basis, and in a resumption of its role as inducing agent, manager and regulator in the Amazon.

In its first edition will be followed by periodic reviews, to be made based on the successes, difficulties, progress, new challenges and opportunities that will be present, and especially by the new knowledge acquired along the realisation of programs that integrate the component C, aimed to the production of new scientific knowledge. These periodic evaluations will recognize the need to deepen the level of planning in the basin, which, by the changes or development levels, problems installed or latent conflicts and complexity, will require more detailed treatments, in which the more suitable expression proves to be through individualized water resources plans.

Table 4.1 Strategic subjects, motivations and guidelines for interventions

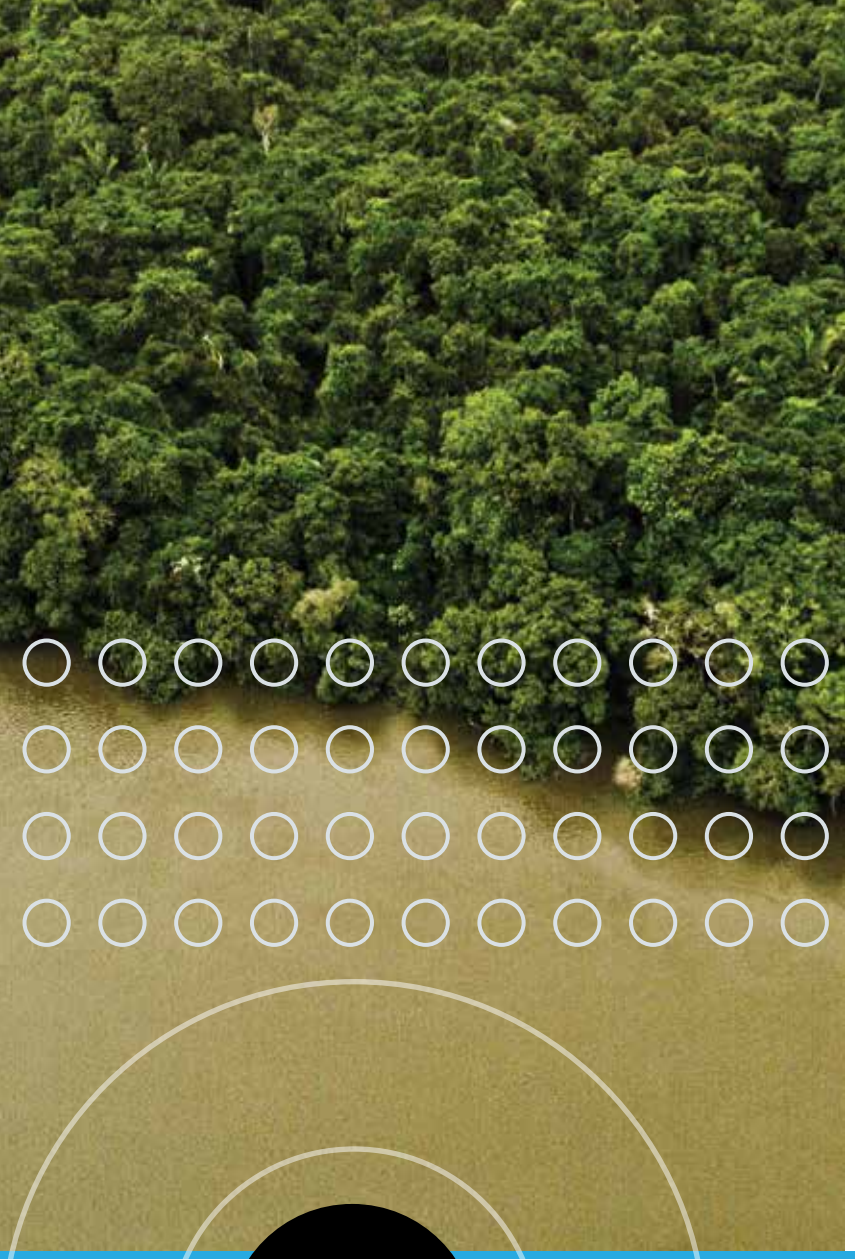
Strategic subject	Motivations	Main guidelines	Main stakeholders involved
Inter-institutional articulation	The articulation and integration of activities conducted by federal and state agencies to promote the water resources multiple use of the MDA is seen as essential to reduce the overlapping of activities and the reduction of human and financial resources waste, as well as fill gaps.	• Promote coordination between programs and actions of federal and state organs and between the environment and water systems. • Support the MDA states in the institutionalization and reinforcement of the management organs of water resources. • Deploy and integrate existing information systems on water resources. • Deploy and integrate systems for granting water use systems of the ANA and the states; • Create a Collegiate Manager for PERH - MDA implementation, like settled for the PERH Tocantins-Araguaia. • Establish, by decree, an interministerial technical group to internalize the proposals of PERH-MDA and joint corresponding actions within the relevant ministries and other government agencies. • Establish partnerships with strategic stakeholders for water management in critical areas or affected by large enterprises.	Ministry of Environment Ministry of Mines and Energy Ministry of Transport Ministry of Agriculture, Livestock and Supply Ministry of Cities National Water Agency State Governments Private stakeholders
Reconciling conflicts in water resources use	Several conflicts were identified in MDA, a large number of them involving the energy sector. The establishment of water, energy and environmental criteria for the project development in this sector and the basins licensing can put them in a more logical and wider way for the solution of other conflicts.	• Establish water, energy and environmental criteria to be met by ventures that might be placed at the MDA, from the PERH-MDA conflicts inventory. • Within the Collegiate Manager of PERH-MDA, monitor and encourage conciliation/mediation of already installed or latent conflicts, in order to promote their resolution through cooperative actions and negotiations among all the stakeholders.	National Water Agency Ministry of Environment Ministry of Mines and Energy Stakeholders involved in conflicts
Hydroelectric Generation	The PERH-MDA provides a joint vision of the MDA seven basins and its interbasins. The projects planned for the Madeira and Xingu Rivers in the considered planning horizon were already auctioned and they are under construction (Madeira) or about to install the construction site (Xingu). The Tapajós Basin concentrates 17.7 GW of power (not counting the Juruena River and its tributaries, wich an inventory is being completed), awaiting environmental licensing and grants. Such analysis may add new insights regarding other projects planned in the MDA and induce synchronization across other sectoral planning and the schedule of hydropower projects implementation in the MDA.	Provide special treatment to the Tapajós River Basin, notwithstanding the studies and regulatory licensing procedures, regarding its unique features, providing an analysis of all the planned ventures, following the deployment and the association with other enterprises, in order to ensure the best multiple use of their waters and to promote the trade-offs and compensation provisions. From the referrals to the Tapajós Basin, evaluate other enterprises planned for the MDA on the horizon of the Plan.	Ministry of Environment Ministry of Mines and Energy National Water Agency National Agency of Electric Energy Other strategic stakeholders identified

Continues...

Table 4.1 Strategic subjects, motivations and guidelines for interventions

Strategic subject	Motivations	Main guidelines	Main stakeholders involved
Water quality	Low coverage of water supply inadequate, sewage collection and treatment and solid waste disposal. The water quality of MDA, despite the great river flows, is compromised by the load of sewage and manure that reaches water bodies (usually the release is done in small streams and water bodies). The environmental liabilities resulting from mining activity at the MDA. The presence of mercury in Amazonian ecosystems. The diffuse loads resulting from agricultural activities. The control of effluents and industrial loads at the MDA. The changes in water quality at reservoirs of hydroelectric plants and their relationships with sources of pollution at the basin.	Establish a program of basic sanitation at the MDA, in order to ensure that the goals of environmental sanitation are achieved. Achieve universal collection and appropriate disposal of solid waste. Institutionally strengthen the state sanitation companies and the superintendecies of water and sewer - SAEs. Create a competitive fund for the implementation of urban drainage projects. Plan for the recovery of degraded areas, what reflects on water quality. Study the biogeochemical cycle of mercury in Amazonian ecosystems and plan for its control, especially the human exposure to it.	Ministry of Environment Ministry of National Integration Ministry of Cities Ministry of Health (Funasa) National Water Agency State management agencies
Hydrological monitoring, sedimentometry and water quality	The need to increase the hydrometric system of water quality, to provide better hydrological and water quality studies. The need for characterization and prediction of extreme events. The control of changes in the hydrological regime of rivers and in the water quality, either because of phenomena on a global scale, or because of local or regional effects. The need to know the behavior of transboundary water bodies upstream of the Brazilian territory.	Improve and enhance the hydrometric and sedimentometric network. Improve and enhance the water quality network. Integrate the national system with the system of Peru and Bolivia, with new stations installed. Join the Data Acquisition and Treatment System of the Water Quality Network to the PNQA. Monitor and analyze the water quality at reservoirs and their connection with the pollution sources at the basin.	Ministry of Environment. Ministry of Foreign Affairs Ministry of Science and Technology National Water Agency State management agencies
Increase/improve the existing knowledge on water resources and aquatic ecosystems of the MDA	The Amazon has many aquatic ecosystems permanently or partially flooded, and it is estimated that 20% represents wetlands. The resulting physical and chemical environment in these regions promotes morphological, anatomical, physiological, geological and other responses, what creates unique and characteristic structures and features. The heterogeneity, the characteristics and the dynamics of these areas are of great importance, whose scientific understanding is essential, both for conservation actions and for their sustainable exploitation.	Support the research development on the characteristics, the operation and the evolution of the Amazonian ecosystems, which can be natural or modified by human action, also on their biogeochemical cycles, their biomass production and the population stocks inventories of the Amazonian rivers and lakes. Support research on fishing, aquaculture, and associated production arrangements.	Ministry of Environment National Water Agency State management agencies
Management of water resources especially in sensitive areas	There are several relevant and highly vulnerable areas at the MDA linked to the conservation of aquatic ecosystems.	Support the establishment of conservation units at areas of interest to aquatic ecosystems.	Ministry of Environment National Water Agency State management agencies
Studies for groundwater resources management	The region has important aquifers which are responsible for regulating the natural flow of several rivers originated in the highlands of Mato Grosso, Rondônia and Pará, and for the supply of urban and agricultural enterprises, whose hydrogeological knowledge is still very incomplete.	The studies to assist the hydrogeologic aquifers characterization of the Parecis Group, the Ronuro and the Alter do Chão formations. The protection of the major aquifers recharge areas and the groundwater from contamination. The exploitation monitoring and the definition of granting criteria for wells in those aquifers.	Ministry of Environment National Water Agency State management agencies

Amazon River - PA - Rui Faquini/ANA Image Bank



REFERENCES

REFERENCES

Agência Nacional de Águas (Brasil). **Atlas Regioes Metropolitanas: abastecimento urbano de agua**. Sumário Executivo. Brasília: ANA, 2009. 120p.

Agência Nacional de Águas (Brasil). **Plano Estratégico de Recursos Hídricos da Bacia Hidrográfica dos Rios Tocantins e Araguaia**: relatório-síntese. Brasília: ANA, 2009. 198p.

Brasil. **Lei nº 9.433, de 8 de janeiro de 1997**. Institui a Política Nacional de Recursos Hídricos, cria o Sistema Nacional de Gerenciamento de Recursos. Disponível em: <https://www.planalto.gov.br/>. Acesso em: mar. 2008.

Brasil. Ministério de Minas e Energia. **Plano Decenal de Expansão de Energia Elétrica**: 2010-2019**.** Brasília: MME: EPE, 2010.

Brasil. Ministério dos Transportes; Ministério da Defesa. **Relatório Executivo do Plano Nacional de Logística e Transportes**: versão preliminar. Brasília: [s.n.], 2007. Disponível em: <http://www.centran.eb.br/plano_logistica_05.htm>. Acesso em: 5 mar. 2008.

Brasil. **Pesquisa Nacional de Saneamento Básico.** Rio de Janeiro: [s.n.], 2000. Disponível em: <http://www.ibge.gov.br>. Acesso em: 5 mar. 2008.

Brasil. Secretaria Nacional de Defesa Civil. **Situação de emergência e estado de calamidade pública**. Disponível em: <http://www.defesacivil.gov.br>. Acesso em: 5 mar. 2008.

BURNETT, J. A. B.; MATOS, B. A.; MARANHÃO, N.; LOTUFO CONEJO, J. G. Índice de Disponibilidade Hídrica – IDHidr. In: SIMPÓSIO BRASILEIRO DE RECURSOS HÍDRICOS, 17., 2009, Campo Grande. **Anais**... Mato Grosso do Sul, 2009.

Conselho Nacional de Recursos Hídricos (Brasil). **Resolução nº 17, de 29 de maio de 2001**. Brasília: MMA, 2001.

Conselho Nacional de Política Energética (Brasil). **Resolução nº 06, de 3 de julho de 2008.** Brasília: MME, 2008.

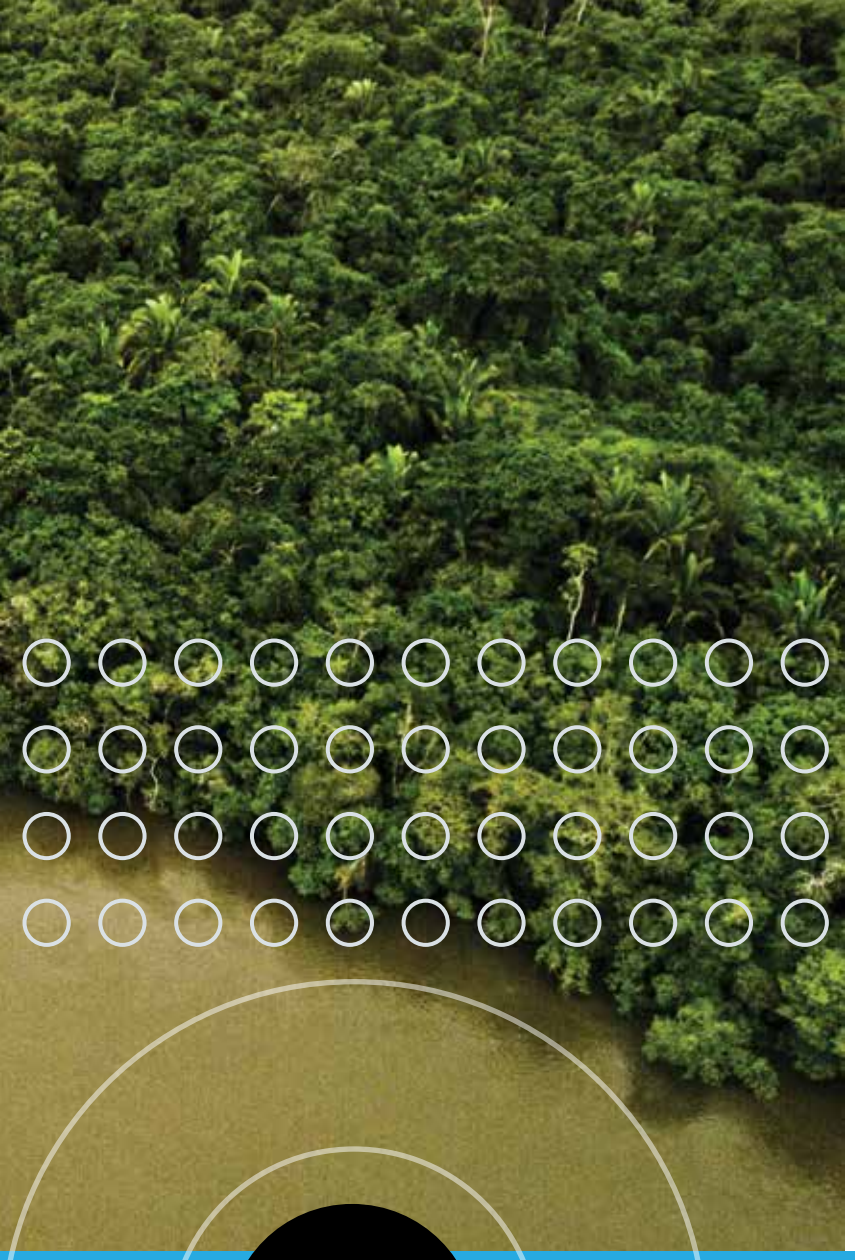
Instituto Brasileiro de Geografia e Estatística. **Contagem da População 2007**. Disponível em: <www.ibge.gov.br>. Acesso em: 10 mar. 2008.

Instituto Brasileiro de Geografia e Estatística. **Pesquisa agrícola municipal 2006**. In:_____. Banco de dados agregados Sidra. Disponível em: <www.sidra.gov.br>. Acesso em: 16 jul. 2007.

Instituto Brasileiro de Geografia e Estatística. **Pesquisa da pecuária municipal 2006**. In:_____. Banco de dados agregados Sidra. Disponível em: <www.sidra.gov.br>. Acesso em: 16 jul. 2007.

Instituto Brasileiro de Mineração. **Contribuição da indústria mineral ao plano estratégico da margem direita do Rio Amazonas**: PERH-MDA, em processo de elaboração pela ANA. Brasília: Ibram, 2009.

Instituto Nacional de Pesquisas Espaciais. **Monitoramento da floresta amazônica brasileira por satélite**: projeto Prodes. [S.l.]: [s.n.], 2004. Disponível em: <http://www.obt.inpe.br/prodes>. Acesso em: maio 2007.



APPENDIX

6

Xingu River - PA - Rui Faquini/ANA Image Bank

Appendix 1 - Types of vegetation, water, anthropic use by river basin and by hydric planning units of MDA

Basins and interbasins	Hydric Planning Units	Tropical rain forest		Open rainforest		Deciduous forest		Semideciduous forest		Savannah (Cerrado)		Pioneer Formation Area		Ecological tension area		Campinarana		By hydric		Anthropic Use		Total Area (km²)
		Area		Area		Area		Area		Area		Area		Area		Area		Area		Area		
		(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	
XINGU	Low Xingu	37,949.5	58.3	11,469.9	17.6	–	–	–	–	394,4	0.6	1,047.1	1.6	–	–	–	–	2,557.9	3.9	11,651.7	17.9	65,070
	Iriri	22,725.6	16.0	103,347.3	72.7	–	–	–	–	1,296.0	0.9	–	–	6,633.2	4.7	–	–	1,559.6	1.1	6,516.9	4.6	142,079
	Middle Xingu	17,857.9	13.6	62,523.4	47.8	–	–	–	–	7,863.4	6.0	–	–	11,798.5	9.0	–	–	3,335.8	2.5	27,485.8	21.0	130,865
	High Xingu	381.5	1.2	1,345.0	4.1	–	–	–	–	4,797.1	14.5	1,089.7	3.3	14,985.3	45.2	–	–	126.2	0.4	10,392.8	31.4	33,118
	Xingu Headwaters	0.8	0.001	-	-	–	–	574.6	0.4	19,587.8	14.1	10,763.2	7.8	67,329.1	48.6	–	–	102.5	0.1	40,195.9	29.0	138,554
	BH Xingu	78,915.3	15.5	178,685.7	35.1	–	–	574.6	0.1	33,938.6	6.7	12,900.0	2.5	100,746.1	19.8	–	–	7,682.0	1.5	96,243.1	18.9	509,685
Xingu-Tapajós	IB Xingu-Tapajós	29,287.1	65.2	2,972.5	6.6	–	–	–	–	1,894.3	4.2	4,044.5	9.0	–	–	–	–	1,245.7	2.8	5,442.7	12.1	44,896
TAPAJÓS	Low Tapajós	32,904.6	76.4	2,786.7	6.5	–	–	–	–	1.4	0.003	204.3	0.5	122.5	0.3	–	–	3,295.0	7.6	3,763.9	8.7	43,078
	Jamanxim	16,703.7	28.8	33,369.3	57.5	118.4	0.2	–	–	253.1	0.4	–	–	2,842.5	4.9	–	–	10.8	0.02	4,703.2	8.1	58,001
	Middle Tapajós	20,620.1	80.6	2,548.1	10.0	-	-	–	–	–	–	–	–	1,289.6	5.0	–	–	684.8	2.7	430.0	1.7	25,573
	High Tapajos	14,812.2	44.2	2,394.2	7.2	672.6	2.0	–	–	2,664.3	8.0	–	–	11,125.3	33.2	–	–	1,066.6	3.2	749.7	2.2	33,485
	Low Teles Pires	4,265.2	8.3	10,499.0	20.5	4,236.1	8.3	–	–	1,023.6	2.0	–	–	23,369.4	45.7	–	–	898.6	1.8	6,813.0	13.3	51,105
	Middle Teles Pires	992.1	1.8	8,186.0	14.6	219.2	0.4	–	–	1,094.6	2.0	–	–	17,271.1	30.8	–	–	–	–	28,232.5	50.4	55,996
	High Teles Pires	–	–	–	–	–	–	57.4	0.2	6,947.3	20.0	–	–	5,680.6	16.3	–	–	–	–	22,120.6	63.6	34,806
	Low Juruena	1,125.0	6.6	12,716.2	74.8	–	–	–	–	54.6	0.3	–	–	2,232.5	13.1	–	–	575.1	3.4	288.4	1.7	16,992
	Middle Juruena	2,624.1	12.3	11,754.9	54.9	–	–	–	–	0,2	0.001	–	–	2,105.9	9.8	–	–	64.6	0.3	4,852.1	22.7	21,402
	Arinos	1,012.5	1.7	2,990.7	5.1	–	–	287.7	0.5	3,428.3	5.8	–	–	25,279.5	43.0	–	–	–	–	25,735.6	43.8	58,734
	High Juruena	291.5	0.3	1,863.6	2.0	–	–	2,404.0	2.6	28,473.5	30.6	–	–	27,808.8	29.9	–	–	–	–	32,250.4	34.6	93,092
	BH Tapajós	95,351.1	19.4	89,108.7	18.1	5,246.3	1.1	2,749.2	0.6	43,941.0	8.9	204.3	0.04	119,127.8	24.2	–	–	6,595.6	1.3	129,939.4	26.4	492,263
Tapajós-Madeira	IB Tapajós-Madeira	83,880.6	88.2	273.3	0.3	–	–	–	–	1,189.5	1.3	1,242.9	1.3	651.8	0.7	–	–	4,793.3	5.0	3,104.3	3.3	95,136

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Appendix 1 - Types of vegetation, water, anthropic use by river basin and by hydric planning units of MDA

Basins and interbasins	Hydric Planning Units	Tropical rain forest		Open rainforest		Deciduous forest		Semideciduous forest		Savannah (Cerrado)		Pioneer Formation Area		Ecological tension area		Campinarana		By hydric		Anthropic Use		Total Area (km²)
		Area		Area		Area		Area		Area		Area		Area		Area		Area		Area		
		(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	(km²)	(%)	
MADEIRA	Low Madeira-Sucunduri	48,246.4	80.5	5,446.4	9.1	–	–	–	–	255.1	0.4	–	–	3,297.5	5.5	–	–	1,926.0	3.2	752.0	1.3	59,923
	Low Aripuanã	14,173.5	86.7	848.9	5.2	–	–	–	–	76.0	0.5	–	–	-	-	–	–	390.8	2.4	855.8	5.2	16,345
	Aripuanã	24,015.9	33.9	26,354.7	37.2	–	–	–	–	1,307.4	1.8	–	–	11,901.3	16.8	–	–	–	–	7,252.9	10.2	70,832
	Middle Madeira	61,495.4	79.1	4,070.8	5.2	–	–	–	–	4,511.6	5.8	1,322.8	1.7	2,637.4	3.4	–	–	1,515.9	2.0	2,143.0	2.8	77,697
	Roosevelt	7,294.1	12.2	35,277.7	58.9	–	–	14.7	0.02	3,162.1	5.3	–	–	7,541.8	12.6	–	–	–	–	6,553.5	11.0	59,844
	Ji-Paraná	2,479.5	3.9	20,133.8	31.5	–	–	1,398.4	2.2	2,162.5	3.4	–	–	9,791.3	15.3	–	–	37.1	0.1	27,907.7	43.7	63,910
	Jamari	5,860.5	14.7	21,744.9	54.4	–	–	-	-	688.1	1.7	–	–	242.3	0.6	–	–	115.5	0.3	11,325.4	28.3	39,977
	Abunã-Madeira	3,286.7	8.3	21,787.4	55.2	–	–	71.2	0.2	870.3	2.2	–	–	3,820.6	9.7	–	–	944.9	2.4	8,696.5	22.0	39,478
	Mamoré	1,095.3	4.7	16,109.8	69.6	–	–	493.6	2.1	2,997.9	13.0	582.3	2.5	680.7	2.9	–	–	–	–	1,190.2	5.1	23,150
	Middle Guaporé	2,836.3	5.0	21,270.9	37.3	–	–	1,804.5	3.2	12,522.6	21.9	3,765.6	6.6	2,047.5	3.6	–	–	–	–	12,812.3	22.5	57,060
	High Guaporé	–	–	–	–	–	–	9,718.5	23.9	6,785.9	16.7	–	–	3,029.0	7.4	–	–	–	–	21,210.9	52.1	40,744
	BH Madeira	170,783.7	31.1	173,045.3	31.5	–	–	13,501.0	2.5	35,339.4	6.4	5,670.7	1.0	44,989.2	8.2	–	–	4,930.2	0.9	100,700.3	18.3	548,960
Madeira-Purus	IB Madeira-Purus	45,337.0	87.9	881.4	1.7	–	–	–	–	728.3	1.4	0.4	0.001	–	–	–	–	2,109.7	4.1	2,537.0	4.9	51,634
PURUS	Low Purus	19,448.3	72.3	3,437.0	12.8	–	–	–	–	286.0	1.1	3,281.3	12.2	–	–	–	–	341.4	1.3	117.9	0.4	26,912
	Sub-middle Purus	12,060.0	33.5	19,678.1	54.7	–	–	–	–	106.4	0.3	-	-	3,449.0	9.6	–	–	–	–	705.6	2.0	35,999
	Middle Purus	8,016.1	30.5	8,393.8	31.9	–	–	–	–	1,179.2	4.5	2.8	0.01	7,961.7	30.3	–	–	–	–	739.5	2.8	26,293
	Tapauá	58,390.0	93.1	4,305.8	6.9	–	–	–	–	18.2	0.03	-	-	-	-	–	–	–	–	20.4	0.03	62,734
	Ituxi	18,156.6	41.4	15,558.7	35.5	–	–	–	–	1,848.2	4.2	271.1	0.6	4,802.3	10.9	–	–	–	–	3,220.1	7.3	43,857
	High Purus II	55,770.1	71.2	21,450.6	27.4	–	–	–	–	44.2	0.1	146.9	0.2	–	–	–	–	–	–	965.3	1.2	78,377
	Rio Acre	8,619.8	27.8	15,434.0	49.7	–	–	–	–	1.9	0.01	–	–	–	–	–	–	–	–	6,976.1	22.5	31,032
	High Purus I	9,529.5	19.5	38,058.9	77.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	48,846.7	2.6	48,847
	BH Purus	189,990.4	53.7	126,316.9	35.7	–	–	–	–	3,484.1	1.0	3,702.1	1.0	16,212.9	4.6	–	–	341.4	0.1	14,003.2	4.0	354,051
Purus-Juruá	IB Purus-Juruá	79,158.1	94.1	1,054.2	1.3	–	–	–	–	125.9	0.1	622.3	0.7	-	-	–	–	2.859.1	3.4	281.4	0.3	84,101
JURUÁ	Low Juruá	24,030.3	89.9	876.6	3.3	–	–	–	–	179.2	0.7	–	–	–	–	–	–	1.368.2	5.1	283.0	1.1	26,737
	Middle Juruá	19,345.4	74.6	4,905.5	18.9	–	–	–	–	85.0	0.3	–	–	–	–	–	–	1.577.6	6.1	3.5	0.01	25,917
	High Juruá	12,119.4	33.7	22,377.8	62.2	–	–	–	–	38.3	0.1	–	–	–	–	–	–	765.2	2.1	668.6	1.9	35,969
	Juruá Mirim	10,418.0	28.3	23,960.6	65.1	–	–	–	–	1.5	0.004	–	–	–	–	631.8	1.7	-	-	1.810.5	4.9	36,882
	Tarauacá	7,607.8	14.7	42,672.6	82.2	–	–	–	–	185.3	0.4	–	–	–	–	-	-	0.7	0.001	1.417.9	2.7	51,884
	BH Juruá	73,520.9	41.5	94,793.1	53.5	–	–	–	–	489.2	0.3	–	–	–	–	631.8	0.4	3.711.6	2.1	4.183.5	2.4	177,330
Juruá-Jutaí	IB Juruá-Jutaí	1,002.9	73.6	–	–	–	–	–	–	40.4	3.0	–	–	–	–	–	–	305.0	22.4	13.8	1.0	1,362
JUTAÍ	BH Jutaí	63,790.6	80.9	14,716.3	18.7	–	–	–	–	180.3	0.2	–	–	–	–	–	–	23.5	0.03	142.6	0.2	78,853
Jutaí-Javari	IB Jutaí-Javari		52.9		40.0	–	–	–	–		0.4	–	–	–	–	–	–	–	6.2		0.5	24,426
JAVARI	Ituí	5,339.1	12.6	37,072.4	87.3	–	–	–	–	18.4	0.04	–	–	–	–	–	–	–	–	26.6	0.1	42,456
	Curuçá	7,067.4	17.9	32,241.7	81.8	–	–	–	–	3.0	0.01	–	–	–	–	–	–	–	–	107.3	0.3	39,419
	BH Javari	12,406.4	15.2	69,314.1	84.7	–	–	–	–	21.4	0.03	–	–	–	–	–	–	–	–	133.8	0.2	81,876
TOTAL -MDA		936,381.6	36.8	760,927.1	29.9	5,246.3	0.2	16,824.8	0.7	121,476.9	4.8	28,387.4	1.1	281,727.8	11.1	631.8	0.02	36,119.9	1.4	356,850.4	14.0	2,544,574

Appendix 2 - Spatial distribution of protected areas in the MDA

Conservation Units (UC) and Indigenous Lands (TI) in Hydric Planning Units of the MDA								
Basins	Hydric Planning Unit-UPH	Area UPH (km²)	Area TI		Area UC		AP*	
			(km²)	(%)	(km²)	(%)	(km²)	(%)
Xingu	Xingu Headwaters	138,554	31,597.2	22.8	39.0	0.03	31,636.2	22.8
	High Xingu	33,118	11,989.1	36.2	1,970.2	5.9	13,958.9	42.1
	Middle Xingu	130,865	64,423.7	49.2	25,704.0	19.6	90,110.4	68.9
	Low Xingu	65,070	20,852.0	32.0	13,453.2	20.7	34,305.1	52.7
	Iriri	142,079	68,515.7	48.2	51,610.6	36.3	119,579.7	84.2
Xingu		509,685	197,377.6	38.7	92,777.0	18.2	289,590.4	56.8
Xingu-Tapajós interbasin		44,896	2,278.5	5.1	6,582.6	14.7	8,861.1	19.7
Tapajós	High Teles Pires	34,806	629,7	1.8	1,558.1	4.5	2,187.8	6.3
	Middle Teles Pires	55,996	56.1	0.1	2,229.2	4.0	2,285.3	4.1
	Low Teles Pires	51,105	14,896.7	29.1	1,158.9	2.3	16,053.8	31.4
	High Juruena	93,092	34,196.5	36.7	1,740.0	1.9	34,067.2	36.6
	Middle Juruena	21,402	1,657.3	7.7	2,961.8	13.8	4,619.1	21.6
	Low Juruena	16,992	526,5	3.1	16,465.5	96.9	16,992.0	100.0
	High Tapajós	33,485	18,966.3	56.6	7,409.4	22.1	26,368.7	78.7
	Middle Tapajós	25,573	928.9	3.6	18,710.4	73.2	19,635.4	76.8
	Low Tapajós	43,078	0.6	0.0	23,978.8	55.7	23,979.4	55.7
	Arinos	58,734	3,257.6	5.5	158.5	0.3	3,415.1	5.8
	Jamanxim	58,001	309.6	0.5	31,502.7	54.3	31,811.0	54.8
Tapajós		492,264	75,425.8	15.3	107,873.4	21.9	181,414.9	36.9
Tapajós-Madeira interbasin		95,136	12,555.8	13.2	22,220.3	23.4	33,612.2	35.3
Madeira	High Guaporé	40,744	3,513.2	8.6	2,787.1	6.8	6,246.8	15.3
	Middle Guaporé	57,060	17,222.9	30.2	25,901.6	45.4	35,808.4	62.8
	Mamoré	23,150	9,452.5	40.8	11,225.2	48.5	19,536.4	84.4
	Abunã-Madeira	39,478	3,443.4	8.7	12,392.0	31.4	15,203.0	38.5
	Roosevelt	59,844	22,774.4	38.1	9,070.3	15.2	31,838.1	53.2
	Jamari	39,977	3,995.3	10.0	15,498.3	38.8	17,962.3	44.9
	Ji-Paraná	63,910	5,360.2	8.4	10,367.5	16.2	14,548.1	22.8
	Aripuanã	70,832	14,654.9	20.7	14,410.6	20.3	28,765.4	40.6
	Low Aripuanã	16,345	43.9	0.3	3,537.7	21.6	3,581.6	21.9
	Middle Madeira	77,697	21,929.4	28.2	11,115.7	14.3	32,744.0	42.1
	Low Madeira-Sucunduri	59,923	8,063.6	13.5	18,339.6	30.6	26,395.0	44.0
Madeira		548,960	110,453.7	20.1	134,645.6	24.5	232,629.1	42.4
Madeira Purus interbasin		51,634	4,651.2	9.0	5,099.7	9.9	9,750.9	18.9

Continues...

Appendix 2 - Spatial distribution of protected areas in the MDA

Conservation Units (UC) and Indigenous Lands (TI) in Hydric Planning Units of the MDA								
Basins	Hydric Planning Unit-UPH	Area UPH (km²)	Area TI		Area UC		AP*	
			(km²)	(%)	(km²)	(%)	(km²)	(%)
Purus	High Purus I	48,847	6,495.9	13.3	20,376.0	41.7	26,842.5	55.0
	High Purus II	78,377	19,803.3	25.3	18,125.2	23.1	37,222.1	47.5
	Middle Purus	26,293	6,422.1	24.4	9,497.6	36.1	13,021.4	49.5
	Sub-middle Purus	35,999	261.4	0.7	8,570.3	23.8	8,831.7	24.5
	Low Purus	26,912	3,098.1	11.5	17,494.0	65.0	18,441.8	68.5
	Acre River	31,032	831.5	2.7	8,813.9	28.4	9,630.8	31.0
	Ituxi	43,857	5,262.7	12.0	23,666.8	54.0	27,672.4	63.1
	Tapauá	62,734	24,129.6	38.5	22.2	0.04	24,151.8	38.5
Purus		354,051	66,304.6	18.7	106,565.9	30.1	165,814.4	46.8
Purus-Juruá interbasin		84,101	417.9	0.5	11,645.7	13.8	12,063.6	14.3
Juruá	High Juruá	35,969	10,181.9	28.3	9,716.3	27.0	19,699.5	54.8
	Middle Juruá	25,917	7,826.8	30.2	7,705.4	29.7	15,532.2	59.9
	Low Juruá	26,737	778.0	2.9	2,740.0	10.2	3,518.0	13.2
	Juruá Mirim	36,822	3,305.5	9.0	14,049.7	38.2	16,896.1	45.9
	Tarauacá	51,884	11,171.8	21.5	4,225.3	8.1	14,629.3	28.2
Juruá		177,330	33,264.0	18.8	38,436.8	21.7	70,275.2	39.6
Juruá-Jutaí interbasin		1,362	0.0	0.0	0.0	0.0	0.0	0.0
Jutaí	Jutaí	78,853	21,430.6	27.2	33,923.2	43.0	54,921.8	69.7
Javari	Curuçá	39,419	29,563.9	75.0	0.0	0.0	29,563.9	75.0
	Ituí	42,456	40,159.1	94.6	0.0	0.0	40,159.1	94.6
Javari		81,876	69,723.0	85.2	0.0	0.0	69,723.0	85.2
Jutaí-Javari interbasin		24,426	11,688.3	47.9	457.9	1.9	12,146.2	49.7
Southbank of the Amazon River-total		2,544,574	605,571.0	23.8	560,228.1	22.0	1,140,802.8	44.8

Note: * AP - Protected Areas = (TI area + UC area) - overlap area between TI and UC.
Note 1 - the areas occupied by UCs do not include the private reserves of natural heritage - RPPN which total 220.1 km² at the MDA.
Note 2 - after January/2009 eight protected areas were created, as shown below, which were not included in the calculation of the areas occupied by the UCs at the MDA. These protected areas represent 1.1% of the MDA total area, which raises the area occupied by UCs and TIs at the MDA to 1,166,306 km², changing the percentage of protected areas to 45.8% of the total MDA area.

Conservation unit	Area (km²)	Level	State	Legal Act
Matupiri State Park	5,095.9	State	AM	Decree nº 28.424, of 3/27/2009
Tapaua State Forest	8,817.1	State	AM	Decree nº 28.419, of 3/27/2009
Canutama State Forest	1,505.9	State	AM	Decree nº 28.422, of 3/27/2009
Canutama Extractive Reserve	1,979.9	State	AM	Decree nº 28.421, of 3/27/2009
Igapó-Açu Sustainable Development Reserve	3,946.2	State	AM	Decree nº 28.420, of 3/27/2009
Matupiri Sustainable Development Reserve	1,790.8	State	AM	Decree 28.423, of 3/27/2009
Japiim-Pentecoste Area of Ecological Interest	250.0	State	AC	Decree nº 4.365, of 7/6/2009
Renascer Extractive Reserve	2,117.4	Federal	PA	Decree without number of 6/5/2009
Total	25,503.2			

Appendix 3 - Major rivers, streams and creeks that have non-compliance in relation to the concentration of DBO (CONAMA Resolution nº· 357/2005)

Basins	UPH	River/Stream/Creek	Length (km)	Water availability (m³ /s)		Municipalities located at the hidrographic basins / Streams / creeks that are responsible for non-compliance regarding organic load	
				Current	Climate Changes		
Xingu River	Low Xingu	Jarauçu River	297.1	55.33	48.14	Brasil Novo (PA)	
		Jo Creek	38.9	0.2	0.17	Vitória do Xingu (PA)	
		Lau-Labu River	42.9	0.18	0.16	Anapu (PA)	
	Middle Xingu	Arraias River	102.3	1.2	1.06	Cumaru do Norte (PA)	
		Juari River	87.8	0.93	0.81	Bannach (PA)	
		Branco River	150.7	1.26	1.1	Tucumã (PA) and Ourilândia do Norte (PA)	
		Carapanã Creek	99.2	1.27	1.1	Rural area of Tucumã (PA) and São felix do Xingu	
		Fresco River	542.4	25.74	22.4	Tucumã (PA), Ourilândia do Norte (PA) and São Félix do Xingu (PA)	
	Xingu Headwaters	Água da Paca River	57.5	3.31	2.89	Feliz Natal (MT)	
		Leda Stream	27.6	1.16	1	Cláudia (MT)	
Tapajós River	Low Teles Pires	Tributary of Apiacas River	38.2	2.2	1.9	Tabaporã (MT)	
		Creek of Bruno	94.4	9.2	8	Apiacás (MT)	
	Middle Teles Pires	Tributary of Teles Pires River	20.6	0.94	0.82	Paranaíta (MT)	
		Curupi River	56.5	1.47	1.28	Sinop (MT)	
		Taxidermista Stream	40.9	3.18	2.71	Alta Floresta (MT)	
		Tributary of Taxidermista River	29.5	1.01	0.87	Alta Floresta (MT)	
		Kaiap River	111.2	16.02	13.94	Colíder (MT)	
		Carapa River	47.8	1.78	1.55	Colíder (MT)	
	High Teles Pires	Paratinga River	123.5	7.66	6.6	Paratinga (MT)	
		Preto Stream	31.4	3.26	2.84	Sinop (MT)	
	Middle Juruena	Creek of Noca	73.9	2.28	1.98	Cotriguaçu (MT)	
	High Juruena	Tributary of Juruena River	65.6	0.94	0.82	Castanheira (MT)	
		Juína Mirim River	114	3.58	3.12	Juína (MT)	
		Perdido or Barroso River	53.6	0.71	0.62	Juína (MT)	
	Arinos	Rio dos Patos	112.9	20.6	18	Nova Mutum (MT)	

	Length (%) of non-compliance with the class of the River / Stream / Creek[1]				General Observations
	Current Situation	Scenario			
		Normative	Trend	Critical	
	1%	0%	14%	14%	Several tributaries of the Xingu River, between Altamira and Vitoria do Xingu, may present problems due to the low water availability of the region, that ranges from 0 to1 L / s.Km ²
	0%	0%	100%	100%	
	0%	100%	100%	100%	
	0%	0%	16%	30%	Small rivers that belong to the Rio Fresco tributaries are very sensitive to local activities due to low local water availability (minimum specific flow ranges from 0 to 1 L / s.Km ²), among them are the Carrion and Triunfo streams, the Carapanazinho and Manelao creeks and the Juarizinho stream
	100%	56%	100%	100%	
	100%	100%	100%	100%	
	35%	0%	100%	100%	
	0%	0%	19%	19%	
	100%	100%	100%	100%	
	100%	100%	100%	100%	
	50%	22%	50%	50%	
	0%	0%	10%	10%	
	100%	100%	100%	100%	
	100%	100%	100%	100%	
	100%	92%	100%	100%	
	100%	100%	100%	100%	
	7%	0%	25%	25%	
	100%	100%	100%	100%	
	8%	8%	21%	52%	
	58%	58%	58%	58%	
	53%	53%	53%	53%	
	56%	20%	56%	56%	
	31%	31%	31%	41%	
	79%	79%	79%	79%	
	0%	0%	17%	18%	

Continues...

Appendix 3 - Major rivers, streams and creeks that have non-compliance in relation to the concentration of DBO (CONAMA Resolution nº· 357/2005)

Basins	UPH	River/Stream/Creek	Length (km)	Water availability (m³ /s)		Municipalities located at the hidrographic basins / Streams / creeks that are responsible for non-compliance regarding organic load	
				Current	Climate Changes		
Madeira River	Low Aripuanã	Juma River	235.4	10.4	8.7	Apuí (AM)	
	Aripuanã	Presidente Médici River	93	3.15	2.62	Juína rural area (MT)	
		Perseverança Creek	32.6	0.6	0.5	Colniza (MT)	
	Roosevelt	São Gabriel Creek	48.9	1.17	0.97	Rondolândia (MT)	
		Branco River	278.3	33.71	28.15	Ministro Andreazza (RO)	
	Ji-Paraná	Comemoração River	238	47.4	39.6	Vilhena (RO)	
		Anta Atirada River	48	0.78	0.65	Rolim de Moura (RO)	
		Palmeira Creek	83.3	1.24	1.03	Espigão d'Oeste (RO)	
		Jaru River	223.5	20.74	17.32	Theobroma (RO) e Jaru (RO)	
		Boa Vista River	75.7	2.25	1.88	Ouro Preto d'Oeste (RO)	
		Machadinho River	200.3	15.74	13.14	Machadinho d'Oeste (RO)	
		Acangapiranga River	74.6	2.15	1.8	Nova Brasilândia do Oeste (RO)	
	Jamari	Jamari River	429.9	170.22	142.13	Ariquemes (RO)	
		Tributary of Candeias River	40	2.11	1.76	Buritis (RO)	
	Middle Guaporé	Branco River	275	21.75	18.16	Alta Floresta d'Oeste (RO)	
		Igarapé Xibutaí	50.5	1.39	1.16	São Miguel do Guaporé (RO)	
		Branco Creek	52.2	0.32	0.27	Cerejeiras (RO)	
		Corumbiara River	235.7	7.68	6.41	Corumbiara (RO)	
	High Guaporé	Belo River	41.3	1.3	1.09	Colorado d'Oeste (RO)	
		Piolho River	148	7.68	6.42	Comodoro	
Purus River	Ituxi	Ituxi River	82.6	8	6.5	Acrelância (AC)	
	Acre River	Creek of Mata	42.5	0.3	0.24	Capixaba (AC)	
		Judia Creek	24.6	0.1	0.08	Senador Guiomard (AC)	
		São Francisco Creek	56	1.36	1.1	Rio Branco (AC)	
		Acre River	845	72.15	58.44	Rio Branco (AC) e Porto Acre (AC)	
Juruá River	Juruá Mirim	At the Juruá Mirim UPH, at the Juruá Mirim Basin (tributary of the Juruá in the rural area of Rodrigo Alves) there are several small stretches of rivers that have non-compliance in relation					
Interbasin	Xingu-Tapajós	Uruará River	300.1	62.8	54.9	Ururará (PA)	
	Tapajós-Madeira	Creek of Retiro	115	13.1	11.3	Juruti (PA)	

[1] The colors represent the dominant range of non-compliance in relation to DBO released, according to the IPO values below:

Rivers considered larger (L> 200 km)

	Length (%) of non-compliance with the class of the River / Stream / Creek[1]				General Observations
	Current Situation	Scenario			
		Normative	Trend	Critical	
	25%	25%	38%	38%	
	38%	38%	38%	71%	
	57%	57%	57%	57%	
	100%	100%	100%	100%	
	16%	15%	16%	21%	
	23%	8%	44%	49%	
	100%	100%	100%	100%	
	56%	56%	56%	56%	
	10%	0%	14%	18%	
	38%	38%	38%	38%	
	0%	0%	0%	7%	
	0%	0%	0%	80%	
	2%	2%	7%	7%	
	100%	100%	100%	100%	
	1%	0%	4%	8%	The Branco creek embraces the final portions of the Azul and Pimenteiras creeks in all scenarios (the Pimenteiras creek is a tributary of the Guaporé river)
	12%	5%	12%	12%	
	100%	100%	100%	100%	
	0%	0%	4%	9%	
	100%	100%	100%	100%	
	18%	18%	23%	26%	
	0%	0%	41%	41%	
	100%	100%	100%	100%	
	100%	100%	100%	100%	
	38%	24%	38%	38%	
	5%	0%	23%	26%	
to organic load when considered the critical scenario					
	7%	7%	7%	9%	
	46%	100%	100%	100%	

IPO	Class color	Description
< 1		Excellent / good
1 a 5		Reasonable
5 a 20		Bad
> 20		Very Bad

Appendix 4 - Hydroelectric uses at THE MDA.

Plants with construction scheduled until 2020 by the PDE 2019.

AHE	Basin/river	Installed capacity (MW)	Status	Value MWh (auction)	Year expected to begin generating	Area reservoir (km²)	Area reservoir (km²)
Jirau	Madeira/Madeira	3450	Under construction	78.87	2013**	302.6	11.4
Santo Antônio	Madeira/Madeira	3150	Under construction	71.37	2012 (jan.)**	271.0	11.6
Belo Monte	Xingu/Xingu	11233	Auction completed; the construction of the building site should happen in 2010.	77.97	2015 (oct.)	516.0	21.7
Colíder	Tapajós/Teles Pires	300*	Feasibility completed; auctioned.	103.4	2015	123.3	2.43
Teles Pires	Tapajós/Teles Pires	1820	Feasibility complete, awaiting the licenses.	–	2015	123.4	14.7
S. Manuel	Tapajós/Teles Pires	746	Feasibility complete, awaiting the licenses.	–	2015	53.0	14.0
Foz do Apiacás	Apiacás	275	Under feasibility study	–	2015	68.7	4.0
Sinop	Tapajós/Teles Pires	461	Feasibility completed; awaiting the licenses	–	2015	329.6	1.4
S. Luiz do Tapajós	Tapajós/Tapajós	6,133	Feasibility study in progress.	–	2016/2017*	722.2	8.5
Jatobá	Tapajós/Tapajós	2336	Inventory approved; viability study about to begin.	–	2017	646.3	3.6
Chacorão	Tapajós	3336	Feasibility study to be initiated by EPE.	–	n/d	616.3	5.4
Jamanxim	Jamanxim	881	Feasibility study in progress.	–	2017*	74.4	11.8
Cachoeira dos Patos	Jamanxim	528	Inventory approved.	–	Until 2019	116.5	4.5
Cachoeira do Caí	Jamanxim	802	Inventory approved.	–	Until 2019	420.0	1.9
Tabajara	Ji-Paraná	350	Feasibility completed and in process of obtaining a provisional license.	–	n/d	722.0	0.5
Dardanelos	Aripuanã	261	Under construction.	112.68	2010	without reservoir	–
Rondon II	Ji-Paraná	73.5	Built	n.d.	2010	3.0	–
Total		**36,136**				**5,108**	**117**

Note: * Estimated by SPR / ANA. Other estimates were based on PDE 2010-2019.
**It is estimated to advance the start of generation in about six months.

Enterprises operating at the MDA

Plant	Start-up	River	Basin	Federal Unit (State)	Domain	Power (MW)	Reservoir area (km²)	MW/km²
Guaporé	2003	Guaporé	Madeira	MT	Union	120	3	40
Samuel	1989	Jamari	Madeira	RO	State	216	540	0.400
Curuá-Una	1977	Curuá-Una	Xingu-Tapajós	PA	State	30	78	0.385
					Total	366	621	0.589

Projects under construction or already auctioned at the MDA

Plant	River	Watershed	Federal Unit (State)	Domain	Power (MW)	Reservoir area (km²)	MW/Km²
Rondon II	Comemoração	Madeira	RO	State	74	83	0.89
Dardanelos	Aripuanã	Tapajós	MT	Union	256	0.2	1280
Jirau	Madeira	Madeira	RO	Union	3,450	258	13.37
Santo Antônio	Madeira	Madeira	RO	Union	3,150	271	11.62
Colíder	Teles Pires	Tapajós	MT	Union	300	172	1.74
Belo Monte	Xingu	Xingu	PA	Union	11,233	516	21.77
				Total	18,463	1300.2	14.2

UHEs Feasibility studies in progress or about to begin in the MDA

Plant	River	Basin	Federal Unit (State)	Domain	Power (MW)	Reservoir area (km²)
Tabajara	Jiparaná or Machado	Madeira	RO	State	350	128.0
Magessi	Teles Pires	Tapajós	MT	Union	53	60.0
Sinop	Teles Pires	Tapajós	MT	Union	461	329.6
Teles Pires	Teles Pires	Tapajós	PA/MT	Union	1,820	123.4
São Manoel	Teles Pires	Tapajós	PA/MT	Union	746	53.0
Foz do Apiacás	Apiacás	Tapajós	MT	State	275	68.7
Chacorão	Tapajós	Tapajós	PA	Union	3,336	616.2
Jatobá	Tapajós	Tapajós	PA	Union	2,336	646.3
São Luiz do Tapajós	Tapajós	Tapajós	PA	Union	6,133	722.2
Cachoeira do Caí	Jamanxim	Tapajós	PA	State	802	420.0
Jamanxim	Jamanxim	Tapajós	PA	State	881	74.4
Cachoeira dos Patos	Jamanxim	Tapajós	PA	State	528	116.5
Jardins de Ouro	Jamanxim	Tapajós	PA	State	227	426.1
				Total	State	

Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
COMPONENT A NON STRUCTURAL ACTIONS					
PROGRAM A1: IMPLEMENTATION AND OPERATION OF INSTITUTIONAL ARRANGEMENT OF WATER RESOURCES MANAGEMENT **General objective:** To track an institutional arrangement that gives technical, financial and political support to the implementation of the PERH-MDA and really promotes advances in the water resources management at the region.	**Subprogram A1.1:** Implementation and Operation of the Recommended Institutional Agreement. Scope: The whole area of PERH MDA, respecting rivers domain. Correspondence with the PNRH: Program II - Institutional Development of GIRH in Brazil of the PNRH	• Installation of the PERH-MDA Collegiate Manager, in a year. • Operation of the Collegiate Manager and the executive secretariat in ten years. • Creation of two basin committees, during the first five years of the Plan, in basins, sub-basins or stretches of river basin tributaries of major rivers at the MDA.	Establish and support the operation of a Collegiate Manager of Water Resources for the MDA.	• Conduct prior meetings to the presentation and discussion of the proposed PERH-MDA Collegiate Manager establishment. • Installation of executive Board of the PERH-MDA Collegiate Manager establishment. • Establishment, maintenance and operation of the executive secretariat to support the functioning of the PERH-MDA Collegiate Manager. • Support the semiannual meetings. • Conduct workshops for review and redefinition of the adopted management model.	9,034,000.00 Main source of funding: National Water Agency - ANA. Executors: ANA and the state management organs of water resources of the MDA
	Subprogram A1.2: Negotiation, Conciliation and Mediation for Conflict Resolution Involving the Use of Water Resources. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Program VI: Multiple Use and Integrated Water Resources Management (Subprogram VI.3 - Demand Management, Conflict Resolution, Multiple Use and Integrated Water Resources).	• Achieve measurable progress in the management / development of two conflicts per biennium, transferring them from a serious class to a less serious one.	Support governing organs in the negotiation, mediation, conciliation and conflict prevention involving the use and protection of water resources in the MDA.	• Hire a “mediator/conciliator” to aid in the prevention and conflict resolution efforts. • The identification and prioritization of conflict direction and solution. • The supervision of the actions to promote prioritized conflicts conciliation/mediation. • Hire ad hoc experts in conflict resolution, with specific knowledge of the conflict nature.	5,752,000.00 Main sources of funding: ANA and the state governments of the MDA. Executors: ANA, the state management organs of water resources and the competent Public Authorities
	Subprogram A1.3: Formation of Inter-Ministerial Technical Group of Institutional. Scope: The entire area of the PERH-MDA (federal government). Correspondence with the PNRH: Program I - Studies Strategy on Water Resources (Sub-I.2): Strategic studies on National Development Scenarios and Impacts Affecting Regional Water Resources Management).	• Install the GTI within two years. • Integrate or harmonize three sectoral plans in the PERH-MDA horizon.	Establish and operate an Inter-Ministerial Technical Group focused on the integration and/or harmonization of plans and actions involving the water resources use in the MDA.	• Offer an Event for the Interministerial Technical Group launching and a workshop for the presentation and discussion of the MDA sectoral planning. • Semi-annual meetings of the Interministerial Technical Group with guidelines prepared by the Collegiate Manager. • Workshops every two years to evaluate and propose adjustments to sectoral plans involving the use or protection of the water resources.	230,000.00 Main source of funds: financed by the federal agencies participating in the GTI Executors: Involved government organs, under the coordination of the Presidency Civil House.

Continues...

Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A2: INSTITUTIONAL DEVELOPMENT-STRENGTHENING OF THE WATER RESOURCES MANAGEMENT ORGANS **General objective:** Improving the institutional capacity of the water resources management state organs, aiming at effective management of the water resources in the states in the MDA through capacity building new technologies implementation and the development of economic-financial mechanisms.	**Subprogram A2.1:** Institutional Development-Strengthening of the Water Resources Management Organs. Scope: All the MDA (state management organs of water resources). Correspondence with the PNRH: Program II-Institutional Development of the GIRH in Brazil (Subprograms II.1 - Organization and support to the SINGREH and II.2 - Support Organization of SEGRH) and Program IV: Technological Development, capacity building, Communication and Dissemination of Information on Water Resources Integrated Management (Subprograms IV.1: Development, Knowledge Consolidation, including Traditional Knowledge, and Technological Advances in Water Resources Management and IV.2: Capacity Building and Education, Specially Environmental Education, to the Water Resources Integrated Management).	• Train, through short courses and internships, 135 technicians from OGERHs or related departments of the MDA states. • Train, through post-graduate (specialization, master and doctorate), 35 technicians from OGERHs of the MDA states. • Development, command and application of 20 water resource management tools (four by each OGERH).	• Institutionally support the expansion of the tehnical and support staff of OGERHs and provide adequade logical and structural conditions in order to provide the correct discharge of their duties. • Provide capacity building of technical staff in a continuous and uninterrupted way. • Create conditions for the technological tools development focused on water resources management.	• Give institutional support to the OGERHs to conduct the public tenders for hiring qualified personnel. • Give institutional support to the activities of water resources management. • Support the implementation of continuous capacity building and technical training of the OGERHs staff. • Support the development and application of new technologies related to water resources management.	5,700,000.00 Main sources of funding: ANA, Water Resources Sector Fund and the state governments of the MDA. Executors: State management organs of water resources of the MDA and ANA.
	Subprogram A2.2: Improvement of Legal Regulations and Development of Economic and Financial Mechanisms. Scope: The whole area of PERH-MDA. Correspondence with the PNRH: Program II - Institutional Development of the GIRH in Brazil (Subprograms II.3 - Suitability, accomplishment and Convergence of the Legal and Institutional Framework and II.4 - Economic - Financial Sustainability of the Water Resources Management.	• Add and/or improve the economic - financial mechanisms for the institutional development of five legal regulations in the MDA states (one per state).	• Devise proposals for the development of water resources legal regulations, aiming at the inclusion of the economic-financial and compensation mechanisms for improve and increase the efficiency of the water resource management in the MDA states. • Identify the earning-power through compensation of the electrical sector and establish strategies for its use in agreement with the water resources management.	• Analysis of the legal regulations of water resources of the MDA states and proposition of economic-financial mechanisms for institutional development. • Identification of earning power through financial compensation of the eletric sector and definition of strategies to be used in agreement with the water resources management. • Conduct regional workshops to discuss and propose economic-financial mechanisms in the water resources state laws and strategies for the use of financial compensation revenues from the electric sector in agreement with the water resource management. • Consolidation and formatting of the proposed economic-financial mechanisms and of the strategies defined for the use of compensation revenues in agreement with the water resource management.	240,000.00 ANA and the governments of the MDA states. Executors: Governments of the MDA states and ANA

Continues...

Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A3: TECHNICAL BASIS FOR MANAGEMENT **General objective:** Provide public agencies, particularly the water resources managers, accurate and reliable data that can guide them in the decisions making process regarding the indication of works and its sizing, the preventive action against extreme events, in conducting studies and projects, as well as the knowledge about the real situation of water resources.	**Subprogram A3.1:** Hydrological Monitoring System: Expansion, Improvement and Integration of Existing System. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Subprogram III.2 - National Quali-Quantitative Hydrological Network and Subprogram III.3 - Processing, Interpretation and Dissemination of Hydrological Information of the Programme III - Development and Implementation of the PNRH Instruments for Water Resources Management.	• Installation and operation of 120 PCDs and 141 Digital Rain Gauges at the MDA	• Expand and improve the hydrological network in the PERH-MDA region. • Support the hydrological network expansion at the Amazon Basin in Bolivia and in Peru. • Automate the conventional stations. • Enable monitoring critical hydrological events, such as floods or droughts, in real time. • Enable real-time monitoring of rainfall and river flows measurements. • Monitor, in real time, the operation of the reservoirs used by the electric sector. • Enable the integration and the exchange of data collected by other sectors such as sanitation, hydropower generation, irrigation, among others. • Disseminate information.	• Expand the fluviometric and pluvimetric monitoring points at the PERH-MDA region. • Support the hydrological network expansion in portions of the Madeira, Purus, Juruá and Javari river basins that are in the territories of Peru and Bolivia. • Modernize and improve monitoring stations through telemetry and the state of the art equipment. • Support the acquisition of pluviometric and fluviometric measuring equipment by Bolivia and Peru.	11,158,600.00 Main sources of funding: Financial compensation and royalties for the water resources use, Ministry of Environment, Ministry of Foreign Affairs, National Water Agency, Organization of the Amazon Cooperation Treaty and the Global Environment Fund. Executors: State organs of water resources management, the National Water Agency of Brazil, Ministry of Foreign Affairs of Brazil, Ministry of Environment and Water of Bolivia and National Water Authority of Peru.
	Subprogram A3.2: Water Quality Monitoring Network: Expansion, Improvement and Integration of the Existing Network. Scope: The whole area of PERH-MDA. Correspondence with the PNRH: Subprogram III.2 - National Quali-Quantitative Hydrological Network and the Subprogram. III.3 - Processing, Interpretation and Dissemination of Hydrological Information of the Program III - Development and Implementation of the PNRH Instruments for Water Resources Management.	• Install 180 multiparametric probes and 100 suspended sediment samplers at the MDA.	• Expand and improve the water quality network at the MDA. • Support the expansion of the water quality network in portions of the Madeira, Purus, Juruá and Javari river basins that are in the territories of Peru and Bolivia. • Automate the conventional stations. • Monitor, in real time, water quality degradation in a watercourse caused, for example by environmental accidents, anthropic activities or anthropic effects. • Enable the integration and exchange of data collected by other sectors such as sanitation, energy, irrigation, among others. • Support the structuring of the monitoring networks and the water quality laboratories at the MDA states. • Integrate water quality and fluviometric networks, so as the monitoring networks of the dams for hydroelectric generation reservoirs. • Disseminate information.	• Expand the water quality and suspended sediments monitoring points the MDA region. • Purchase equipment for measuring water quality and suspended sediment at the MDA area.	8,780,000.00 Main sources of funding: Ministry of Environment, Ministry of Foreign Affairs, National Water Agency (PNQA), Organization of the Amazon Cooperation Treaty and the Global Environment Fund. Executors: State organs of water resources management, the National Water Agency of Brazil, Ministry of Foreign Affairs of Brazil, Ministry of Environment and Water of Bolivia and National Water Authority of Peru.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
	Subprogram A3.3: Implementation of Forecasting and Defense of Extreme Events Systems. Scope: The whole PERH-MDA area. Correspondence with the PNRH: Sub VI. I - Management in Areas Subjected to Critical Climate or Hidrological Events of the Program VI - Program for Multiple Use and Integrated Water Resources Management.	• Development of a vulnerability general map concerning the vulnerability of the the main southbank tributaries of the Amazon River, during the first five years of the PERH-MDA. • Preparation of detailed maps concerning the vulnerabilities in five areas recognized as critical in the general map of vulnerability. • Installation and operation of five situation rooms in the five MDA states during in the first five years of the PERH-MDA	• Act preventively in the occurrence of extreme events • Reduce human and economic losses coming from to the occurrence of extreme events. • Implement automated forecasting and protection systems against droughts and floods. • Integrate state information systems with the information system of the ANA. • Provide information to defense agencies and civil society in general.	• Development of general map of vulnerability based on historical data, concerning droughts and floods identifying critical basin areas. • Preparation of detailed maps concerning the vulnerabilitiesin areas recognized as critical from the general vulnerability map. • Provide equipment and operation of Situation Rooms in the States of Amazonas, Pará, Acre, Rondônia e Mato Grosso, and also integrate them to the ANA Situation.	1,700,000.00 Main source of funds: Water Resources Sector Fund-CTHidro. Executors: Federal University of Rio Grande do Sul and Technological Institute of Aeronautics.
PROGRAM A4: **WATER RESOURCES PLANNING** **General Objectives:** • Update and expand knowledge about the socio-economic and institutional dynamics, and the use of water resources in the region. • Monitor the implementation of programs proposed by the PERH-MDA. • Monitor the implementation of planned projects, so that managers can continually review the intervention strategies and increase their actions effectiveness.	**Subprogram A4.1:** Additions, Periodical Updates and Reviews of PERH-MDA. Scope: The entire PERH-MDA area. Correspondence with the PNRH: Program XIII - Program for Executive Management and Monitoring and Evaluation of the PNRH Implementation.	• Four updates/reviews of the PERH-MDA until 2030.	• Monitor economic and social development of the southbank basins of the Amazon River and its impacts on water resources. • Monitor the PERH-MDA implementation and review the implementation strategy and the investment needs.	• To make four updates/ reviews of the PERH-MDA until 2030.	12,000,000.00 Main sources of funding: ANA and Ministry of Environment. Executor: ANA.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A4: WATER RESOURCES PLANNING **General objectives:** • Update and expand knowledge about the institutional and socio-economic dynamics, and about the water resources use in the region. • Monitor the implementation of programs proposed by the PERH-MDA. • Monitor the implementation of the planned projects, so that managers can continuously review the intervention strategies and increase the effectiveness of their actions.	**Subprogram A4.2:** Development of Water Resources Plans of the MDA Basins. Scope: Basins of the Tapajós, Madeira and Xingu rivers, incorporating their interbasins, and the Purus Basin afterwards. Correspondence with the PNRH: Subprogram III.6 -Water Resources Plans and Water Quality Objectives in Water Uses of the Program III - Development and Implementation of the PNRH Instruments for Water Resources Management.	• Development of water resources plans of the Tapajós, Madeira, Purus, and Xingu river basins until 2030.	• Improve physical, biotic and hydrologic knowledge interbasins comprising the MDA basins and intrabasins. • Propose guidelines, programs and actions for the water resources management in the relevant basins in the MDA in line with the PERH-MDA proposals	• Develop water resources plans in the priority MDA basins.	12,000,000.00 Main sources of funding: ANA and Ministry of Environment. Executor: ANA
	Subprogram A4.3: Preparation of Viability Studies for Construction of Large Works Included in the PERH-MDA by Sectors Responsible Users. Scope: The whole area of PERH-MDA (the highest concentration of enterprises to be objects of viability studies are planned for the Xingu, Tapajós and Madeira river basins). Correspondence with the PNRH: The PNRH does not contain any project covering viability studies for the proposed enterprises.	• Preparation of eight Technical, Economic, Financial and Environmental Viability Studies, including the Environmental Impact Reports and Studies (EIA/RIMA) for major enterprises involving water resources that are planned for the MDA and included in sector planning.	• Identify the technical, economic, financial, social and environmental viability of the enterprises listed in the PERH-MDA. • Provide guidance in making decisions about whether or not to undertake a specific enterprise.	• Assess the technical, economic, financial and environmental viability for the enterprises that are listed in the PERH-MDA, providing support for the managers to make decisions based on consistent technical assumptions.	15,000,000.00 Main sources of funding: Ministry of Cities, National Integration Ministry, Ministry of Transport, Ministry of Mines and Energy, Ministry of Fisheries and Aquaculture and the private sector. Executors: Responsible for the works: the Ministry of Cities, National Integration Ministry, Ministry of Transport, Ministry of Mines and Energy, Ministry of Fisheries and Aquaculture and the private sector

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A5: IMPLEMENTATION OF WATER RESOURCE MANAGEMENT INSTRUMENTS **General objective:** Promote the development and implementation of water quality objectives, licensing, supervision, control and information system about water resources in the MDA region.	**Subprogram A5.1:** Water Quality Objectives. Scope: The entire area of PERH-MDA (major rivers and critic streams). Correspondence with the PNRH: Subprogram III.6 - Water Resources Plans and Water Quality Objectives in Water Uses of the Program III - Development and Implementation of the PNRH Instruments for Water Resources Management.	• Establish water quality objectives for the main rivers of the Tapajós (including Teles Pires and Juruena), Madeira and Xingu river basins.	• Provide the states of Rondônia, Acre, Amazonas, Pará and Mato Grosso with essential instruments for the water resources management. • Ensure that water quality complies with the intended uses, according to CONAMA Resolution 357/2005. • Develop state public policies for pollution control. • Generate technical basis for a better understanding of the main uses of water, its current condition and the main sources of pollution. • Improve the water quality objectives of the water bodies under the domain of the Union.	• Identify rivers that should be object of enterprises. • Evaluate available data and program campaigns for the measurement of primary data. • Conduct field campaigns to collect primary data on the predominant water uses, its current condition and the main sources of pollution. • Analyze and integrate the results. • Develop water quality objectives. • Assist states in developing water quality objectives. • Promote discussions and negotiations on the water quality objectives. • Support state boards of water resources to review and approve the water quality objectives.	425,600.00 Main sources of funding: Ministry of Environment, ANA and state management organs of water resources MANAGEMENT Executors: ANA and state management organs of water resources.
	Subprogram A5.2: Development, Implementation and Coordination of the State and Union Articulation Systems Scope: The entire area of the PERH-MDA (water resource management organs). Correspondence with the PNRH: Subprogram III.4 - Granting Water Use Systems and Methodologies of the Program. Program III - Development and Implementation of the PNRH instruments for water resources management.	• Implement granting in all the MDA states. • Standardise the adopted granting criteria for all the MDA (ANA and OGERHs)	• Implement granting system in the states of Amazonas and Acre. • Improve granting systems in the states of Mato Grosso, Para and Rondonia. • Integrate federal and state granting systems.	• Register and regulate users. • Conduct hydrological and water quality studies. • Establish and develop granting procedures. • Create computerized systems to automate and control the granting processes.	8,675,000.00 Main sources of funding: Ministry of Environment, ANA and state management organs of water resources. Executors: ANA and state management organs of water resources.
	Subprogram A5.3: Supervision and Control of Polluting Sources and Uses of Water Resources. Scope: The entire area of the PERH-MDA Correspondence with the PNRH: Subprogram III.5 - National Subprogram of Water Resources Use Supervision of the Program III - Development and Implementation of the PNRH instruments for water resources management.	• Conduct at least one monitoring campaign in the MDA rivers, per year, by water resources management organs (OGERHs and ANA). • Sign agreements with the SIPAM for supervision and control of water resources use.	Monitor the relevant consumptive and non comsumptive uses in water bodies of the MDA.	• Provide management organs with trained personnel and equipment that are necessary for supervision. • Regulate the supervision activities, establishing the procedures for investigation of offenses and penalties. • Develop supervision plans to field campaigns. • Conduct field campaigns in order to evaluate granting performance and not granted uses situations that compromise water resources quality and quantity. • Make an agreement with the SIPAM for supervision and control water resources use.	1,382,700.00 Main sources of funding: Ministry of Environment, ANA and state management organs of water resources. Executors: ANA and state management organs of water resources.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
	Subprogram A5.4: Development, Implementation and Coordination of the Information System on Water Resources. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Subprogram III. 8 - National Information System of Water Resources of the Program III - Development and Implementation of the PNRH Instruments for Water Resources Management.	• Water Resources Information Systems developed and implemented in five states of the MDA. • State Water Resources Systems integrated to National Water Resource Information System (SNIRH).	• Update and expand the database established under the PERH-MDA. • Develop water resources information systems in the MDA states that enable their integration into SNIRH, which is under construction by the ANA.	• Promote the cooperation between the ANA and the state management agencies to exchange information and preparation of technical cooperation agreements. • Implement and develop water resources information systems at the management agencies. • Integrate the state water resources information systems into the SNIRH. • Seek support from SIPAM to exchange information and give technical support to states.	3,000,000.00 Main sources of funding: Ministry of Environment, ANA and state management organs of water resources. Executors: ANA and state management organs of water resources
PROGRAM A5: IMPLEMENTATION OF THE INSTRUMENTS FOR WATER RESOURCES MANAGEMENT **General objective:** Promote the development and implementation of water quality objectives, granting supervision, control and information system on water resources in the MDA region.	**Subprogram A6.1:** Articulation and Compatibility with Federal and State Government Actions and Plans Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program V - Intersector, intra-institutional and inter-institutional Articulation of Water Resources Management of the PNRH.	• Development of institutional and economic modeling for the construction of level transposition mechanisms for navigation in hydropower facilities, involving the Ministries of Transport and Energy. • Environmental Sanitation Program for the MDA articulated with the Ministries of Environment, Cities, National Integration and Health, concerning basins and synchronization in project implementation. In the case of public water supply, take into account the contents and recommendations of the Metropolitan Areas and Brazil Atlas, both produced by ANA.	Articulate the various governmental and private sectors, in order to promote the policies, programs and actions mainstreaming aimed at the multiple use of water resources.	• Discuss and implement an action strategy and policy integration mechanisms. • Monitor the dynamics of government policies in the field of institutional arrangement in order to enable predicting or reversing actions that are contrary to the PERH-MDA objectives and support the ones considered as relevant. • Perform meetings of the MDA states with the federal government during the 20 years of the PERH-MDA implementation.	4,500,000.00 Main sources of funding: Ministry of Environment, Ministry of Agriculture, Livestock and Supply, Ministry of Mines and Energy, Ministry of National Integration, Ministry of Cities, Ministry of Transport, Ministry of Planning, Budget and Management, Regulatory Agencies (ANA, Antaq, ANEEL and ANTT), state management bodies of water resources and IBAMA. Executors: Ministry of Environment, Ministry of Agriculture, Livestock and Supply, Ministry of Mines and Energy, Ministry of National Integration, Ministry of Cities, Ministry of Transport, Ministry of Planning, Budget and Management, Regulatory Agencies (ANA, Antaq, ANEEL and ANTT), state management bodies of water resources and IBAMA.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A6: ARTICULATION AND COMPATIBILIZATION OF THE PERH-MDA WITH SECTOR PLANS AND ACTIONS FOR MULTIPLE AND RATIONAL USE OF WATER RESOURCES **General objective:** • Articulate the three levels of the federal domain - Union, states and municipalities - with the private sector, to promote the mainstreaming of public policies. • Ensure the achievement of goals set by the PERH-MDA. • Protect and use water resources sustainably, through supporting actions to reduce water bodies siltation and the creation of protected areas which are relevant to aquatic ecosystems.	**Subprogram A6.2:** Articulation and Compatibility with Municipal Master Plans. Scope: Major cities affected by large enterprises in Porto Velho (RO), Altamira (PA), Santarém (PA), Alta Floresta (MT), Rio Branco (AC), Cruzeiro do Sul (AC), Humaitá (AM) and Ji-Paraná (RO). Correspondence with the PNRH: Program V - Intersector, Inter-institutional and intrainstitutional articulation of the Water Resources Management of the PNRH.	• 90% of the municipal master plans matching with the PERH-MDA, regarding the guidelines, in the municipalities where the master plans are legally mandatory.	Coordinate and match the growth of cities with municipal master plans and PERH-MDA programs.	• Support municipalities in the preparation of municipal master plans. • Conduct, every four years, meetings of the mayors of the cities considered regional poles in the MDA during the 20 years of the PERH-MDA implementation. • Coordinate actions of the federal and state governments to enable sustainable growth of the municipalities of interest.	2,240,000.00 Main sources of funding: Ministry of Environment, Ministry of Agriculture, Livestock and Supply, Ministry of Mines and Energy, Ministry of National Integration, Ministry of Cities, Ministry of Transport, Ministry of Planning, Budget and Management, Regulatory Agencies (ANA, Antaq, ANEEL and ANTT), state management organs of water resources, state planning secretariats and municipal goverments. Executors: Ministry of Environment, Ministry of Agriculture, Livestock and Supply, Ministry of Mines and Energy, Ministry of National Integration, Ministry of Cities, Ministry of Transport, Ministry of Planning, Budget and Management, Regulatory Agencies (ANA, Antaq, ANEEL and ANTT), state management organs of water resources, state and municipal governments.
	Subprogram A6.3: Support the Prevention and Control of Erosion and siltation. Scope: Headwater areas of the Tapajós and Xingu river basins. Correspondence with the PNRH: Subprogram VI.5 - Soil and Water Integrated Actions - Micro Basins Management in the Rural Environment of the Program VI - Multiple Uses and Integrated Water Resources Management of the PNRH.	• A demonstration project for soil conservation management in a basin pilot to be implemented in the first ten years of the PERH-MDA. • Dissemination and disclosure of the practices developed in the demonstration project for the sub-basins located in the headwaters of the Teles Pires, Xingu, Arinos and Juruena rivers.	Reduce the sediment production in rural areas and consequently the siltation of reservoirs and water bodies.	• Identify a pilot basin for the subprogram implementation. • Support the dissemination and capacity building of farmers and agricultural technicians in conservation practices to control erosion. • Support the implementation of conservation practices to control erosion on farms through programs like the “Water Producer” program of the ANA. • Support the disclosure of the results obtained on pilot basin, also the initiatives in other basins based on the obtained experience.	2,000,000.00 Main sources of funding: Ministry of Environment, Ministry of Agriculture, Livestock and Supply, National Water Agency, state departments of agriculture, state management organs of water resources, state agencies for rural technical assistance and extension. Executors: ANA, state departments of agriculture, state management organs of water resources, state agencies for rural technical assistance and extension.
	Subprogram A6.4: Support the Establishment of Protected Areas. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Program X - Environmental Management of Water Resources in the Amazon Region of the PNRH.	• Identification of priority wetlands in the Madeira, Purus and Juruá river basins. • Publication of three reports on recommended management for the identified wetlands.	• Maintenance of the aquatic ecosystems integrity and, consequently, its structures and ecological and evolutionary dynamics. • Conservation of aquatic biodiversity and social and cultural diversity of the populations that inhabit wetlands. • Promote the creation of protected areas that can serve as research sites that enable increasing scientific knowledge about the various environmental aspects of the Amazon.	• Identify priority wetlands for conservation. • Articulate with the environmental state management organs and the Chico Mendes Institute for Biodiversity Conservation - ICMBio to jointly identify opportunities and areas of interest for the creation of protected areas. • Disclose information to characterize the priority wetlands for conservation. • Support the environmental state management organs in fostering the creation of protected areas for water resources conservation.	2,000,000.00 Main sources of funding: Ministry of Environment, Chico Mendes Institute for Biodiversity Conservation and environmental state secretariats. Executors: Ministry of Environment, Chico Mendes Institute for Biodiversity Conservation, environmental state secretariats.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
					10,250,000.00
					Main sources of funding: Ministry of Environment and ANA.
PROGRAM A6: ARTICULATION AND COMPATIBILIZATION OF THE PERH-MDA WITH SECTOR ACTIONS AND PLANS FOR THE MULTIPLE AND RATIONAL USE OF WATER RESOURCES **General objective:** • Articulate the three levels of the federal domain - Union, states and municipalities - and the private sector in order to promote the mainstreaming of public policies. • Ensure the achievement of the goals set by the PERH-MDA. • Protect and use water resources sustainably, by supporting actions to reduce water bodies siltation and the creation of protected areas which are relevant to aquatic ecosystems.	**Subprogram A6.5:** Cooperation and Articulation with Municipalities for the Development and Protection of Surface and Underground Waters Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Program III - Development and Implementation of PNRH Instruments for Water Resources Management.	• Development of plans for protecting water supplies of 20 municipalities and supporting their implementation.	Decentralize the federal government action to protect surface and underground waters.	• Cooperate with municipalities for prevention services and works against erosion in the areas of water sources. • Cooperate with municipalities in the development of environmental sanitation. • Cooperate with municipalities on the rationalization of agricultural practices in the areas of water sources. • Support actions for reforestation and restoration of riparian vegetation. • Cooperate with municipalities to identify the potential of surface and underground water sources within their territories.	Executors: Ministry of Environment, ANA, state management organs of water resources and municipal governments.
					500,000.00
					Main sources of funding: Ministry of Tourism, Embratur, Ministry of Environment, ANA and states of the MDA.
	Subprogram A6.6: Support for the Sustainable Tourist Exploitation of the MDA Water Resources. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Program IV - Technological Development, Capacity Building, Communication and Dissemination of Information on Integrated Water Resources Management Program V - Interinstitutional, intra-institutional and intersector articulation of the Water Resources Management, and Program VI - Multiple Use and Integrated Water Resources Management.	• A macro survey about sites of interest to the sustainable tourist exploitation of the MDA water resources. • A proposal prepared for the sustainable tourist development related to the MDA water resources.	Support the exploitation and sustainable development of tourism related to water resources in the MDA.	• Develop a macro survey of the main sites of interest related to water in the MDA, whether considering the possibility of direct use (sports, swimming, scenic beauty, etc..), as a path (transportation) or as an environment (sport fishing). • Give priority order to the surveyed sites, according to the potential for exploitation and previously defined criteria. • Develop a proposal for sustainable tourist exploitation related to the water resources in the MDA. • Consolidate, together with national and regional representatives of the tourism sector, state governments and ANA, a final proposal for the sustainable tourist exploitation related to the water resources of the MDA.	Executors: Ministry of Tourism, Embratur, Ministry of Environment, ANA and states of the MDA.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A7: MANAGEMENT OF BOUNDARY AND TRANS-BOUNDARY WATER RESOURCES LOCATED ON THE SOUTHBANK OF THE AMAZON RIVER **General Objective:** Structure the institutional and legal conceptual foundations and together with the governments of Bolivia and Peru, implement the integrated management of boundary and transboundary tributary rivers of the MDA.	**Subprogram A7.1:** Integration of Legal and Institutional Instruments of Brazil, Peru and Bolivia for the Management of boundary and Transboundary Water Resources. Scope: Madeira, Purus, Juruá and Javari river basins. Correspondence with the PNRH: Program I - Strategic Studies about Water Resources - Subprogram I.3: Practical implementation of international commitments on transboundary water bodies and development of management and decision support instruments, shared with neighboring countries and Program II: Institutional Development of Integrated Water Resources Management in Brazil - Subprogram II.3: Adequacy, Complementarity and Convergence of the Legal and Institutional Framework.	• Approval of modification/adequacy of a legal normative for each country (Brazil, Peru and Bolivia), aimed at legal and institutional harmonization of boundary and transboundary water resources management in the MDA	Respecting the sovereignty and considering the particular characteristics of nations, this subprogram aims at harmonizing and integrating the legal and institutional instruments related to the boundary and transboundary water resources management among Brazil, Peru and Bolivia.	• Preparation of a "Base Document" about the Water Resources Law of Brazil, Peru and Bolivia and a Necessary Convergence Proposal. • Conducting workgroups for the definition of necessary convergences to legal and institutional integration. • Preparation of a final document for processing the proposals in the governments of Brazil, Peru and Bolivia.	324,900.00 Main sources of funding: Ministry of Foreign Affairs, ANA, Organization of the Amazon Cooperation Treaty and the Global Environment Fund. Executors: National Water Agency of Brazil, Ministry of Foreign Affairs of Brazil, Ministry of Environment and Water of Bolivia and National Water Authority of Peru.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM A7: BOUNDARY AND TRANSBOUNDARY WATER RESOURCES MANAGEMENT LOCATED IN THE SOUTHBANK OF THE AMAZON RIVER **General Objective:** Structure the conceptual, institutional and legal foundations, in conjunction with the governments of Bolivia and Peru, to implement the integrated management of boundary and transboundary tributaries of the MDA.	**Subprogram A7.2:** Exchange and Technical Cooperation for Water Resources Management. Scope: Madeira, Purus, Juruá and Javari River Basins. Correspondence with the PNRH: Program I: Strategic Studies on Water Resources - Subprogram I.3: Practical implementation of international commitments on transboundary water bodies and development of management and decision support instruments, shared with neighboring countries. Program III: Development and Implementation and Instruments for Water Management in Brazil - Subprogram III.2: Hydrological Monitoring Network and Qualitative and Quantitative National Network Program IV: Technological Development, Capacity Building, Communication and Dissemination of Information on Integrated Water Resources Management Sub-IV.1: Development, Knowledge Consolidation, Including Traditional Knowledge and Technological Advances in Water Resources Management; Subprogram IV.2: Capacity Building and Education, in Special the Environmental One, for the Integrated Water Resources Management, and Subprogram IV.3 : Communication and Dissemination of Information on Integrated Water Resources Management.	• Training and capacity building of 25 technicians from Peru and 25 from Bolivia for operation and maintenance of water quantity and quality monitoring networks. • Capacity building of 40 technicians from Brazil, 40 from Peru and 40 from Bolivia in Instruments and Mechanisms for Water Resources Management used by the MDA countries. • Conducting five trinational seminars . • Flow of information and knowledge established between the national organs of water resources in Brazil, Peru and Bolivia.	Enable institutional approach and technical information flow and use between representatives of government agencies, water users and civil society, of Brazil, Bolivia and Peru that act directly or indirectly in boundary and transboundary water resources management of the Madeira, Purus, Juruá and Javari River Basins.	• Preparation and enforcement of courses and internships focused on operation and maintenance of hydrological and water quality monitoring networks in the MDA. • Preparation and enforcement of courses and internships focused on water resources management instruments and mechanisms used by the MDA countries. • Organisation of workgroups and supporting of the participation of technicians and officers of the national water resources organs in Brazil, Peru and Bolivia. • Organization, every two years, of trinational seminars and supporting the participation of technicians and officers of the national and state/district water resources organs, also representatives of water users and civil society in Brazil, Peru and Bolivia.	4,693,000.00 Main sources of funding: Ministry of Foreign Affairs, ANA, Organization of the Amazon Cooperation Treaty and the Global Environmental Fund and Water Resources Sector Fund Executors: National Water Agency of Brazil, Ministry of Foreign Affairs of Brazil, Ministry of Environment and Water of Bolivia and National Water Authority of Peru.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
	Subprogram A7.3: Support the Organization and Functioning of the Binational and/or Trinational Organs Focused on Boundary and transboundary Water Resources Management in the MDA. Scope: Madeira, Purus, Juruá and Javari River Basins. Correspondence with the PNRH: Program I: Strategic Studies on Water Resources - Subprogram I.3: Practical implementation of international commitments on transboundary water bodies and development of management and decision support instruments, shared with neighboring countries.	• Signing an international agreement for the creation of a binational or trinational water resources organ in the MDA. • Support the installation and operation of a binational or trinational water resources organ in the MDA.	Support the creation and operation of binational and/or trinational water resouces organs with the aim of promoting sustainable development and boundary and transboundary water resources integrated management in the region of the MDA, in accordance with the laws of the participant countries.	• Definition of the boundary and transboundary river basins of the MDA that are priority for the water resoucers integrated management. • Conduct workgroups to define the institutional model and the organization proporsal for binational and/or trinational organs to be installed. • Development of a joint proposal among representatives of the three countries of the MDA for the installation of binational and/or trinational organs focused on water resources management. • Support the operation of a binational and/or trinational organ to be installed.	1,893,900.00 Main sources of funding: Ministry of Foreign Affairs, ANA, Organization of the Amazon Cooperation Treaty and the Global Environmental Fund. Executors: National Water Agency of Brazil, Ministry of Foreign Affairs of Brazil, Ministry of Environment and Water of Bolivia and National Water Authority of Peru.
PROGRAM A8: ENVIRONMENTAL EDUCATION AND SOCIAL COMMUNICATION **General Objective:** to promote initiatives aimed at environmental education and social communication in water resources.	**Subprogram A8.1:** Environmental Education Aimed at Water Resources Protection and Management. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Subprogram IV.2: Capacity Building and Education, especially the Environmental one, for Integrated Water Resources Management of Program IV: Technological Development, Capacity Building, Communication and Dissemination of Information on the PNRH Integrated Water Resources.	• Elaboration of a political-pedagogical proposal for environmental education aimed at the water resources protection and management. • Training of 500 teachers to provide formal environmental education in public schools of basic and primary education, according to the guidelines of the political-pedagogical proposal. • Elaborate four reports for monitoring and tracking changes in the conception and understanding of water resources by students in public schools of basic and primary education at the MDA.	• Develop political-pedagogical proposal for environmental education aimed at protection and management of water resources in line with the PERH-MDA objectives, with regional culture, with reality and with the problems related to water at the MDA. • Train teachers and provide formal environmental education in public schools of primary and basic education. • Monitor and evaluate changes in the conception and understanding of water resources by students in public schools of basic and primary education at the MDA.	• Develop a political-pedagogical proposal. • Train teachers. • Monitor and evaluate students in public schools of basic and primary education at the MDA. • Train and empower water users.	12,000,000.00 Main sources of funding: Federal and State Budget Executors: Teaching and research institutions, ANA, non-governmental organizations - ONGs working in the MDA, municipal governments, state water resources management organs.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
					3,000,000.00 Main sources of funding: Federal and State Budget and international organizations.
PROGRAM A8: ENVIRONMENTAL EDUCATION AND SOCIAL COMMUNICATION. **General Purpose:** Promote initiatives aimed at environmental education and social communication in water resources.	**Subprogram A8.2:** Social Communication. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: Subprogram IV.3: Communication and Dissemination of Information on Integrated Water Resources Management of Program IV: Technological Development, Capacity building, Communication and Dissemination of Information on the PNRH Integrated Water Resources Management.	• Elaboration of a communication plan aimed at the dissemination of water resource management in the MDA. • Publication and dissemination of annual reports on water resources management in the the MDA, highlighting the activities of the PERH-MDA Collegiate Manager. • Publication and distribution of printed materials (folders and primers) directed to the dissemination of the MDA water resources management. • Five-year assessment of awareness and dissemination by the media of issues involving the water resources of the region.	Design and implement social communication activities, aimed at raising awareness and mobilizing the whole society, that contributes to the recovery and preservation of water and associated environment.	• Employ the communication means and channels available at the MDA to promote environmental education actions, aimed at identifying and training of opinion leaders in charge of increasing the range and dissemination of actions.	Executors: State management organs of water resources, teaching and research institutions, the National Water Agency, ONGs active in the MDA and municipal governments.

Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
COMPONENT B - NO STRUCTURAL ACTIONS					
PROGRAM B1: STUDIES AND WATER INFRASTRUCTURE PROJECTS ASSOCIATED WITH ENVIRONMENTAL LIABILITIES AND IMPACTS ON WATER RESOURCES **General Objectives:** • Conduct studies, diagnoses and projects aimed at understanding the impacts of water use in especific hydroelectric power plants of the PERH-MDA region to allow their licensing, bidding and implementation. • Conduct studies and projects for bidding, licensing and implementation of structural interventions.	**B1.1 Subprogram:** Environmental Studies and Diagnostics regarding the Structural Interventions of the PERH-MDA. Scope: Areas subject to larger structural interventions, especially the Madeira, Tapajós and Xingu river basins. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon region of the Component of Regional Water Resources Program.	• EIAs for environmental sanitation projects designed for all municipalities of the MDA. • Fourteen (14) sets of complete detailed environmental projects for UHEs. • A complete detailed environmental project for waterways	• Enable users of water resources to obtain the environmental structural interventions licenses licenses which are part of their sectorial plans. • Increase specific knowledge of water users sector and about the region affected by these interventions.	• To conduct studies and environmental diagnostics to perform environmental sanitation. • To conduct studies and environmental diagnostics for performing power plants, dams, waterways, aquaculture and irrigated agriculture.	34,372,898.00 Major sources of funds: Private sector, international organizations, municipalities, concessionaries of public services, regulatory agencies and the federal government. Executors: users sectors.
	Subprogram B1.2: Projects regarding the Structural Interventions of the PERH-MDA. Scope: The entire area of the PERH-MDA. Correspondence with the PNRH: This subprogram has no connection with the PNRH programs.	• 20 basic engineering projects for hydroelectric power plants. • A basic engineering project for waterway. • Elaboration of 30 basic projects for aquaculture and fishing, including ponds, tanks, dams and nursery stations. • Basic engineering projects of environmental sanitation designed for all municipalities of the MDA, in the first 10 years of the Plan.	• Enable users of water resources to the bidding process of works. • Provide basic sanitation projects for municipal governments and state concessionaires of water and sewage. • Develop basic projects for interventions planned by the navigation, electrical, aquaculture sectors and others associated with the use of water resources. • Assist municipalities in planning integrated interventions of sanitation and the access to financial resources for execution of works.	• Develop basic projects for implementation, improvement and expansion of sewer systems (water, sewer, solid waste and drainage). • Develop basic projects for implementation of multiple uses works and hydropower plants. • Develop basic projects aimed at aquaculture. • Develop basic projects for deployment of waterways.	343,728,986.00 Major sources of funds: Costly Resources from the Union, the performers' own resources and funding obtained from concessionaires and municipalities along with national and foreign credit institutions. For urban drainage projects, the resources will come from a competitive fund to be established under the Ministry of Cities, intended solely for the implementation of urban drainage works. The resources for the implementation of rural sanitation will come from Funasa. Executors: Municipal governments, Funasa, Ministry of Cities, concessionaries of sanitation public services.
	B1.3 Subprogram: Environmental Projects and Regional Accommodation. Scope: The Tapajos, Madeira and Xingu river basins. Correspondence with the PNRH: Subprogram VI.6: Studies About Criteria and Multiple Objectives Focused at Defining Rules and Restrictions in Reservoirs of Hydroelectric Power Plants of Program VI: Program for Multiple Use and Integrated Water Resources Management.	• Projects of environmental compensation defined in the environmental licenses issued for 14 UHEs.	Introduce compensatory measures in areas affected by negative impacts on water resources that cannot be mitigated.	• Perform environmental regional integration projects aimed at the area affected by negative environmental impacts. • Fight against poverty.	700,000,000.00 Main sources of funding: Ministry of Mines and Energy, Ministry of Environment, Ministry of National Integration and Private sector. Executors: Ministry of Environment and Ministry of National Integration.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
	Subprogram B1.4: Projects to recover Degraded Areas and Environmental Liabilities. Scope: MDA, particularly the Xingu, Tapajos and Madeira River Basins. Correspondence with the PNRH: The National Plan for Water Resources does not include investment projects to Recover Degraded Areas and Environmental Liabilities..	• Demonstrative projects to recover two areas that have been degraded by mines. • Interventions to recover 70 areas that have been degraded because of the improper disposal of solid waste.	Develop and implement projects to recover areas that have been degraded by mining and by improper disposal of urban solid waste.	• Develop and implement projects to recover degraded areas, including the conduct of exploration and field and laboratory tests.	90,000,000.00 Main sources of funding: Ministry of Environment and private sector. Executors: Ministry of Environment and private sector.
PROGRAM B2: ENVIRONMENTAL SANITATION General objective: Implement water infrastructure in order to ensure that the urban and rural population access to basic sanitation services in the pursuit of universal access and thereby improve the living conditions of the population in the region of the southbank of the Amazon River, reducing child mortality, contributing to the rational use of water and the conservation of water resources.	**Subprogram B2.1:** Urban Water Supply. Scope: Overall scope in the municipal urban centers of the southbank basins of the Amazon river. Correspondence with the PNRH: Program VI: Program for Multiple Use and Integrated Water Resources Management of PNRH and its subprograms: VI.1 Management in Areas Subject to Hydrological or Critical Climate Events; VI.2 - Supply Management, Expansion, Rationalization and Reuse of Available Water so as with the Program X: Environmental Management of Water Resources in the Amazon Region.	• Water coverage index to urban population of 90% in municipalities where the current index is less than or equal to 45%, and 100% in municipalities where the current index is greater than 45%. • Water coverage Index of 100% in municipalities that receive appropriate water treatment. • Micro-measurement index of 90%. • Loss index of 35%.	• Provide good quality water in sufficient quantity for urban populations of the MDA. • Carry out works for deployment, expansion and improvement of water supply systems in urban areas. • Implement and improve the operational control of existing water supply systems through avoiding water loss. • Promote the rational use of water. • Avoid population contamination by diseases that are transmited by water.	• Implementation, expansion and improvement of water supply systems in urban areas. • Implementation, expansion and improvement of wastewater treatment plants - ETAs. • Implementation of wells with simplified procedure.	1,119,197,195.00 Main sources of costly resources from the Union and from state components of the MDA, obtained by funding required to national and international organizations. Non costly resources from the Union and states of the MDA. Executors: Ministry of National Integration, Ministry of Cities, the Ministry of Health (Funasa), Ministry of Environment and state and local governments.
	Subprogram B2.2: Sewage Collection and Treatment. Scope: Local actions in urban areas and general actions in municipalities of the southbank of the Amazon River Correspondence with the PNRH: Program VI: Program of Multiple Use and Integrated Water Resources Management of PNRH and its Sub-program: VI.4 - Integrated intervention of Sanitation and Environmental Management of Water Resources in Urban Environment as well as Programme X: Environmental Management of Water Resources in the Amazon region.	• Coverage Index of urban population by sewage disposal system of 90%. • Coverage Index of urban population by sewage treatment of 90%. • Coverage Index of urban population by individual sewage systems of 10%.	• Carry out works for the sewage collection and treatment also the appropriate final disposal of sludge in urban areas. • Protect the population from diseases that are transmited by water. • Eliminate the release of wastewater into storm water networks. • Protect water resources from pollution sources.	• Implementation, expansion and improvement of sewage networks in urban areas. • Implementation, expansion and improvement of wastewater treatment plants. • Implementation of septic tanks in urban areas.	1,977,612,521.00 Main sources of resources: Costly Resources from the Union and from the states of the MDA, obtained by means of financing the required national and international organizations, non costly resources from the Union and the component states of the MDA. Executors: Ministry of National Integration, Ministry of Cities, the Ministry of Health (Funasa), Ministry of Environment and state and local governments.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
	Subprogram B2.3: Final Destination and Collection of Urban Solid Waste. Scope: Local actions in urban areas and general actions in municipalities of the south-bank basins of the Amazon River. Correspondence with the PNRH: Program VI: Program for Multiple Use and Integrated Water Resources Management of the PNRH and its Sub-program: VI.4:Integrated Interventions of Environmental Sanitation and Management of Water Resources in Urban Environment as well as the Program X: Environmental Management of Water Resources in the Amazon Region.	• Coverage Index of urban population by regular garbage collection of 95%. • Proper disposition of municipal solid waste in the MDA municipal centers of 95%.	• Implement appropriate disposal of urban solid waste. • Disable existing dumps and controlled landfills. • Recover areas currently used to inappropriate trash disposal. • Prevent contamination of water resources and protect public health. • Eliminate the release of urban solid waste in storm water networks. • Encourage the selective collection and recycling of urban waste, as well as the associated management.	• Implement sanitary landfills in municipal centers or group of centers where total urban population is more than 10 000 inhabitants. • Implement sustainable landfills for municipal centers with urban population less than 10,000 inhabitants. • Disable garbage dumps and controlled landfills.	146,004,908.00 Main sources of funding: Costly resources from the Union and the states of the MDA, obtained from funding required to national and international organizations. Non costly resources from the Union and the component states of the MDA. Executors: Ministry of National Integration, Ministry of Cities, Ministry of Health (Funasa), Ministry of Environment and state and local governments.
PROGRAM B3: WATER INFRASTRUCTURE WORKS AND RELATED SERVICES **General objective:** Provide works and infrastructure services to the sectors of water resources use in the region of PERH-MDA, aiming at multiple use and sustainable development.	**Subprogram B2.4:** Urban Drainage. Scope: Local actions in urban areas and general actions in municipalities of the south-bank basins of the Amazon River. Correspondence with the PNRH: Program VI: Program for Multiple Use and Integrated Water Resources Management of the PNRH and its Sub-program: VI. 4: Integrated Interventions of Sanitation and Environmental Management of Water Resources in Urban Environment as well as the Program X: Environmental Management of Water Resources in the Amazon region.	• Establishment of urban drainage networks in 25% of municipalities that have less than 50000 inhabitants and problems of environmental degradation, unhealthy conditions and subject to risk factors.	• Reduce the vulnerability of the population to flooding that occurs due to failure or lack of urban drainage. • Enhance, restore and maintain the existing urban drainage infrastructure. • Implement microdrainage infrastructure in urban areas subject to the occurrence of floods. • Implement appropriate structures for final stormwater release. • Reduce the incidence of diseases that are transmited by water. • Eliminate the release of stormwater into sewage systems. • Prevent damage caused by flooding on the existing water and sewer infrastructure. • Introduce techniques of retention and/or detention of stormwater before launching releasing into sewage network.	• Enhance, restore and maintain the existing drainage system. • Implement drainage in urban areas subject to flooding, including collection and final release.	350,000,000.00 Main sources of funding: Resources from the competitive fund established under the Ministry of Cities and Funasa, intended solely for the implementation of urban drainage works. Executors: Municipalities.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
	Subprogram B2.5: Rural Sanitation. Scope: Overall Scope in rural areas of municipalities in the southbank basins of the Amazon River . Correspondence with the PNRH: Program VI: Program for Multiple Use and Integrated Water Resources as well as Program X: Environmental Management of Water Resources in the Amazon Region.	• Index of environmental sanitation service to rural population of 60%. • Index of environmental sanitation service to riverside population of 60%.	• Provide sufficient good quality water to non-urban population living in the MDA. • Implement simplified and alternative systems of collection and final disposal of liquid and solid waste. • Avoid contamination of the population by diseases and transmition by water. • Protect water resources from polluting sources.	• Implement actions of environmental sanitation for rural populations. • Implement actions of environmental sanitation for riverside populations.	1,475,709,151.00 Main sources of funding: Non costly resources from the Union and the states of the MDA. Executors: National Health Foundation (Funasa) through the Ministry of Health, state and municipal governments, and ONGs.
PROGRAM B3: WATER INFRASTRUCTURE WORKS AND RELATED SERVICES **General objective:** Provide works and infrastructure services to the sectors of water resources use in the region of PERH-MDA, aimed at multiple use and sustainable development.	**Subprogram B3. 1:** Multiple Exploitation Works of Water Resources. Scope: Tapajós and Madeira River Basin. Correspondence with the PNRH: The PNRH does not include programs for works of multiple use.	• Construction and operation of locks in the dam of four UHEs, to be implemented in Rio Teles Pires and in dams of three hydropower plants planned for the Rio Tapajós. • Construction and operation of a lock in the dam of the Tabajara UHE to be constructed in Ji-Paraná River, if licensed.	• Apply the concept of multiple uses of water. • Facilitate the distribution of agricultural harvest as well as transportation of goods and passengers.	• Build locks in the dams of the UHEs to be constructed at the Teles Pires and Tapajós Rivers (San Manuel, Jatoba, Teles Pires, St. Louis, Chacorão, Sinop and Colíder). • Build a lock in the Tabajara UHE to be constructed at the Ji-Paraná River	6,287,032,000.00 Main sources of funding: Ministry of Transport / National Department of Transport Infrastructure - DNIT. Executors: Ministry of Transport / DNIT.
	Subprogram B3.2: Hydroelectric Use. Scope: Watersheds of the Madeira, Tapajós and Xingu. Correspondence with the PNRH: The PNRH does not foresees programs for civil power generation.	• Installation of a hydropower potential of 36,630 MW, comprising UHEs envisaged in the PDE 2019 for the rivers of the MDA.	Construct and operate hydroelectric power generation projects (UHEs e PCHs)) to meet future national demand for energy.	• License and build UHEs in the MDA area. • License and build PCHs in the MDA area.	82,820,268,408.00 Main sources of funding: public and private resources, with funding from suppliers or national or international banks. Executors: Eletrobras (and its subsidiaries), public and mixed economy companies and private sector. Companies of the electric sector and companies with a especial purpose to be constructed (SPE)

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM B3:: WATER INFRASTRUCTURE WORKS AND RELATED SERVICES **General objective:** Provide works and infrastructure services to sectors focused on the water resources use in the PERH-MDA region, aiming at multiple use and sustainable development.	**Subprogram B3.3:** Water Transport. Scope: Madeira and Tapajos River Basin. Correspondence with the PNRH: The PNRH does not include programs to navigation works.	• Implementation and operation of a waterway in Tapajós and Teles Pires Rivers. • A Waterway operating at Madeira River with the infrastructure improvements that were planned in PAC 2.	• Induce development in productive areas. • Facilitate transportation of cargo and passengers. • Provide existing waterways with better conditions for navigation and with naval infrastructure infrastructure.	• Maintain and introduce structural improvements in the Madeira River waterway. • Implement the Waterway Tapajós/Teles Pires.	5,926,841,000.00 Main sources of funding: Program for Growth Acceleration - PAC II (federal government) and resources from the Ministry of Transport (OGU). Executor: Ministry of Transport
	Subprogram B3.4: Aquaculture and fishing. Scope: Part of the MDA in the states of Para, Amazonas, Rondonia and Acre. Correspondence with the PNRH: The PNRH does not include programs for aquaculture works.	• 30 implemented aquaculture projects, involving the construction of ponds, dams and tanks, and nursery stations.	• Provide a reliable source of animal protein for local people. • Restore the natural stocks of fish. • Encourage the industrial production of fish in the region as a way to avoid unemployment and to generate income. • Promote sustainable rural development in the region. • Create, improve and expand the infrastructure for fish production.	• Implement ponds, dams and breeding tanks. • Implement nursery stations. • Create, improve and expand the infrastructure of production; • Create productive chain and APLs.	100,000,000.00 Main sources of funding: Funds from the Ministry of Fishing and Aquaculture and state secretariats for this purpose. Executors: Union and state governments.
	Subprogram B3.5: Irrigated agriculture. scope: Part of the Xingu, Tapajós and Madeira River Basin in the states of Mato Grosso and Rondonia. Correspondence with the PNRH: The PNRH does not include programs for works of irrigated agriculture.	• A 300,000 irrigated hectares increase in the MDA, in the duration of the Plan* • Note: *the expansion of irrigated areas depends directly on the financial return based on market prices for agricultural products, not the availability of water being, in general, restrictive to the expansion of the sector in the MDA.	Define water requirement for the development of sustainable agriculture and restrict its expansion area to suit the observed growth of irrigated crops.	• Expand irrigated agriculture through the implementation of sustainable projects and works.	1.571.370.452,00 Main source of funds: Private. Executor Private sector

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
COMPONENT C: SCIENCE AND TECHNOLOGY					
PROGRAM C1 IDENTIFICATION AND CHARACTERIZATION OF AMAZONIAN AQUATIC ECOSYSTEMS **General objective:** Conduct scientific research to identify and characterize wetlands and Amazonian aquatic ecosystems in the MDA.	**Subprogram C1.1:** Studies of the Dynamics of Lakes, Rivers and Tributaries in the MDA. Scope: Southbank Tributaries of the Amazon River. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Three projects implemented in three different locations of the MDA.	• Carry out measurements and estimates related to biomass production and to stocks of populations and their regulation by the Amazonian "lakes". • Carry out measurements and estimates related to the productivity of Amazonian "lakes". • Summarize the main mechanisms identified from the research conducted within the subprogram. • Conduct studies on biological and physical and chemical indicators of aquatic ecosystems integrity.		12,900,000.00 Main sources of funding: Ministry of Science and Technology and sector and constitutional funds. Executors: Teaching and research institutions.
	Subprogram C1.2: Environmental Services Provided by Hydroelectric Power Plant Reservoirs. Scope: Southbank tributaries of the Amazon River. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Preparation of six annual reports in a pilot-reservoir.	Conduct characterization and typology of environmental services provided by reservoirs.		6,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C1.3: Environmental Services Provided by Natural Aquatic Ecosystems. Scope: Southbank tributaries of the Amazon River. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Nine sites studied during three years each.	• Assess the environmental services provided by natural ecosystems. • Perform characterization and typology of these services; • Identify alternatives for payment schemes for environmental services in basins of the MDA.		13,500,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C1.4: Typology and Characterization of Aquatic Ecosystems. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Characterization of MDA aquatic Ecoregions.	• Conduct characterization and geomorphological, ecological and hydrodynamic typology of the major Amazonian aquatic ecosystems. • Detail the characteristics of aquatic ecoregions.		5,000,000.00 Main sources of funding: Ministry of Science and Technology and sector and constitutional funds. Executors: Teaching and research institutions.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM C2: STUDIES OF MAJOR BIOGEOCHEMICAL CYCLES General objective: Develop scientific knowledge, based on applied research and focused on the biogeochemical cycles related to the qualitative and quantitative aspects of water resources in the Amazon Region.	**Subprogram C1.5:** Characterization of Wetlands of the MDA. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Mapping of existing wetlands in the MDA. • Characterization of wetlands identified in the Madeira, Purus and Juruá River Basins	• Demarcate and distinguish wetlands in the MDA. • Evaluate the hydrological "role" of wetlands of the MDA. • Evaluate the ecological "role" of the wetlands of the MDA. • Conduct assessments of the ecological dynamics of aquatic biodiversity. • Evaluate the "role" of biogeochemical cycles in wetlands of the MDA. • Characterize the human presence and its relations with the wetlands of the MDA. • Identify wetlands most sensitive to anthropogenic pressures.		7,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C2.1: Biogeochemical Cycle of Carbon, Nitrogen and Phosphorus. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Six studied sites of the MDA (with 18 annual reports produced).	• Study the cycle of C, N and P. • Study the cycle of C, N and P in an integrated way. • Study natural and artificial eutrophication processes, especially in clear water rivers. • Analyze the impact of changes in land use on the supply of C, N and P. • Model the natural and artificial eutrophication processes in anthropic and natural environments.		14,040,000.00 Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C2.2: Biogeochemical Cycle of Mercury in Natural and degraded Systems Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Nine studied sites of the MDA (27 annual reports produced).	• Study the dynamics of Hg between the abiotic and biotic compartments of aquatic environments, as well as its impact on riverside populations and multiple uses of water. • Study the process of methylation of Hg in different types of water bodies (rivers of clear, white and black water) and in reservoirs. • Study the cycle of mercury in natural lakes and manmade reservoirs. • Develop ecotoxicological studies to support the improvement of the legislation limits for fish consumption and levels of Hg toxicity to aquatic organisms.		14,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM C3: STUDIES OF IMPACTS OF GLOBAL CHANGE IMPACTS ON WATER RESOURCES AVAILABILITY **General objective:** Develop specific ongoing research on the impacts of increasing the Earth's temperature on climate and consequently on water availability of surface and ground sources in the southbank tributaries' basins of the Amazon River.	**Subprogram C2.3:** Biogeochemical Cycle of Iron, Manganese, Chromium and Oxygen. Scope: The whole area of the PERH-MDA. Program X: Environmental Management of Water Resources in the Amazon Region.	• Ten studied sites of the MDA (30 annual reports produced).	Model the dynamics of iron, manganese, chromium and oxygen in rivers, lakes and reservoirs.		2,400,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C3.1: Impact Assessment of changes predicted by global climate models over hydrological and nutrient cycles. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Preparation of six reports. Every three years (in the 3rd, the 6th and 9th year of the Plan) two reports will be prepared attesting the reassessments and predictions of climate change obtained by the models used, based on new information added in each period.	Identify and analyze the impacts and predict effects on the hydrological cycle and on the biogeochemical cycles of carbon, oxygen and nitrogen.		6,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C3.2: Impact Assessment of Global Climate Change on Water Balance of the MDA. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region .	• Preparation of three reports. Every three years (the 4th, 7th and 10th years of the Plan) a report will be prepared using the results of subprogram C3.1.	Identify and analyze the impacts and predict effects on water balance in the MDA area.		3,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C3.3: Evaluation and Monitoring of the impacts of changes predicted by global climate models on the supply / demand relation in the basins of the MDA. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Preparation of three reports. Every three years (on the 5th, the 8th and the 11th year of the Plan), a report will be prepared using the results of Subprogram C3.2	Assess the impacts of global climate change of the supply / demand relation in the MDA.		1,500,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C 3.4: Develop Contingency Plans and Adaptive Actions to Global Climate Change, especially for Extreme Events and Evaluation of its Effectiveness. Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Development, on the 5th year of the PERH-MDA, of a contingency plan and proposals of adaptative actions to climate change in the MDA. • Review, on the 10th year of PERH-MDA, of the Contingency Plan and the proposals of adaptative actions to climate change in the MDA	Develop Contingency Plans and Adaptive Actions to Global Climate Change.		4,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM C4 DEVELOPMENT OF STUDIES ON OF QUANTITATIVE AND QUALITATIVE RESEARCH ON UNDERGROUND WATER **General Objectives:** • Raise and provide information and knowledge about the occurrence, circulation and use of underground water in the region of PERH-MDA which are essential for the management of water resources and are fundamental for the socioeconomic development of the region. • Study prominent aquifers in the region, as the Alter do Chao, Parecis Ronuro, Issa and Solimões, including the Pre-Cambrian ones. • Give qualitative and quantitative support to the water supply for human consumption. • Contribute with the optimization of financial resources use for exploitation of water resources.	**Subprogram C4.1:** Characterization and hydrogeological properties of the Alter do Chao aquifer. Scope: Areas where the aquifer occurs. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• The Alter do Chao Aquifer characterized by its hydrogeological properties until the 5th year of the Plan.	Promote the characterization of the Alter do Chao Aquifer, including hydrogeological, hydrodynamic and hydrogeochemical parameters which are essential to the socioeconomic development of the region and indispensable as a basis for integrated management of surface and underground water resources.		5,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research Institutions.
	Subprogram C4.2: Characterization and hydrogeological properties of the Içá and Solimões Aquifers. Scope: Areas where the aquifers occur. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• The Içá and Solimões Aquifers characterized by their hydrogeological properties until the 5th year of the Plan.	Promote the characterization of the Içá and Solimões, including Aquifers hydrological, hydrodynamic and hydrogeochemical parameters which are essencial to the socioeconomic development of the region and indispensable as a basis for integrated management of surface and underground water resources.		4,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds Executors: Teaching and research Institutions
	Subprogram C 4.3: Characterization and hydrogeological properties of the Ronuro and Parecis aquifers. Scope: Areas where the aquifers occur. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• The Ronuro and Parecis Aquifers characterized by their hydrogeologic properties, until the 8th year of the Plan.	Promote the characterization of the Ronuro and Parecis Aquifers, including hydrogeological, hydrodynamic and hydrogeochemical parameters which are essencial to the socioeconomic development of the region and indispensable as a basis for integrated management of surface and underground water resources.		4,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds Executors: Teaching and research Institutions

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Appendix 5-Interventions proposed in the PERH-MDA: programs and subprograms

PROGRAM	SUBPROGRAM/ SCOPE	GOALS	OBJECTIVES	ACTIONS	PLANNED INVESTMENT (R$) / SOURCES / EXECUTORS
PROGRAM C5 RESEARCH APPLIED TO AQUACULTURE AND FISHING **General Objective:** Facilitate, through applied research, solutions for the sustainability of fishing and aquaculture productive chains for the benefit of the population of the MDA area.	**Subprogram C4.4:** Characterization and hydrogeological properties of Pre-Cambrian Aquifers. Scope: Areas where the aquifers occur. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Pre-Cambrian Aquifers characterized by their hydrogeologic properties until the 7th year of the Plan.	Promote the characterization of Pre-cambrian Aquifers, including hydrogeological , hydrodynamic and hydrogeochemical parameters which are essencial to the socio-economic development of the region and indispensable for the integrated management of surface and underground water resources.		2,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.
	Subprogram C5.1: Mapping areas to implement Aquaculture and Fishing in comparison with the greatest potential areas Identified in Program C1 - Aquatic Ecosystems Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Mapping fish areas completed by the 6th year of the Plan.	• Identify major areas to fishing and aquaculture projects. • Map these areas and distinguish them according to their potential and impact on aquatic ecosystems.		1,000,000.00 Main sources of funding: Ministry of Science and Technology, sector funds, Ministry of Fishing and Aquaculture and Brazilian Agricultural Research Corporation (Embrapa). Executors: Teaching and research institutions.
	Subprogram C5.2: Design of Business Models and Productive Chains of Aquaculture and Fishing Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Preparation of two reports, on the 5th and 6th years, containing the models of rational and sustainable exploitation of fishing and aquaculture in the MDA.	• Create business models suited to the different local conditions of the MDA that allow the rational and sustainable exploitation of fishing and aquaculture. • Study the socioeconomic relationships related to the business model.		2,000,000.00 Main sources of funding: Ministry of Science and Technology, sector funds, Ministry of Fishing and Aquaculture and Embrapa. Executors: Teaching and research institutions.
	Subprogram C5.3: Impact Assessment of Aquaculture and Fishing on natural and anthropogenic ecosystems Scope: The whole area of the PERH-MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Preparation of three reports at the end of the 6th, 7th and 8th years of the Plan, containing assessments of the impacts caused by aquaculture and fishing on natural and anthropic ecosystems of the MDA.	• Conduct research on the effectiveness of participatory management of fishery planning. • Evaluate the impacts of fishing and aquaculture activities implemented in the MDA on the water quality monitored by network for this purpose. • Conduct studies to assess the impacts of human activities on fishing resources.		3,500,000.00 Main sources of funding: Ministry of Science and Technology, sector funds, Ministry of Fishing and Aquaculture and Embrapa. Executors: Teaching and research institutions.
PROGRAM C6 RESEARCH APPLIED TO BASIC SANITATION FOR RIVERSIDE POPULATIONS **General objective:** Develop appropriate technologies for collecting and purifying water , collection and disposal of sewage and garbage for the riverside population living in the southbank tributaries of the Amazon River.	**Scope:** Riverbanks occupied by scattered population (riverside) in the area of MDA. Correspondence with the PNRH: Program X: Environmental Management of Water Resources in the Amazon Region.	• Implementation of four demonstration projects with sanitation solutions for riverside populations. • Preparation of four reports about development of research in alternative sanitation models for riverside population. • Preparation of five monitoring reports on the performance of the proposed models.	• Develop alternative supply systems of good quality water and in sufficient quantity for the riverside population living in the MDA. • Develop alternative methods of collection and final disposal of liquid and solid waste. • Reduce the incidence of diseases that are transmited by water in the riverside population. • Increase knowledge on the water use habits by riverside communities. • Protect water resources from polluting sources.		3,000,000.00 Main sources of funding: Ministry of Science and Technology and sector funds. Executors: Teaching and research institutions.

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Appendix 6 – Guidelines for water quality objectives of the main rivers of the MDA

BASIN	WATER BODY	STRETCH	CURRENT SITUATION OF AVAILABLE PARAMETERS	CRITICAL STRETCH	IDENTIFIED POLLUTION SOURCES	RECOMMENDED ACTIONS TO INTEGRATE THE PROGRAMS OF THE PLAN	ISSUES TO BE CONSIDERED IN THE APPLICATION OF THE GUIDELINES
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF XINGU AND IRIRI RIVERS							
XINGU	Xingu River	From the headwaters to the city of Altamira	Dissolved oxygen and turbidity: class 1	State Tributaries entering Xingu Indigenous Park Confluence with the Fresco river in Sao Felix do Xingu.	Drainage of riverside cities and agricultural areas located in state tributaries outside the Xingu Indigenous Park.	Sanitation; control of diffuse pollution from agricultural areas; deploy monitoring network, protection of headwaters and river banks of Batovi, Jatoba, Ronuro, Von den Steinem, Ferro, Arraias, Manissaú-Miçú, Kevuajeli, Curisevo, Pacuneiro, Culuene, 7 de setembro, Tanguro and Sumia Miçu.	Water bodies in indigenous lands.
		From city of Altamira to the mouth.	Dissolved oxygen and turbidity: class 1	Downstream of Altamira.	Sewage from Altamira, agriculture, pastures.	ETE in Altamira, deploy monitoring network to analyze the effect of Belo Monte UHE on the water quality downstream.	Area with consolidated productive structure. Stretch that receives the effluent from Altamira and agricultural lands.
	Iriri River	From the headwaters to the mouth	Dissolved oxygen and turbidity class 1	No critical stretch identified	None	Deploy monitoring network.	Preserved basin, covers indigenous lands, ecological station, and extractive reserves.
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF TAPAJOS AND JURUENA RIVERS							
TAPAJÓS	River Arinos	From the headwaters to the mouth.	Turbidity, coliform, dissolved oxygen: class 1, ammonium values indicate a diffuse pollution.	Between Porto dos Gaúchos and Juara	Sewage from Porto dos Gauchos and Juara, diffuse pollution from agricultural areas.	To expand monitoring for the upper basin. Treatment of sewage from Porto dos Gaúchos and Juara. Control of diffuse loads from agricultural areas.	Area impacted by agriculture and sewage from the cities.
	Juruena River	From the headwaters to the mouth.	Dissolved oxygen; Turbidity: class 1 coliforms: classes 1 and 2 Ammonium values indicate diffuse pollution.	No critical stretch identified	No pollution source identified	Continue existing monitoring	Indigenous Lands Biological importance. Basin with large preserved area.
	Tapajos River	From the headwaters to the mouth.	Dissolved oxygen: classes 1 and 2; turbidity: class 1 (Except downstream Crepori River)	Downstream the mouth of Crepori River; Near the mouth (algae bloom downstream of Alter do Chão)	Mines, sewage, diffuse loads from agricultural areas. Possibility of exotic species introduction through the harbour of Santarem.	Sanitation, pollution control of the mines in Crepori river; monitoring of bathing in Alter do Chao, check causes of algae bloom between Santarem and Alter do Chao, protection of headwaters and riverbanks in the lower course of the Tapajós river in areas of agricultural occupation and livestock	Indigenous Lands, presence of river beaches (Alter do Chao); biological importance.

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Appendix 6 – Guidelines for water quality objectives of the main rivers of the MDA

BASIN	WATER BODY	STRETCH	CURRENT SITUATION OF AVAILABLE PARAMETERS	CRITICAL STRETCH	IDENTIFIED POLLUTION SOURCES	RECOMMENDED ACTIONS TO INTEGRATE THE PROGRAMS OF THE PLAN	ISSUES TO BE CONSIDERED IN THE APPLICATION OF THE GUIDELINES
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF TELES PIRES RIVER							
TAPAJÓS	Teles Pires River	From the headwaters to the border of TI Kaiabi I	Dissolved oxygen: class 1, coliforms: classes 1 and 2 Ammonium values indicate diffuse pollution.	Possibly near Sinop.	Drainage of riverside cities, agricultural areas, industries, mining.	Sanitation, control of environmental liabilities in Peixoto de Azevedo river; control of diffuse pollution from agricultural areas, industrial pollution control.	Area of intense agricultural use, presence of many cities, industries, food processing, lack of UCs and TIs.
		From the limit of TI Kaiabi I to the mouth	Dissolved oxygen and turbidity: class 1	No critical stretch identified	No pollution source identified	Examine the effect of planned UHEs on the water quality downstream; deploy monitoring network.	Indigenous lands.
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF MADEIRA AND GUAPORE RIVER							
MADEIRA	Madeira River	From the headwaters to the mouth	Oxygen: class 2 in the flood (due to the material drag) and class 1 in the drought. Coliforms: class 2;	Downstream of Porto Velho.	Porto Velho launches 14.8 t DBO/day of domestic sewage, high levels of Hg in carnivorous fish.	ETE in Porto Velho, Assessment of the problem of Mercury; implementation of water quality monitoring network, creation of conservation unit in priority areas for biodiversity conservation.	Much of the upstream basin is in Bolivia and Peru, what hinders the adoption of class 1 in the Brazilian section. Area with consolidated productive structure.
MADEIRA	Guaporé River	From the headwaters to the confluence with the Mamore river.	Turbidity: class 1. State Water Resources Plan of Mato Grosso indicates poor condition during the period of lower flows.	Possibly in the headwaters (the most impacted areas).	Agricultural areas on the superior stretch; sewage of the riverside cities.	Conservation of the headwaters, sanitation, control of diffuse pollution; implementation of water quality monitoring network, creation of conservation units in priority areas for biodiversity conservation.	Headwaters in agricultural area. In Rondônia, it receives load from the state tributaries. State Water Resources Plan of Mato Grosso assesses the water quality of the upper Guaporé river from middle to poor during the period of lower water availability.
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF MAMORE, ARIPUANA AND JI-PARANA RIVERS							
MADEIRA	Mamoré River	From the confluence with the Guaporé river to the confluence with the Beni river.	Turbidity: class 2.	Possibly downstream of Guajará Mirim.	Domestic Sewage of Guajará Mirim and Guayara Merin (Bolivia).	ETE Guajará Mirim. Implementation of the water quality monitoring work.	Much of the basin (left margin; Beni river) is in Bolivia, what hinders the adoption of class 1 in the Brazilian section.
MADEIRA	Aripuanã River	From the headwaters to the mouth.	Dissolved oxygen and turbidity: class 1.	No critical stretch identified	No pollution sources identified.	Implementation of the water quality monitoring work.	The river crosses Indigenous lands and Sustainable Development Reserve. It is supplied by a good quality aquifer.
MADEIRA	Ji-Paraná River	From the headwaters to the mouth.	Turbidity: class 1	No critical stretch identified	Domestic sewage of several cities from Rondônia.	Sewage treatment. Implementation of water quality monitoring network. Estimate the polluting load of agricultural areas.	The river flows through agricultural areas and cities in the state of Rondonia. Area with consolidated productive activities.

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Appendix 6 – Guidelines for water quality objectives of the main rivers of the MDA

BASIN	WATER BODY	STRETCH	CURRENT SITUATION OF AVAILABLE PARAMETERS	CRITICAL STRETCH	IDENTIFIED POLLUTION SOURCES	RECOMMENDED ACTIONS TO INTEGRATE THE PROGRAMS OF THE PLAN	ISSUES TO BE CONSIDERED IN THE APPLICATION OF THE GUIDELINES
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF ROOSEVELT, GUARIBA AND SUCUNDURI RIVERS							
MADEIRA	Roosevelt River	From the headwater to the mouth	Dissolved oxygen and turbidity: class 1.	No critical stretch identified	No pollution sources identified	Implementation of water quality monitoring network	Preserved basin; indigenous land; biological importance.
	Guariba River	From the headwater to the mouth	Basin without monitoring network.	No critical stretch identified	No pollution sources identified	Implementation of water quality monitoring network	Preserved basin; indigenous land; biological importance.
	Sucunduri River	From the headwaters to the northern boundary of Juruena National Park.	Dissolved oxygen and turbidity: class 1.	No critical stretch identified	No pollution sources identified	Implementation of water quality monitoring network	Conservation Units of Integral Protection.
		From the northern boundary of Sucunduri State Park to the mouth.	Dissolved oxygen and turbidity: class 1.	No critical stretch identified	No pollution sources identified	Implementation of water quality monitoring network	Preserved basin; indigenous land; biological importance
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF PURUS AND ACRE RIVERS							
PURUS	Purus River	From the Brazil-Peru border to the mouth	Dissolved oxygen: class 1 (except abandoned stretches) turbidity: natural condition	No critical stretch identified	Sewage from riverside cities. Accidents involving vessels (eg diesel oil spill in Santa Rosa do Purus). High levels of Hg in carnivores fish.	Sanitation; Assessment of the problem of mercury; implementation of water quality monitoring network, enhancing the safety of hydro-way transport.	The Purus river crosses indigenous lands, extractive reserves and reserves of sustainable development. Headwaters in Peru are in a little impacted area.
	Acre River	From the headwaters to mouth.	Dissolved oxygen: class 3 (critical downstream of Rio Branco in the dry season); Coliforms: between classes 1 and 4 in the stretch in Rio Branco, depending on the season (worst in the low water levels).	Downstream of Rio Branco	Sewage from riverside cities - Rio Branco launches 12.2 t DBO/day; sand extraction, deforestation of streams and shores of the Acre river, with consequent silting.	ETE in Rio Branco, implementation of water quality monitoring network.	Basin impacted with sewage release, agricultural and mining areas. Implementation of ETE Rio Branco should turn the river into class 2. Headwaters are (Xapuri river) in extractive reserves.

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Appendix 6 – Guidelines for water quality objectives of the main rivers of the MDA

BASIN	WATER BODY	STRETCH	CURRENT SITUATION OF AVAILABLE PARAMETERS	CRITICAL STRETCH	IDENTIFIED POLLUTION SOURCES	RECOMMENDED ACTIONS TO INTEGRATE THE PROGRAMS OF THE PLAN	ISSUES TO BE CONSIDERED IN THE APPLICATION OF THE GUIDELINES
GUIDELINES AND ELEMENTS TO BE CONSIDERED IN THE WATER QUALITY OBJECTIVES OF RIVERS JAVARI, JURUA AND JUTAI							
JAVARI	Javari River	From the headwaters to the mouth	Dissolved Oxygen: class 1; turbidity: natural condition.	No critical stretch identified	Overfishing with the use of toxic products	Implementation of water quality monitoring network. Supervision of over fishing.	Indigenous Land; Northbank tributaries in Peru (Yavari Mirim river, Galvez river) in a preserved area, preservation of biodiversity.
	Southbank tributaries of the Javari river (Curuçá and Ituí river basins)	From the headwaters to the mouth	Dissolved Oxygen: class 1; turbidity: natural condition.	No critical stretch identified	No pollution sources identified.	Implementation of water quality monitoring network.	Indigenous Land, biodiversity conservation.
JURUÁ	Juruá River	From the Brazil-Peru border to the mouth.	Dissolved Oxygen: class 1; turbidity: natural condition.	No critical stretch identified.	Sewage from riverside cities.	ETE in Cruzeiro do Sul ; implementation of water quality monitoring network, fishery planning.	Basin preserved; indigenous lands, extractive reserves and sustainable development reserves. Headwaters in Peru in a little impacted area; biological importance.
JUTAÍ	Jutaí River	From the headwaters to the mouth	Dissolved Oxygen: class 1; turbidity: natural condition.	No critical stretch identified.	No pollution sources identified.	Implementation of water quality monitoring network.	Preserved basin, indigenous lands and extractive reserves.

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