



7th UF Water Institute Symposium

PARTICIPATORY HYDROPOWER INVENTORY STUDIES IN BRAZIL

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Gainesville, FL - February 25th, 2020

Total Installed Power Capacity: 170,2 GW

Renewable: 142,8 GW (83,9%)

Fossil and Nuclear: 26,9 GW (15,8%)



Hydro
109 GW
61,1%



Fossil
25 GW
14,7%



Distributed Generation
0,9 GW
1%



Biomass
15 GW
8,4%



Wind
15,4 GW
8,7%



Solar PV
2,5 GW
1,4%

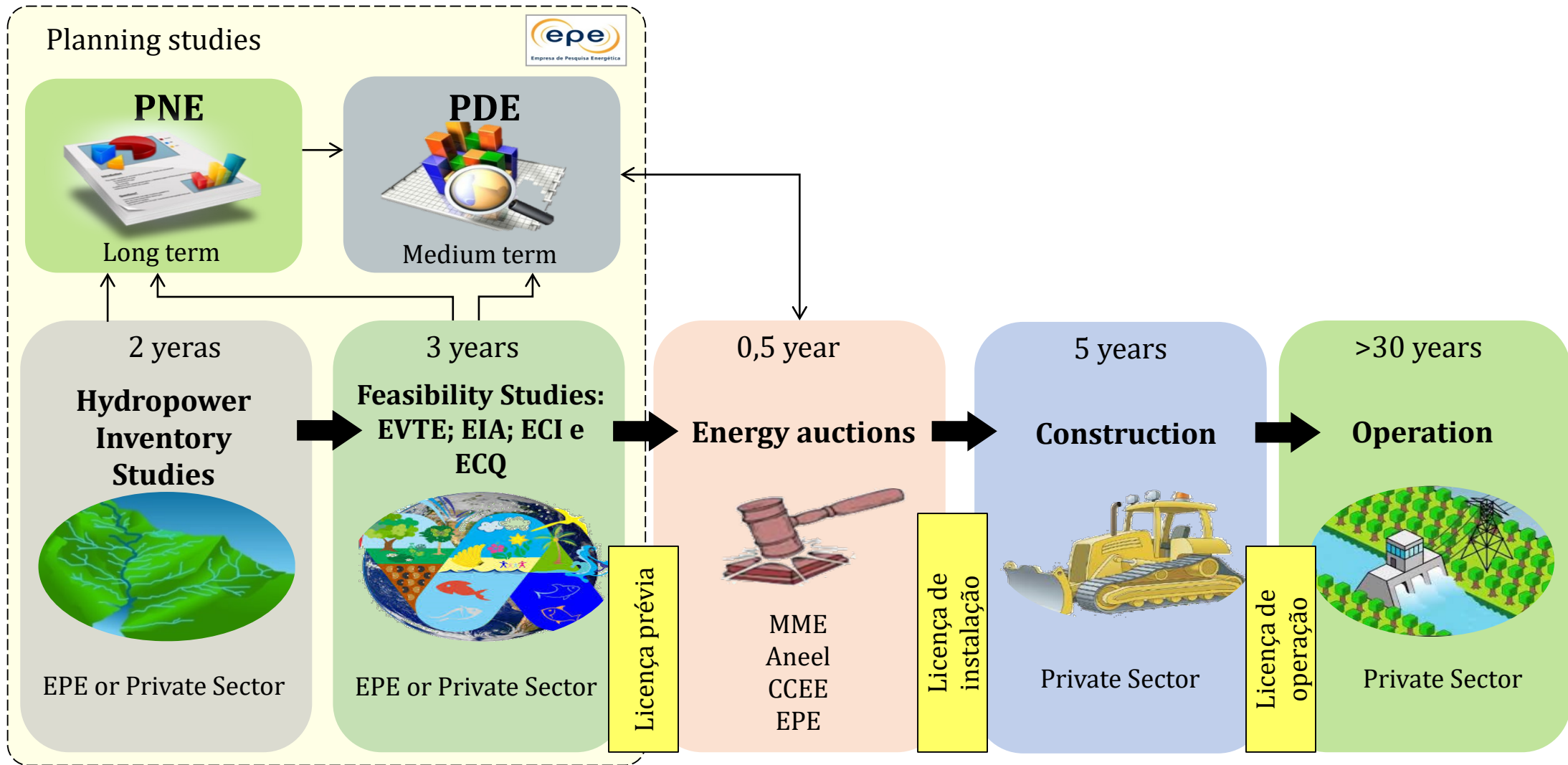


Nuclear
1,9 MW
1,1%

How do we classify our hydro powerplants?

- ✓ CGH – Mini/Micro
 - Power capacity $\leq 5,0$ MW
 - Simplified registration procedure
- ✓ SHP – Small Hydro – REN 673/2015
 - $5,0$ MW < Power capacity ≤ 30 MW
 - Reservoir up to 13km^2
 - Weekly flow regulation
 - Multiple reservoir uses
- ✓ HPP – Hydro Power Plants – *Authorization Permit* – REN 765/2017
 - Power capacity ≤ 50 MW, not framed as SHP
- ✓ HPP – Hydro Power Plants – *Concession Permit* – RES 395/1998
 - Power capacity > 50 MW
 - Mandatory auction

Hydropower expansion planning in the Brazilian electricity sector



Expansion planning in the electricity sector

✓ Latest PDE (10 year) - 2029

<http://www.mme.gov.br/web/guest/secretarias/planejamento-e-desenvolvimento-energetico/publicacoes/plano-decenal-de-expansao-de-energia>

✓ Latest PNE (30 year) – 2050

<http://www.mme.gov.br/web/guest/secretarias/planejamento-e-desenvolvimento-energetico/publicacoes/relatorio-do-pne-2050>

Legislation

Law nº 9.074, July 7th, 1995, art. 5º:

§ 2º Nenhum aproveitamento hidrelétrico poderá ser licitado sem a definição do "aproveitamento ótimo" pelo poder concedente, podendo ser atribuída ao licitante vencedor a responsabilidade pelo desenvolvimento dos projetos básico e executivo.

§ 3º Considera-se "aproveitamento ótimo", todo potencial definido em sua concepção global pelo melhor eixo do barramento, arranjo físico geral, níveis d'água operativos, reservatório e potência, integrante da alternativa escolhida para divisão de quedas de uma bacia hidrográfica.

Legislation

Decree nº 2.335, October 6th, 1997:

Art. 4º À ANEEL compete:

“
...
XXVI - determinar o aproveitamento ótimo do potencial de energia hidráulica, em conformidade com os §§ 2º e 3º do art. 5º da Lei nº 9.074, de 7 de julho de 1995;
...”

Legislation

Decree nº 5.163, July 30, 2004:

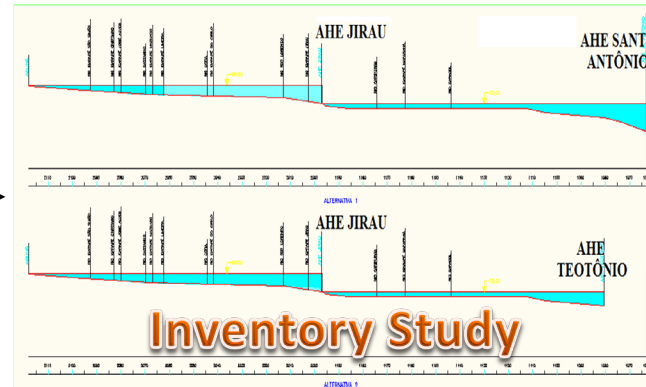
Art. 75-A Ficam delegadas à ANEEL:

“
...

II – a definição do “aproveitamento ótimo” de que tratam os §§ 2º e 3º do art. 5º da Lei nº 9.074, de 7 de julho de 1995.

”
...

How is a hydro powerplant “born”?



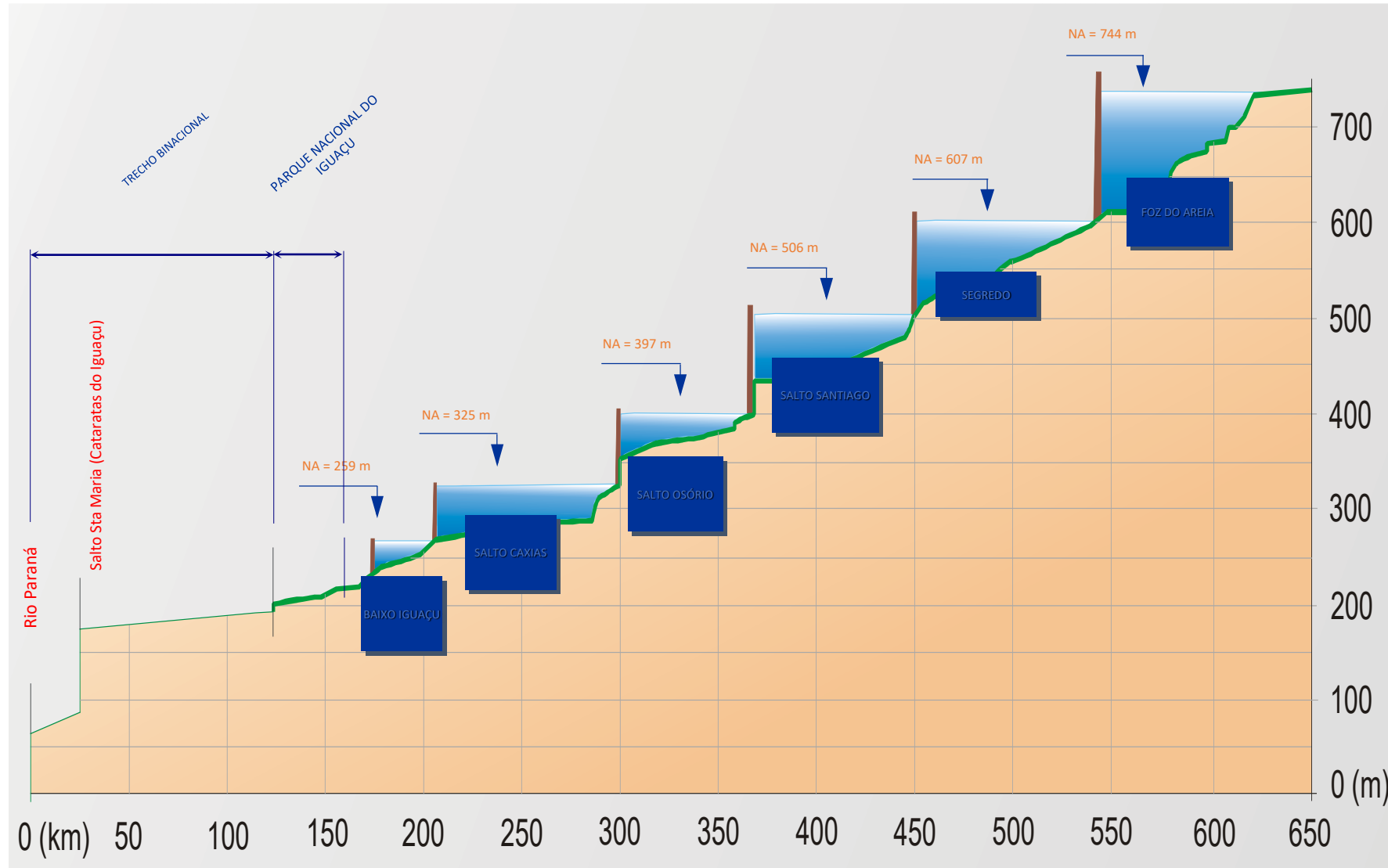
ANEEL Resolution 672/2015

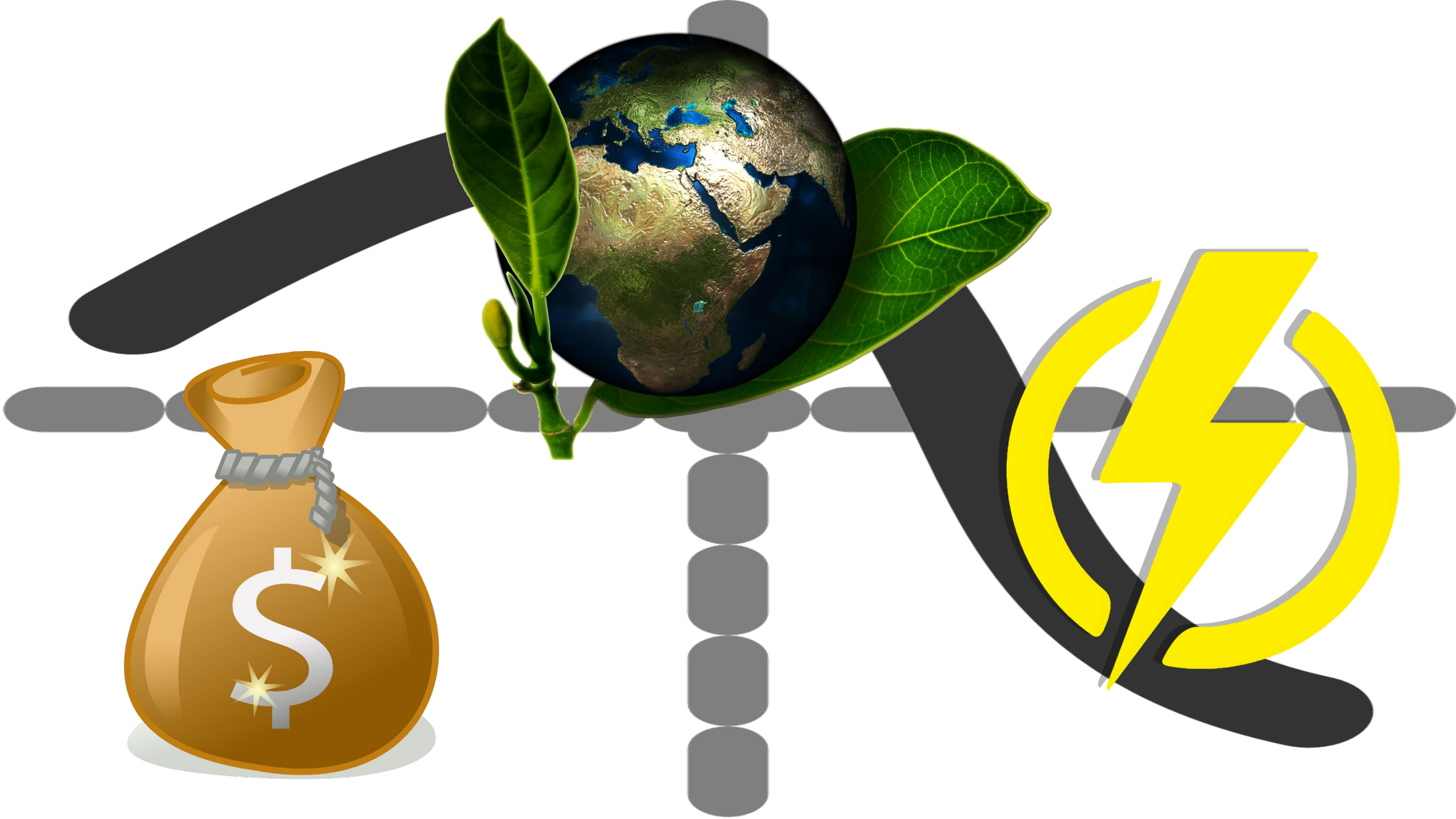
- Defines procedures for developing inventory studies for river basins
- <http://www2.aneel.gov.br/cedoc/ren2015672.pdf>

Manual for Hydropower Inventory Studies for River Basins (2007)

- Used as reference for developing hydropower inventory studies in Brazil
- <http://www.mme.gov.br/web/guest/secretarias/planejamento-e-desenvolvimento-energetico/publicacoes/manual-de-inventario-hidroeletrico-de-bacias-hidrograficas>

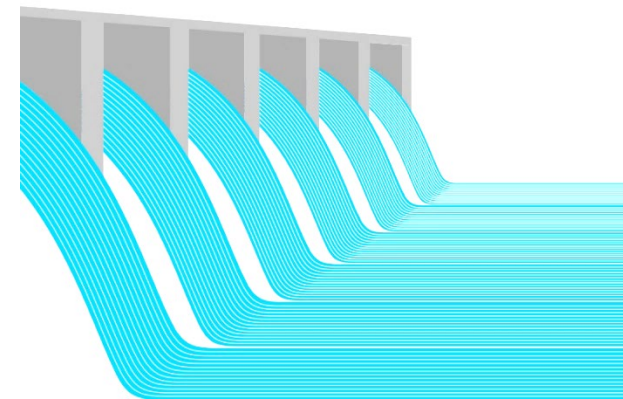
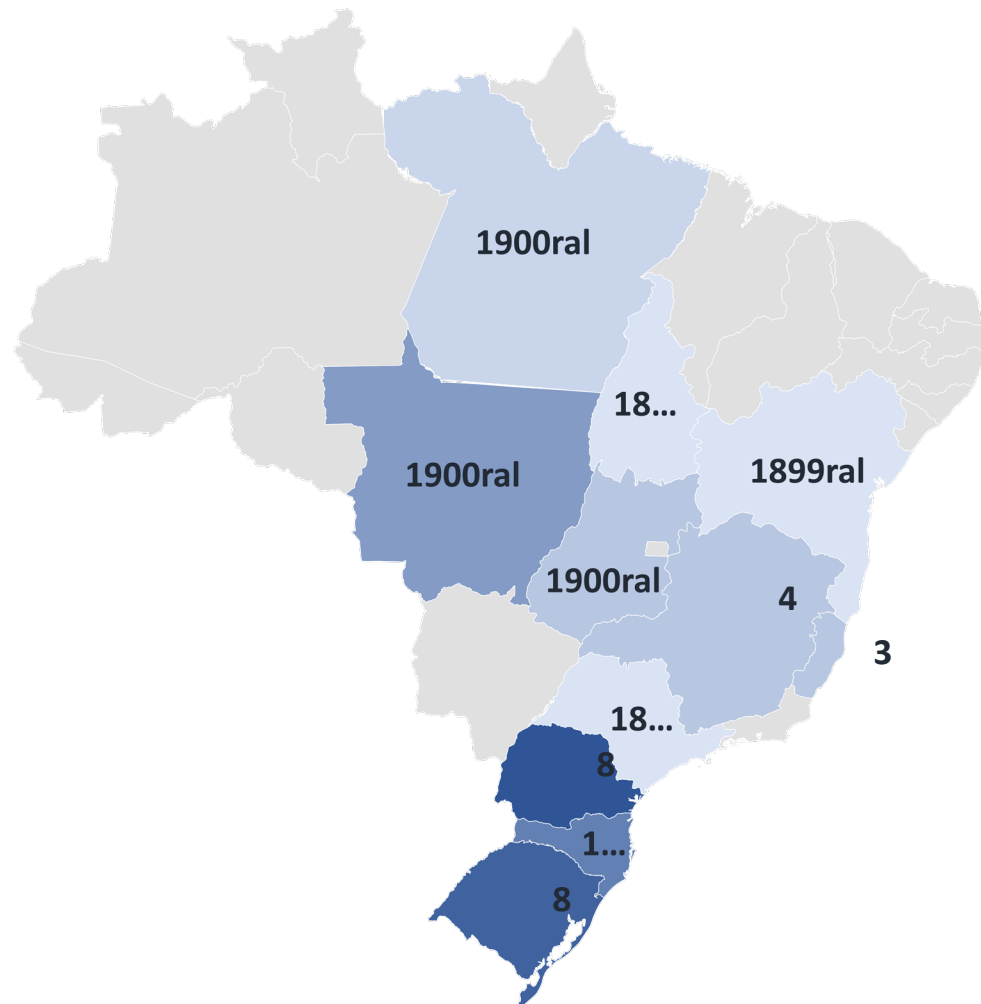
The role of hydropower inventory studies - optimal dam siting



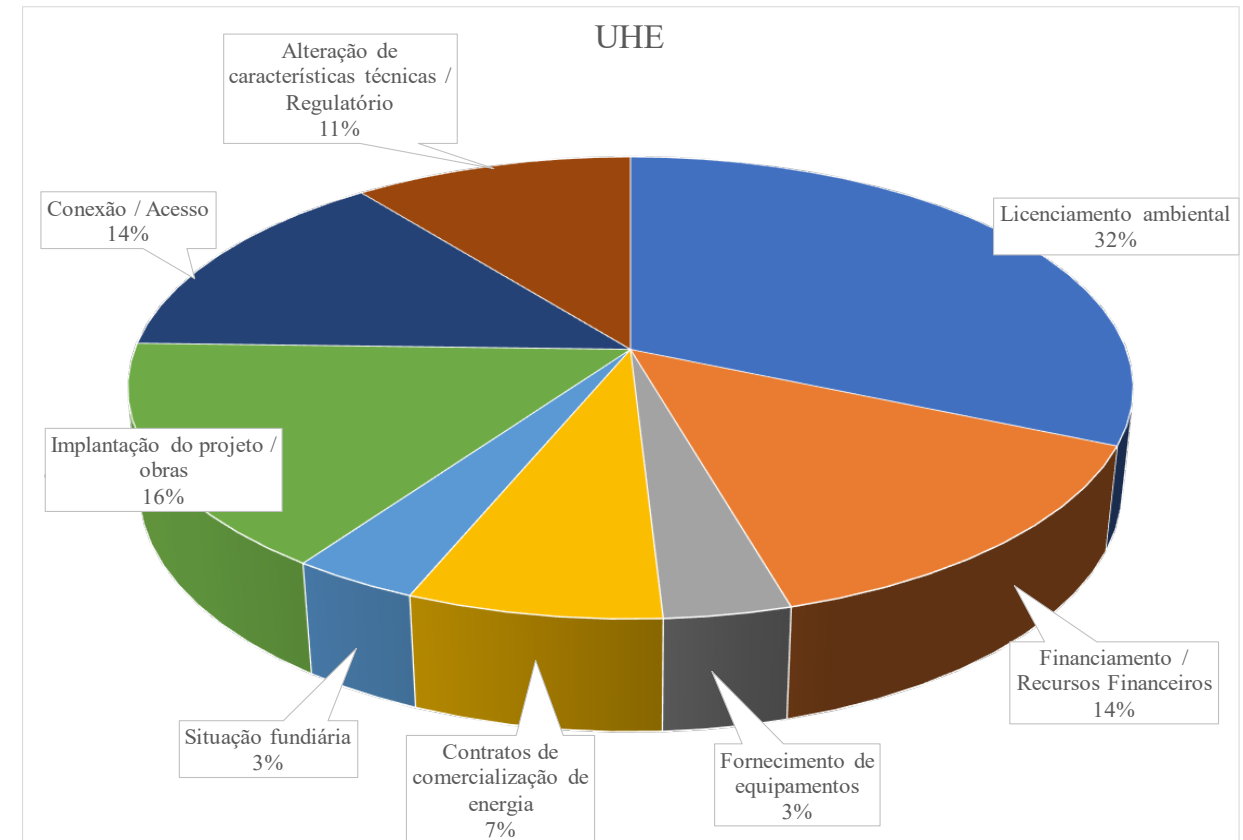
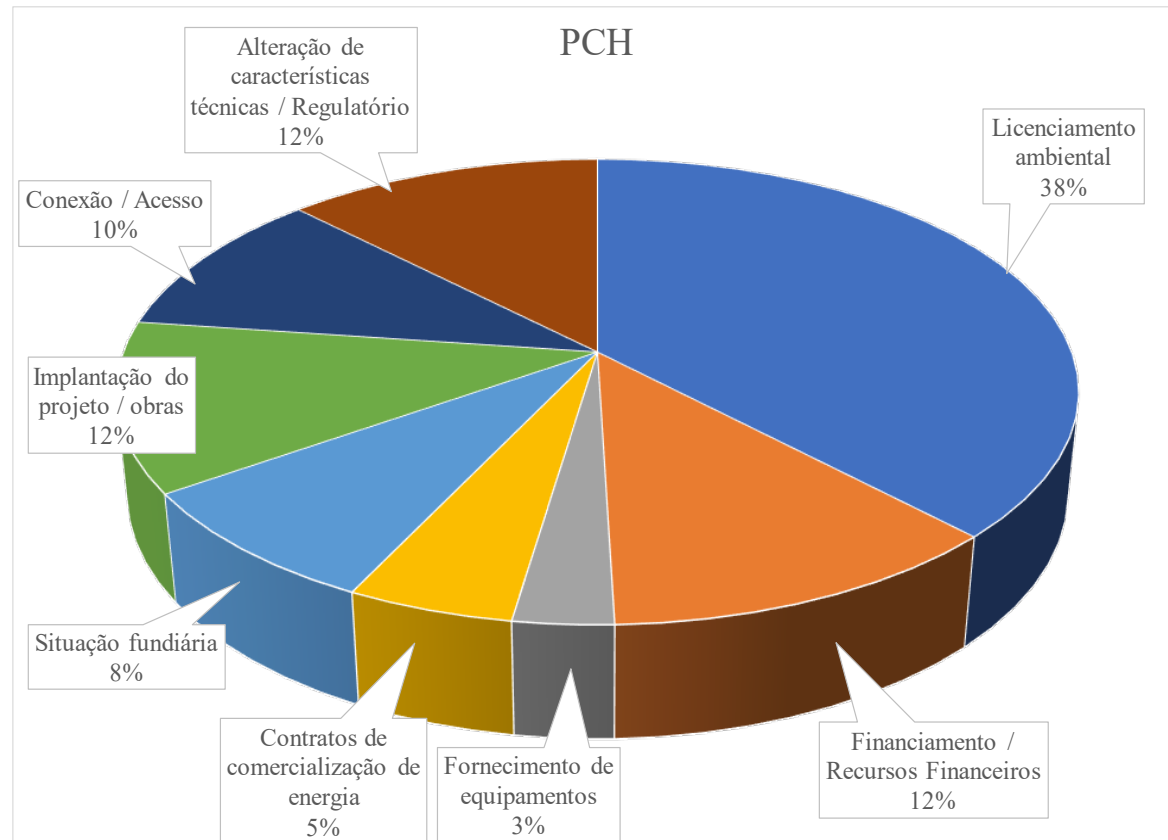


Hydropower Inventory Studies

48 studies being developed (January 2020)



Main challenges to HPP and SHP development



Source: RAPEEL/SFG/ANEEL

Participatory Hydropower Inventory Study



Participatory Hydropower Inventory Study Initiative

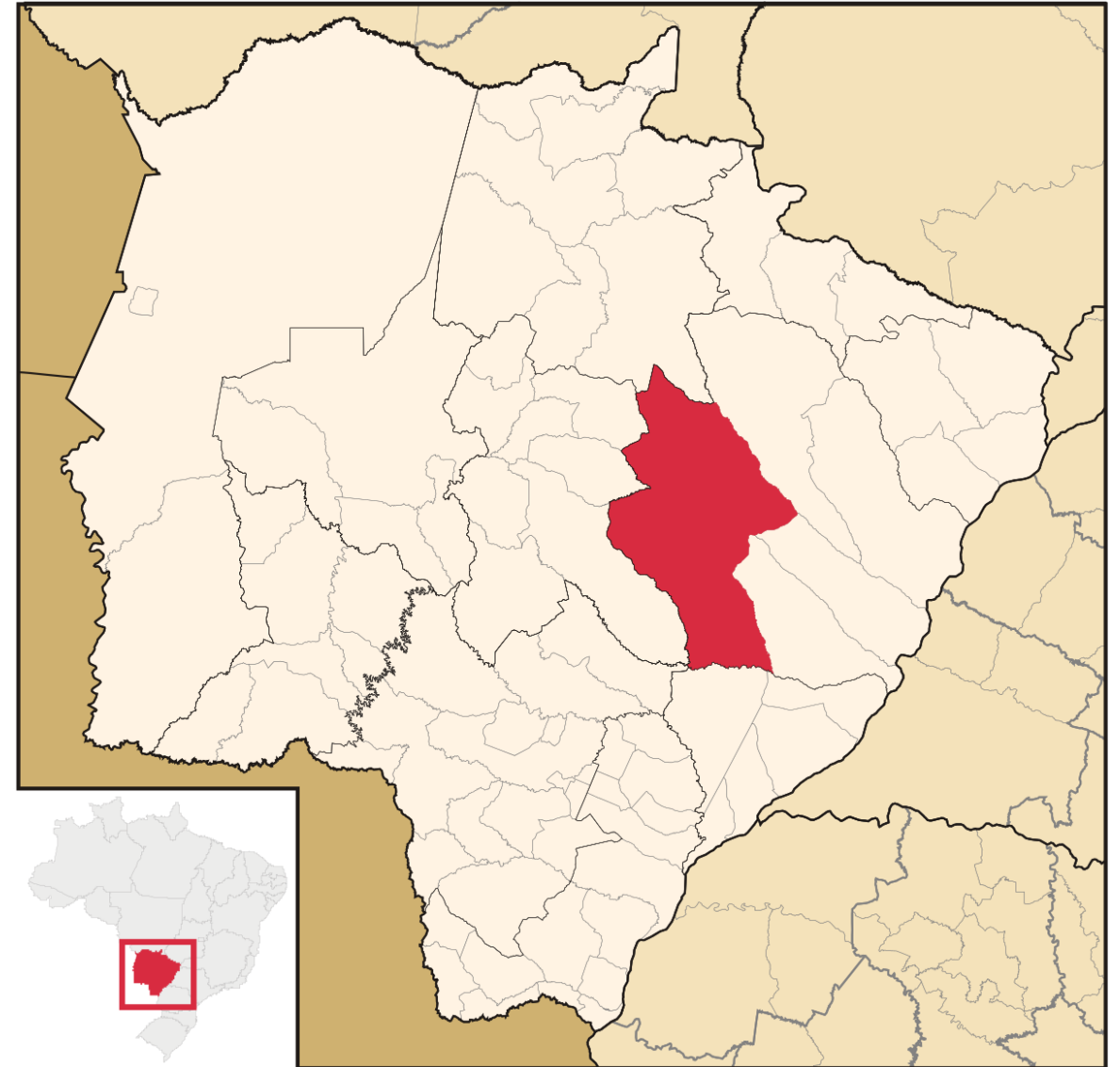
Previous discussion about environmental feasibility – performed during the elaboration of the hydropower inventory study.

The goal is to make it easier to license HPP and SHP which have environmental feasibility while discarding, during the planning stage, those which are not feasible.

Pilot Project concluded - Pardo River and its tributaries - IMASUL (MS).

Next steps: Camaquã River – FEPAM (RS), Itajaí do Norte River – IMA (SC), Benedito River – SEMAS (PA), Tocantinzinho River – SECIMA (GO), Piquiri River – IAP (PR), Ribeira do Iguape River – IBAMA (SP).

Pardo River region, in the state of Mato Grosso do Sul



ESTUDOS DE INVENTÁRIO DO RIO PARDO E AFLUENTES

Legend:

- AHE (Blue hatched)
- Quilombolas (Pink)
- Assentamento (Incra) (Yellow hatched)
- Terra Indígena (Orange hatched)

Unidades de Conservação (Estadual e Municipal)

Grupos

- Não definido (Light green)
- Proteção Integral (Dark green)
- Uso Sustentável (Medium green)

Unidades de Conservação (Federal)

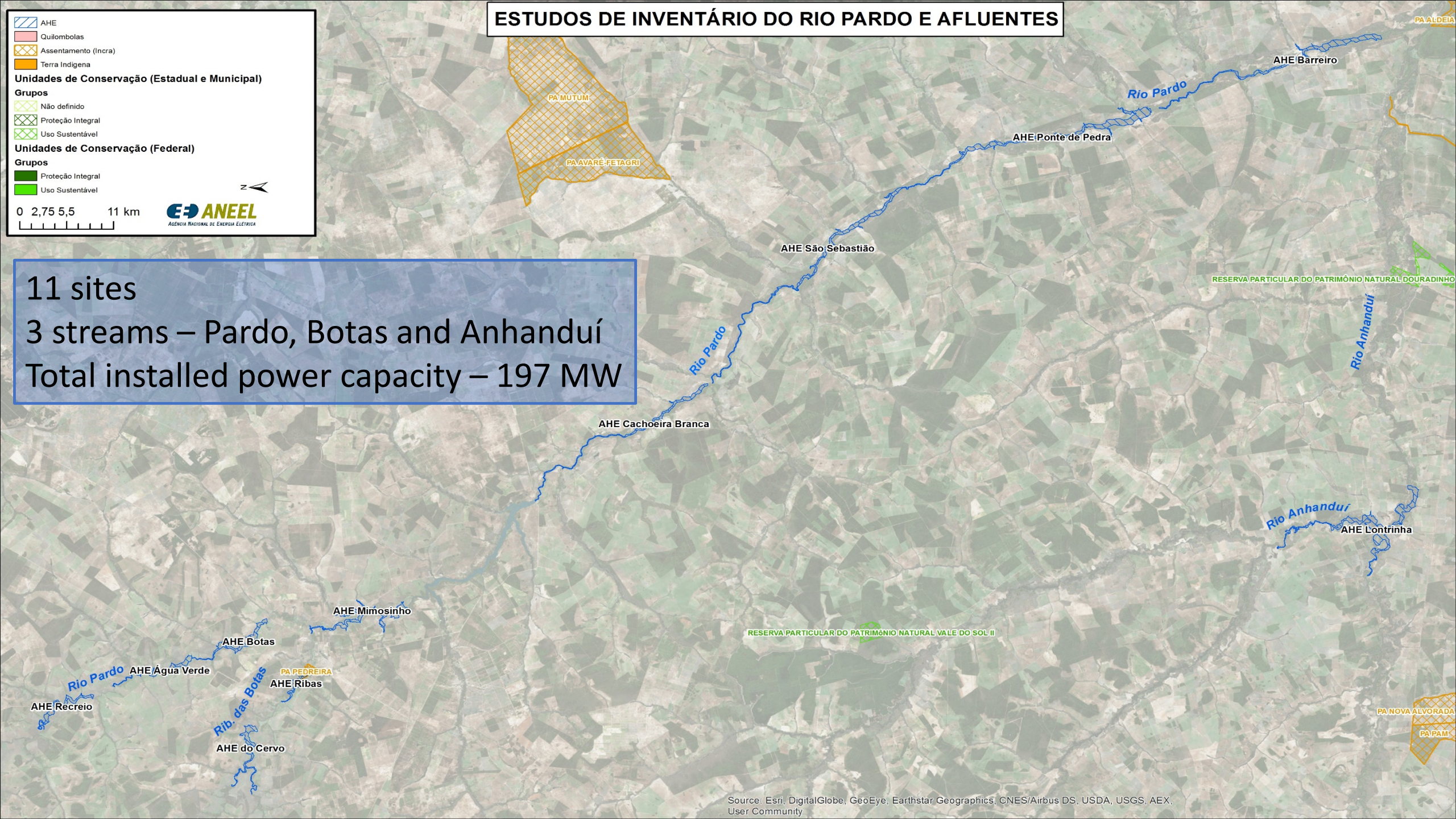
Grupos

- Proteção Integral (Dark green)
- Uso Sustentável (Medium green)

0 2,75 5,5 11 km

ANEEL
AGÊNCIA NACIONAL DE ENERGIA ELÉTRICA

11 sites
3 streams – Pardo, Botas and Anhanduí
Total installed power capacity – 197 MW



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, User Community

IMASUL assessement (May 2018)

Dam siting reassessement considering

- (i) Power capacity x reservoir area
- (ii) Local vegetation
- (iii) Wetlands
- (iv) Tributary interference
- (v) Maximum reservoir elevation
- (vi) Pardo UGP multiple uses

Several recommendations and the necessity to develop the Integrated Environmental Assessement (IEA) for the Pardo River Watershed prior to the environmental licensing process.

6 sites were initially considered viable for SHP installation.

ESTUDOS DE INVENTÁRIO DO RIO PARDO E AFLUENTES

AHE

- Recreio; Água Verde; Mimosinho; Ponte de Pedra; Lontrinha
- Barreiro; Botas; Cachoeira Branca; Ribas; São Sebastião; do Cervo (Viáveis)
- Quilombolas
- Assentamento (Incra)
- Terra Indígena

Unidades de Conservação (Estadual e Municipal)

Grupos

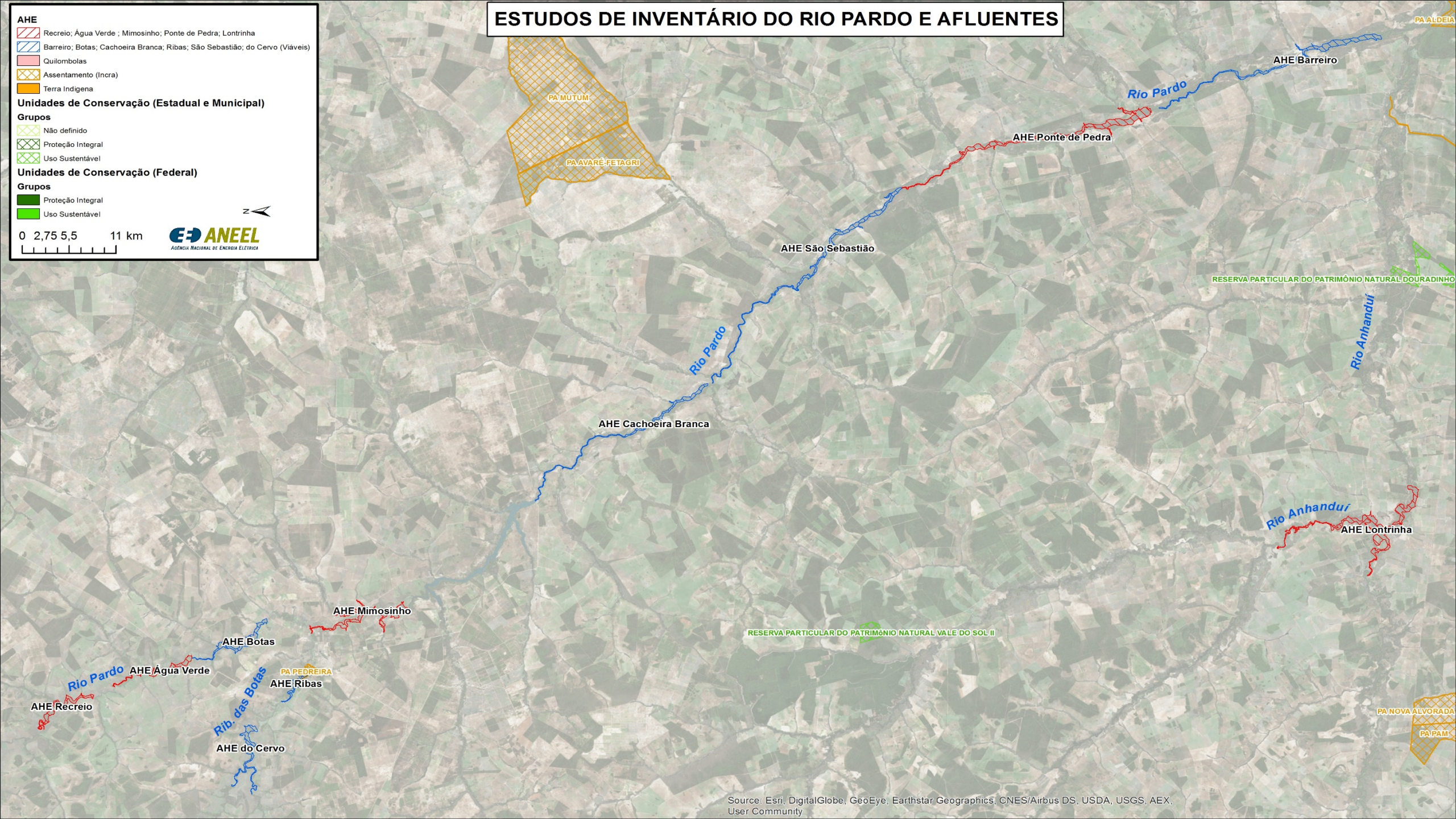


- Não definido
- Proteção Integral
- Uso Sustentável

Unidades de Conservação (Federal)

Grupos

- Proteção Integral
- Uso Sustentável

0 2,75 5,5 11 km



Technical meeting IMASUL/ANEEL (August 2018)

Discussion about the results reached by both agencies.

Several adjustment needs were identified and submitted to the developer of the inventory studies – new deadline to present the revised version of the studies.

Technical meeting IMASUL/ ANEEL (March 2019)

Analysis of the most recent version of the studies.

It was decided that the Term of Reference for the IEA would be made available along with the inventory study approval.

Definition of the optimal dam siting for the Pardo River Watershed.

Stream	Site name	Installed Power Capacity [MW]
Pardo	Barreiro	24,10
Pardo	São Sebastião	23,90
Pardo	Cachoeira Branca	21,00
Pardo	Botas	18,20
Pardo	Recreio Jusante	13,00
Ribeirão das Botas	Ribas	13,60
Ribeirão das Botas	do Cervo	16,10

ESTUDOS DE INVENTÁRIO DO RIO PARDO E AFLUENTES

AHE

- Barreiro; Botas; Cachoeira Branca; Ribas; São Sebastião; do Cervo; Recreio Jusante

Quilombolas

- Assentamento (Incra)
- Terra Indígena

Unidades de Conservação (Estadual e Municipal)

Grupos

- Não definido
- Proteção Integral
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Unidades de Conservação (Federal)

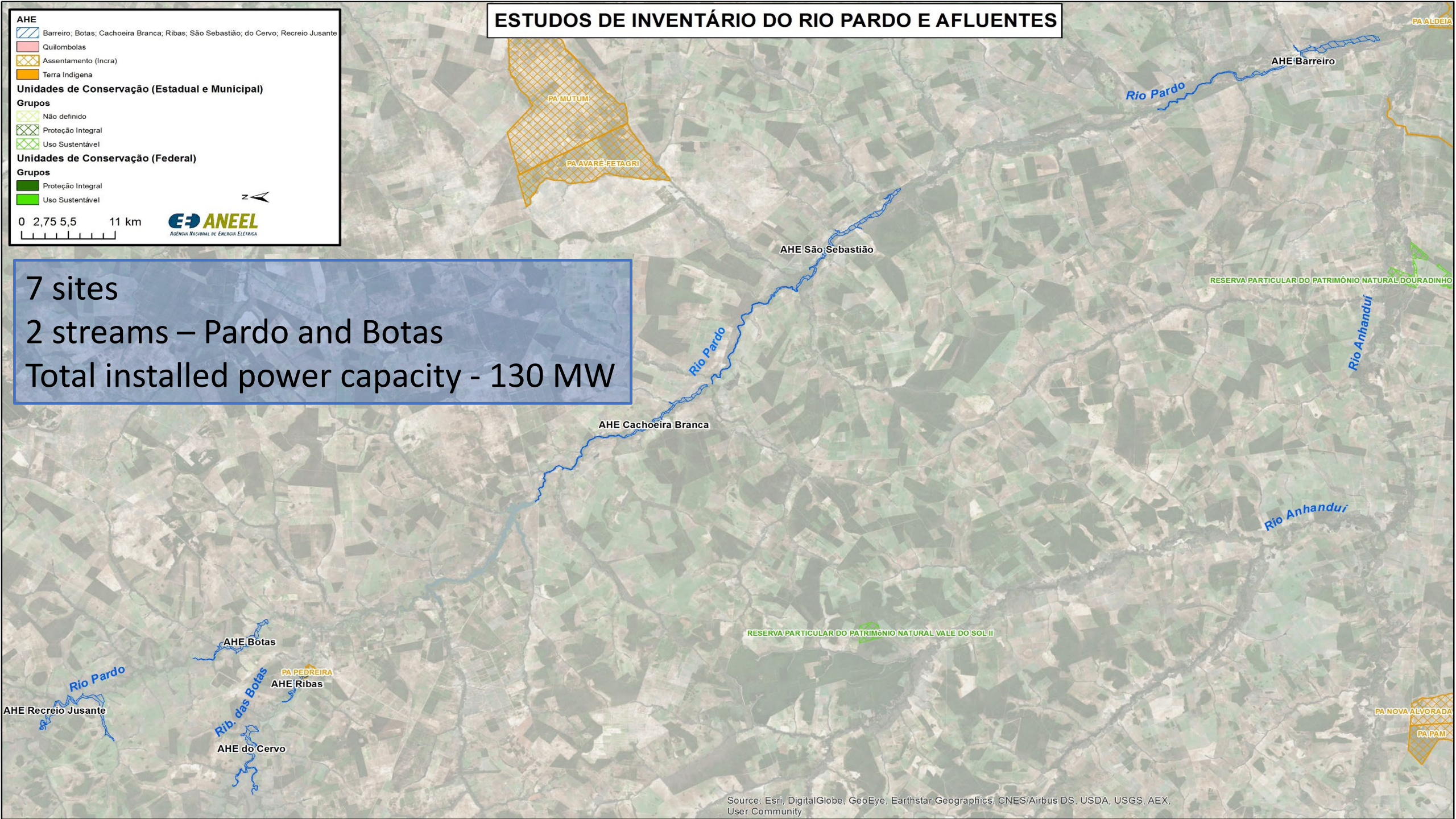
Grupos

- Proteção Integral
- Uso Sustentável

0 2,75 5,5 11 km



7 sites
2 streams – Pardo and Botas
Total installed power capacity - 130 MW



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, User Community

Insights about the whole process

- ✓ Environmental licensing becomes more realistic by reducing miscommunication and asymmetry of information between agencies and between the environmental agency and the developer of the study.
- ✓ The watershed multiple uses are optimized, considering the negative impacts, the positive impacts and the benefits from a holistic perspective, not only from the energy sector.
- ✓ Optimal dam siting was defined for the Pardo River Watershed considering the environmental agency perspective.
- ✓ IMASUL defined the Term of Reference for the Pardo UGP before the beginning of the licensing process.

Next steps

- ✓ *Run pilots with other state agencies and with IBAMA.*
- ✓ *Develop a framework for the participation of environmental agencies in the inventory study approval process.*
- ✓ *Study ways of involving social movements during this process.*
- ✓ *Identify regulatory and legal gaps that might be filled in order to make participatory hydropower inventory studies a standart procedure.*

Planned actions to increase renewable hydro participation

1
2
3

Previous discussion about the **environmental feasibility** of a HPP or SHP during the **Inventory Study** stage.



Incentives to build reservoirs with **flow regulation capacity**



Urge need to **improve relationship** with **environmental agencies** and **social movements**.



AGÊNCIA NACIONAL DE ENERGIA ELÉTRICA

Thank you!

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