The Use of Earth Observations in the Production of SDG Indicators in Brazil

The Role of IBGE - Brazilian Institute of Geography and Statistics

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Side Event on the Earth Observations for Sustainable Development Goals in the Americas Region
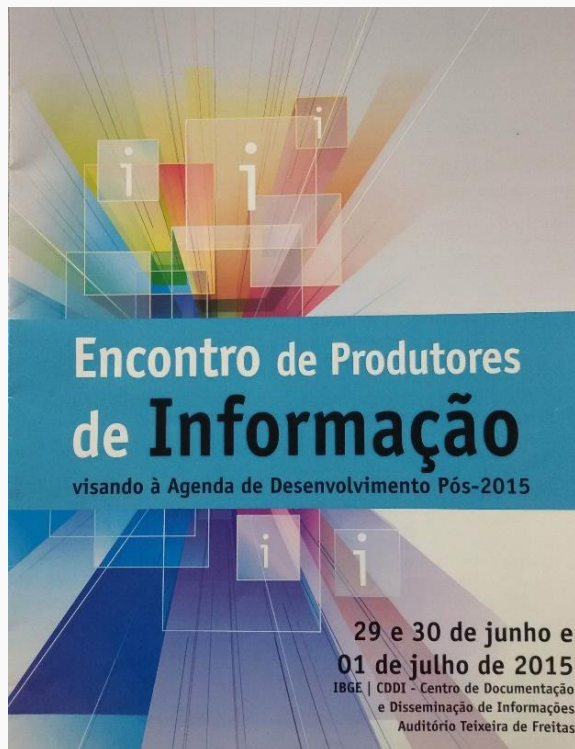
07/04/21

Discussion and collaborative construction
of global indicators

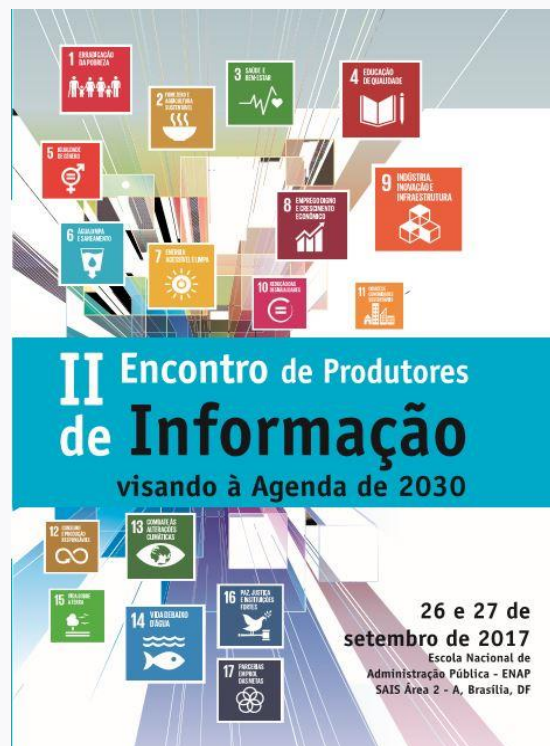IBGE: 50 people

Partner institutions: 200 people

17 working groups

Conferences of Information Producers to Address 2030 Agenda
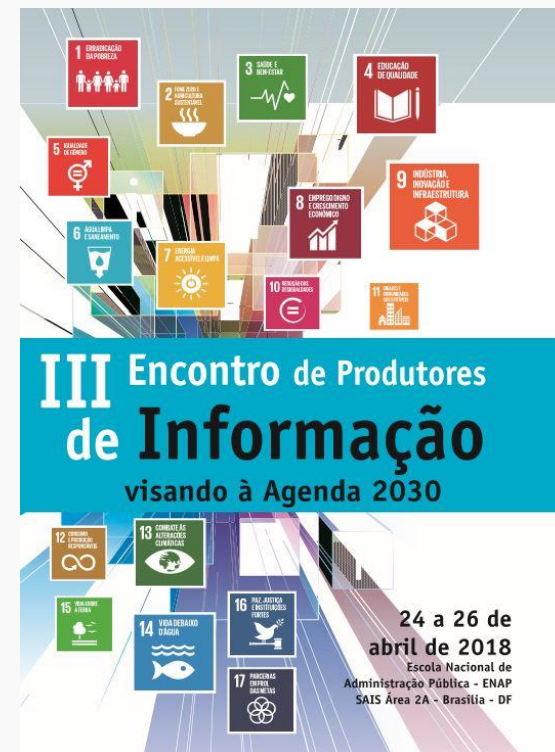

2015

Discussion of the global indicators (IAEG-SDGs)

2017

Discussion of the initial action plans for the production of the SDG global indicators

2018

Launch of the SDG Digital Platform

Brazilian SDG Platform

https://odsbrasil.gov.br

Platform for the Production and Analysis of Information
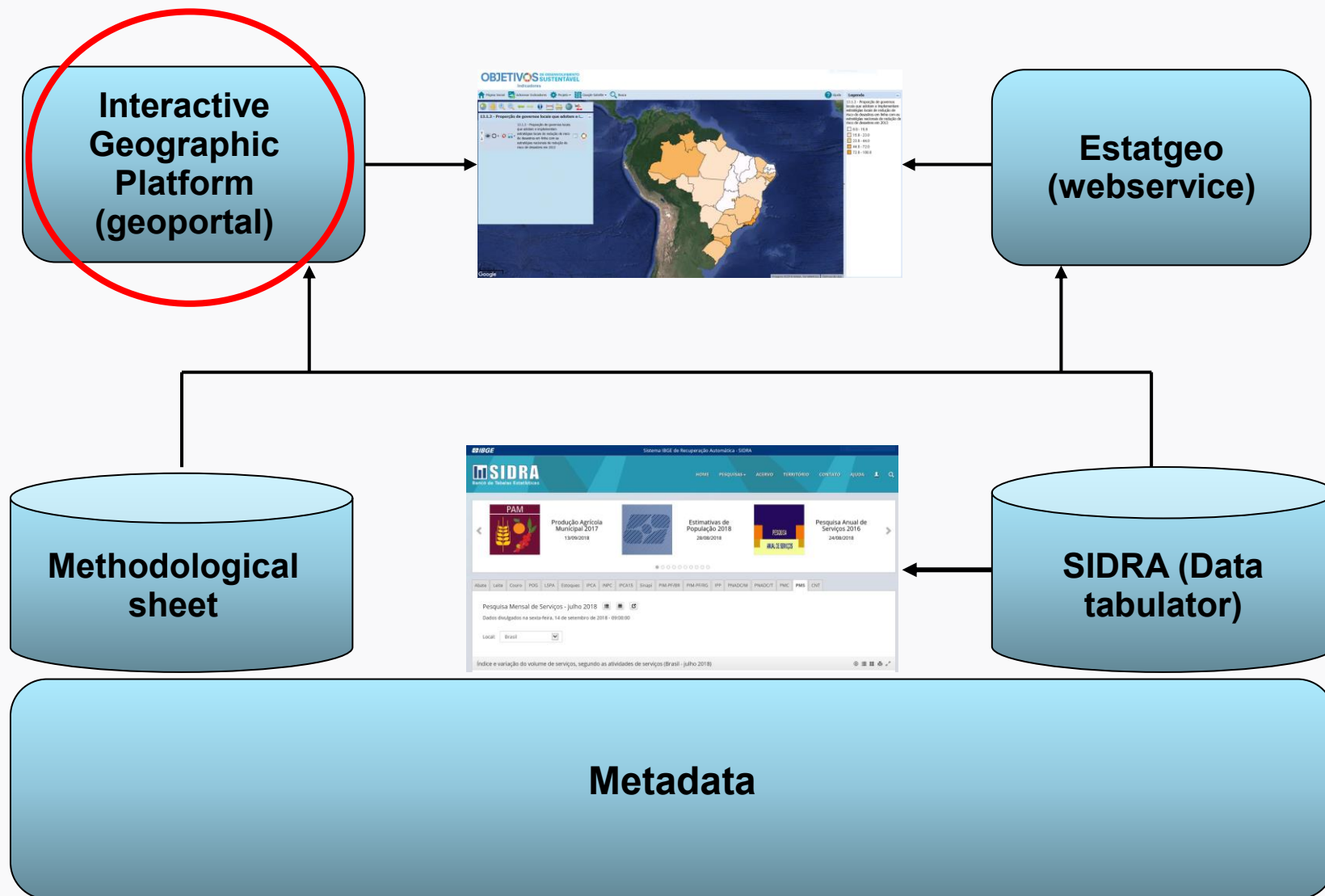
Earth Observations to Suport SDG in Brazil

- Long-term approach: it is necessary to structure an Information System for the Sustainable Development Goals based on Earth Observation.

  - Brazil has a strong tradition of producing information by remote sensing, mainly represented by its space agency (INPE) and IBGE itself.

  - INPE has its own observation satellites (CBERs, Amazon 1).

  However…..

…..This is not enough

It is necessary to integrate organizations that produce information through earth observation.

- Especially in a continental country, like Brazil, it is necessary to develop agile information production processes, which guarantee a regular periodicity.

- It is necessary to produce information with sufficient accuracy for dissemination by municipality, in order to enable the work of local managers in the direction of the SDGs.

- It is necessary to develop algorithms that adequately reflect the regional diversity of the country,

Instituto Brasileiro de Geografia e Estatística   IBGE

IBGE

Earth Observations to Suport SDG in Brazil – Some strategies

Integration between institutions

- IBGE is articulating with INPE (Brazilian space agency) and EMBRAPA (public agricultural research company) the unification of the mapping of Land Cover and Land Use in Brazil. The current Situation is:

    - IBGE has a National mapping every two years, with a resolution of 1 km

    - INPE and EMBRAPA has mapped land use and cover for the Amazon and Cerrado biomes (not for the whole country), in a resolution of 30 meters, but with irregular frequency.

    - INPE annually monitors the deforestation of native forests.

    - In 2021, IBGE is completing the detailed mapping of urbanized areas across the country on a scale of 1: 25,000.

    - IBGE is responsible for the country's vegetation map.

- The expected results is by 2024 unify the mappings, ensuring good resolution and periodicity

Earth Observations to Suport SDG in Brazil – Some strategies

IBGE Land Cover and Land Use Mapping

INPE / EMBRAPA Land Use and Land Cover Mapping
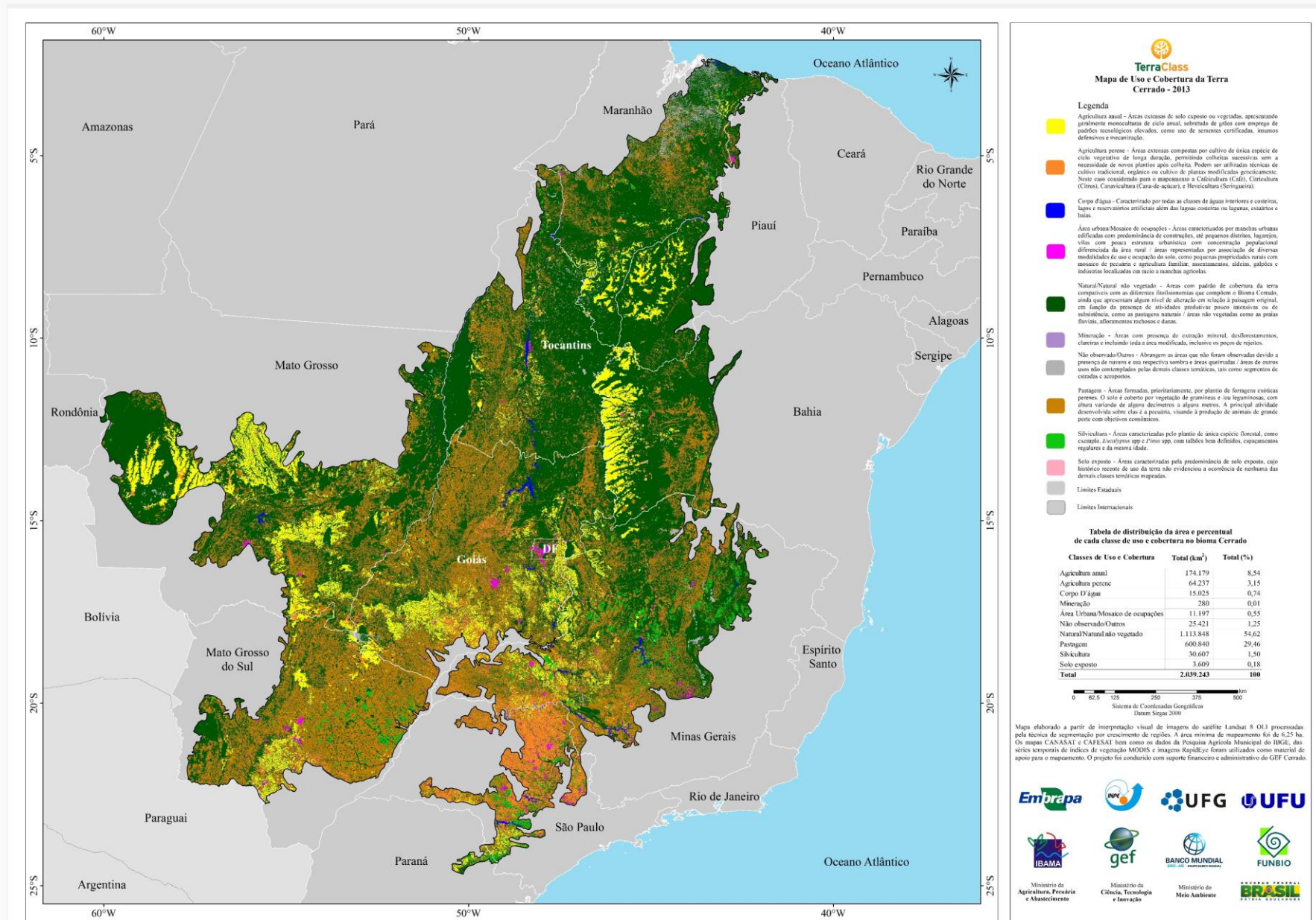
Earth Observations to Suport SDG in Brazil – Some strategies

Development of infrastructure and algorithms for the production of indicators

- Using the Brazil Data Cube (working in Progress), developed by INPE.

    - Brazil Data Cube has a set of images from Sentinel-2, Landsat-8, Cbers-4 and Modis.

    - The Data Cube may enable great agility in the production of indicators.

    - The ability of data cube to work with historical series tends to improve the accuracy of the indicators.

Earth Observations to Suport SDG in Brazil – Some strategies

Development of infrastructure and algorithms for the production of indicators

http://brazildatacube.org

Earth Observations to Suport SDG in Brazil – Some strategies

Visual interpretation vs. automatic interpretation

- The use of automatic classification algorithms, with the application of machining learning, is desirable. However, in some cases, visual interpretation is more efficient and accurate.

- In the case of the identification of built-up areas, the choice of IBGE was to make the mapping visually.

- The decision in favor of visual mapping was due to the need for greater precision in the use of the mapped areas as possible geographical units for the dissemination of the Demographic Census.

- In the future the project is to feed the classification algorithms with the mapping done visually to progressively move towards an automatic mapping.

Earth Observations to Suport SDG in Brazil – Some strategies

Example of built-up areas mapping
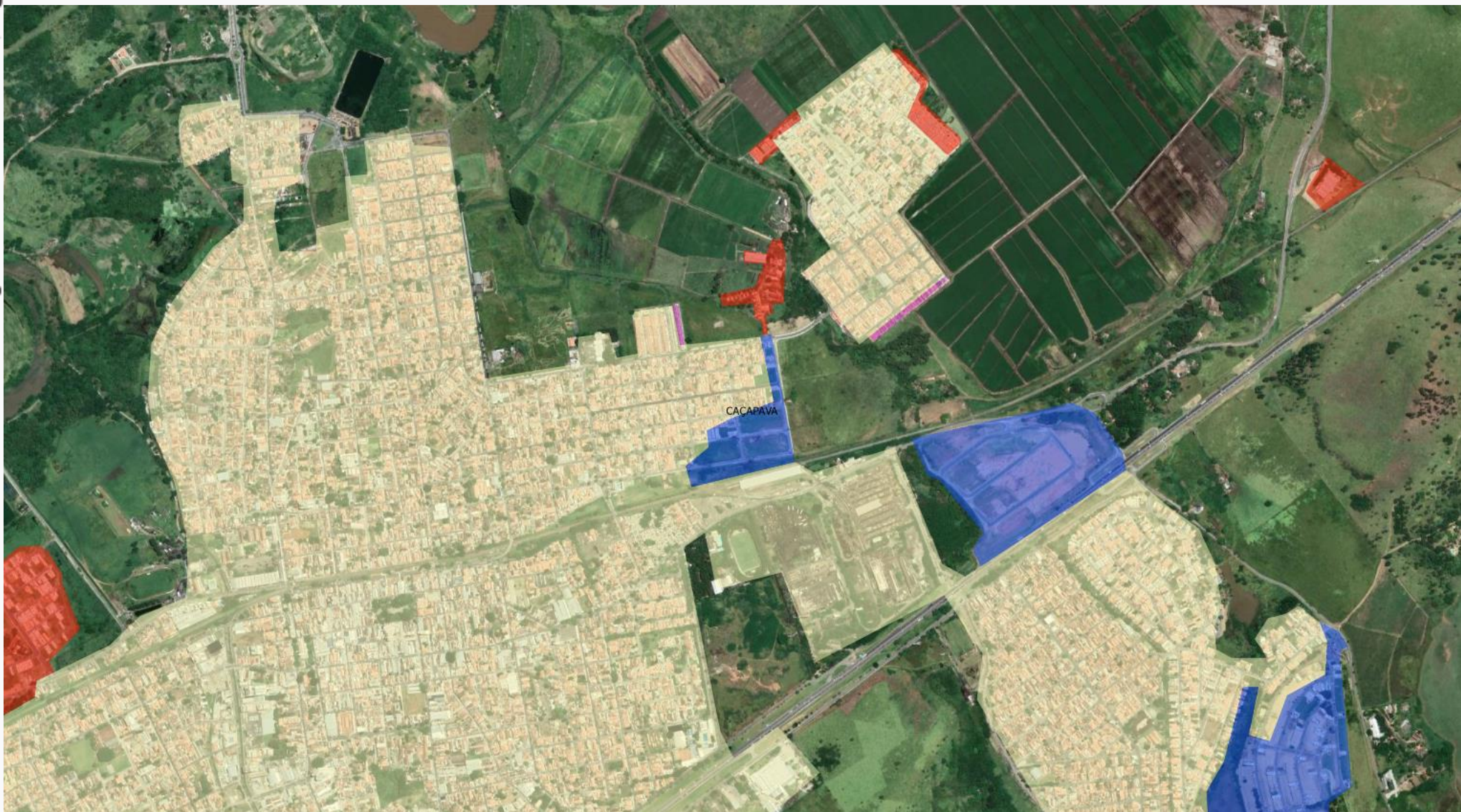
In red, new urban areas that appeared between 2014 and 2109. In blue, new housing developments still unoccupied. In yellow, areas already existing in 2014.

Earth Observations to Suport SDG in Brazil – Some strategies

Example of built-up areas mapping – São Paulo Metropolitan Area
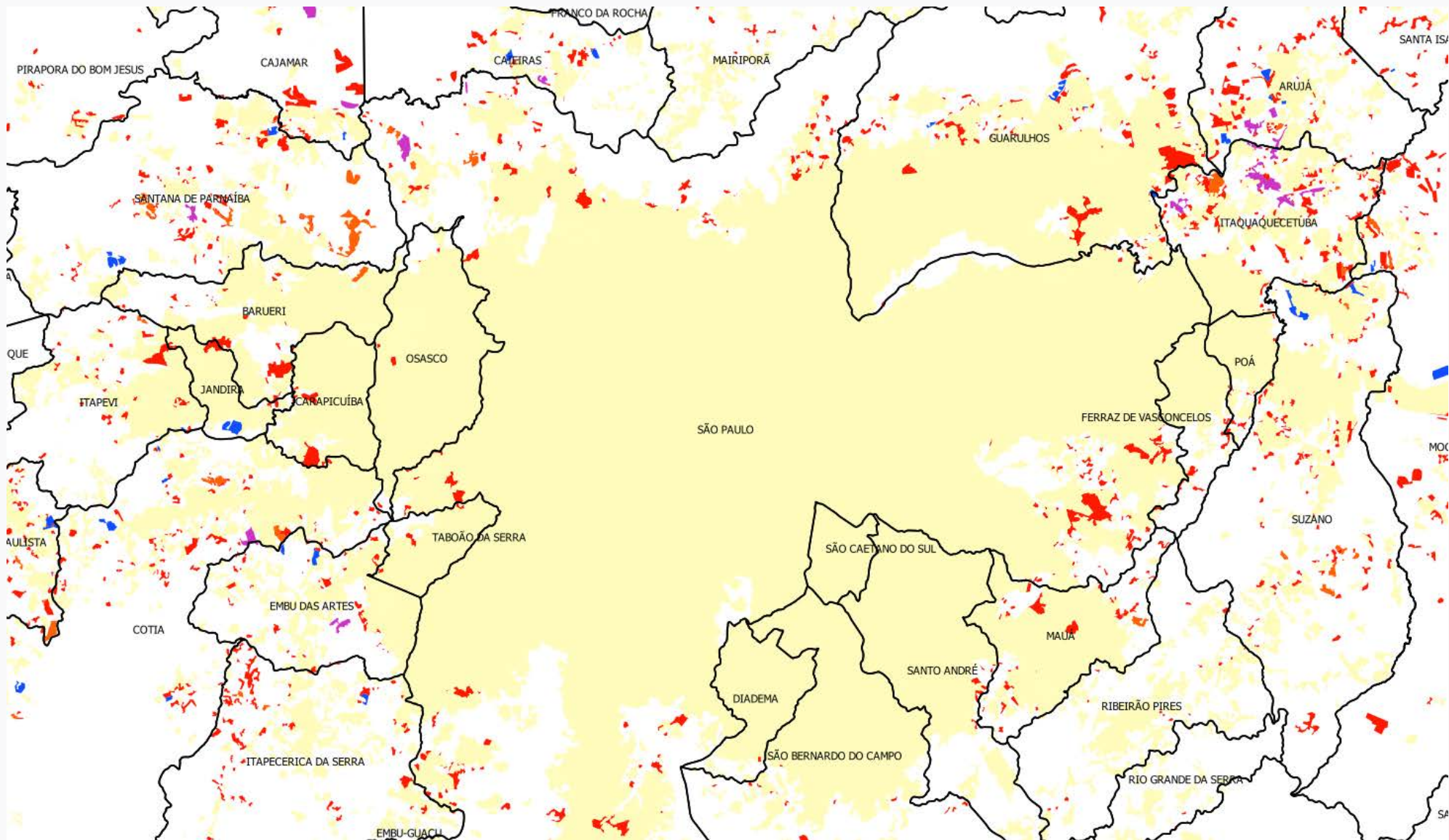
In red, new urban areas that appeared between 2014 and 2109. In blue, new housing developments still unoccupied. In yellow, areas already existing in 2014.

Examples of Indicators Using Earth Observation

15.1.1. Forest area as a proportion of total land area (produced)

Some inputs for indicator construction:

- Vegetation Map (IBGE)

- Satellite Monitoring of the Brazilian Amazon Forest - PRODES (INPE)

- TerraClass (INPE)

- Deforestation Monitoring Program for Brazilian Biomes by Satellite (IBAMA)

Examples of Indicators Using Earth Observation

15.1.1. Forest area as a proportion of total land area (produced)

Vegetation Map (IBGE)

Examples of Indicators Using Earth Observation

15.1.1. Forest area as a proportion of total land area (produced)

Satellite Monitoring of the Brazilian Amazon Forest - PRODES (INPE)
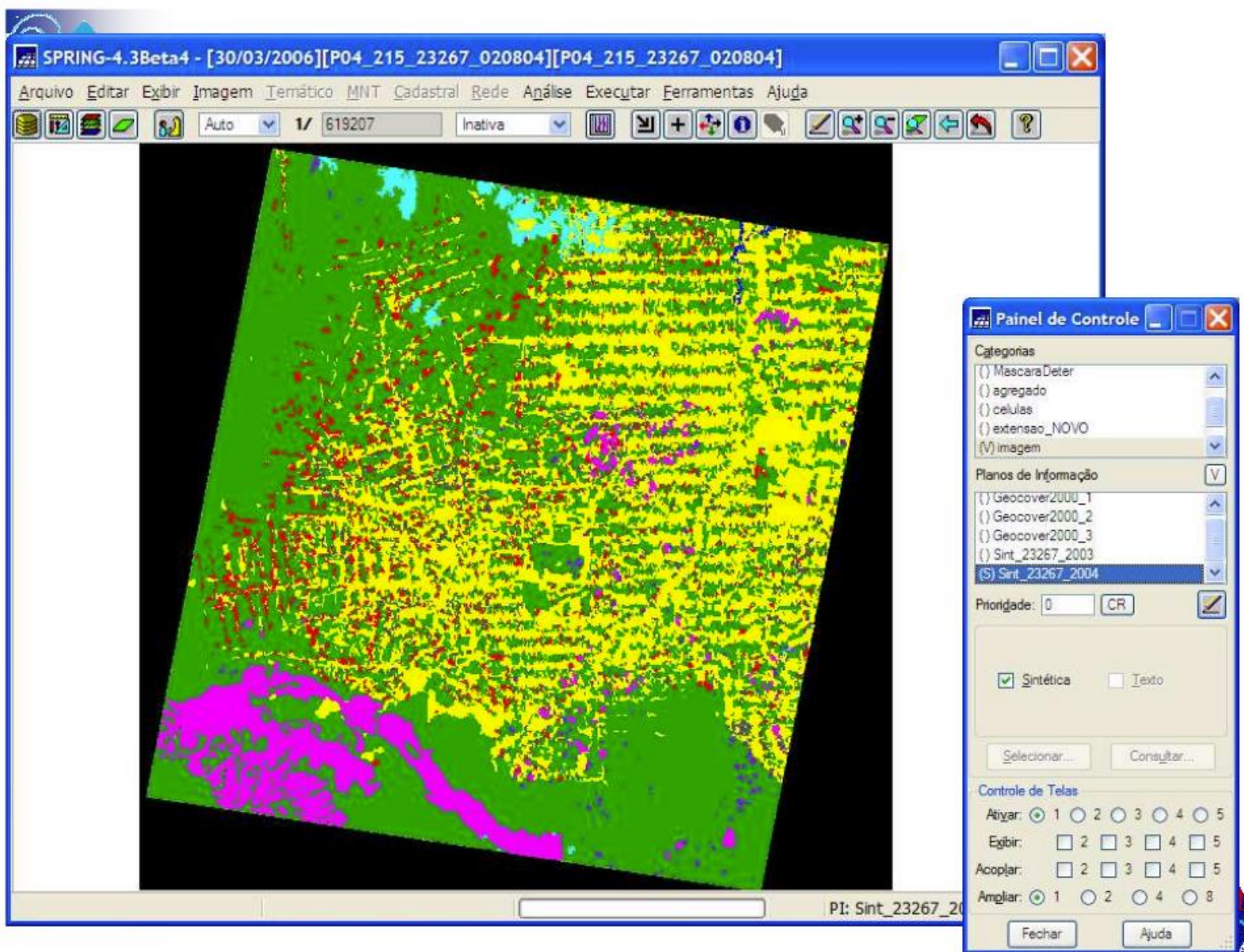
Examples of Indicators Using Earth Observation

15.3.1. Proportion of land that is degraded over total land area (produced, in validation process)

(1) assessment and evaluation of **land cover and land cover changes**;
(2) analysis of **land productivity** status and trends based on net primary production;
(3) determination of **carbon stock** values and changes, with an initial assessment of soil organic carbon as the proxy.

The global model produced an overestimated value and with regional deformities. Adjustments to Brazilian biomes are being made to improve the indicator.
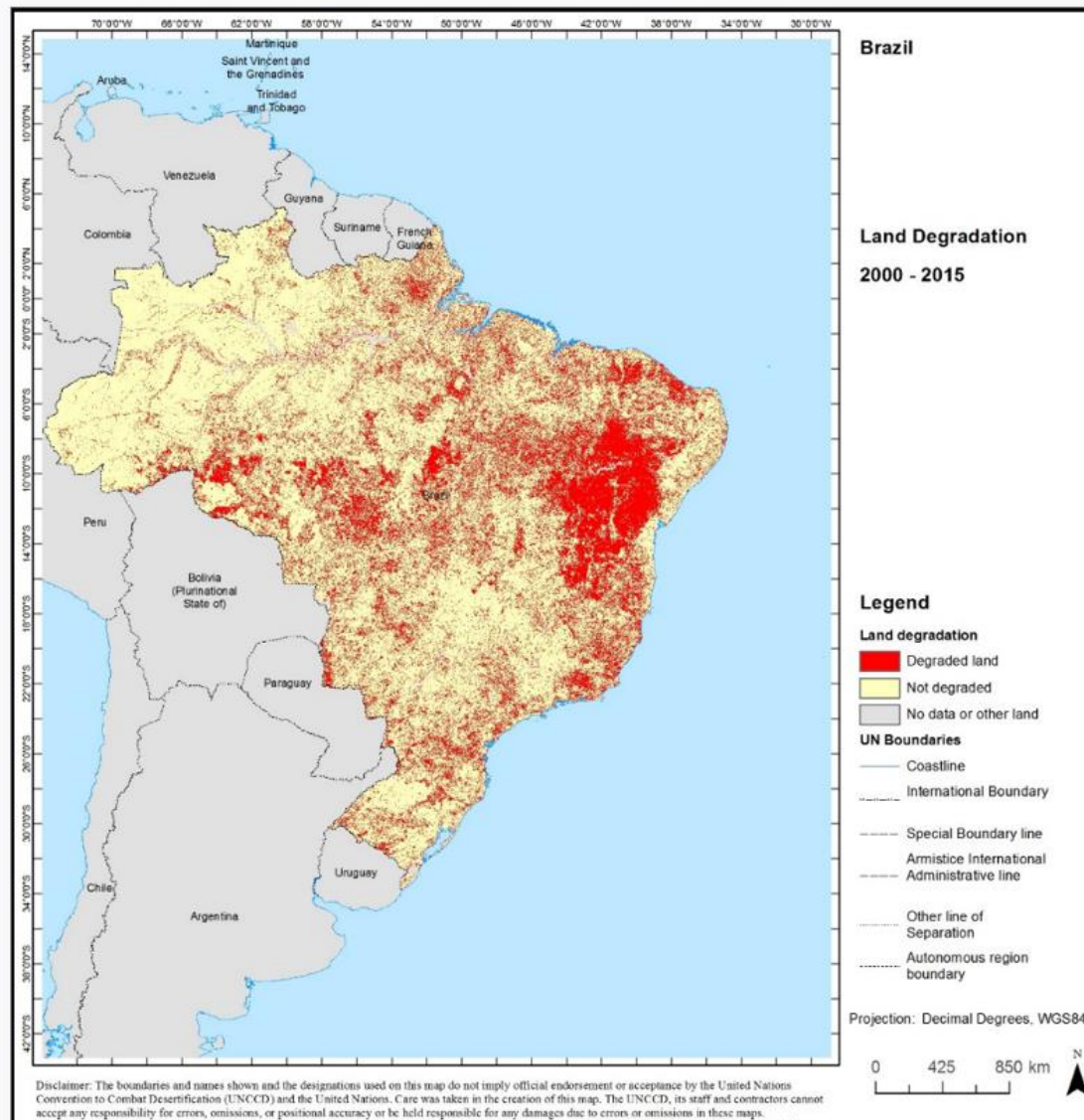

Source: IBGE

Examples of Indicators Using Earth Observation

15.3.1. Proportion of land that is degraded over total land area

(produced, in validation process)

Brazil

Land Degradation

2000 - 2015

Legend

Land degradation
- Degraded land
- Not degraded
- No data or other land

UN Boundaries
- Coastline
- International Boundary
- Special Boundary line
- Armistice International Administrative line
- Other line of Separation
- Autonomous region boundary

Projection: Decimal Degrees, WGS84

0   425   850 km

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations Convention to Combat Desertification (UNCCD) and the United Nations. Care was taken in the creation of this map. The UNCCD, its staff and contractors cannot accept any responsibility for errors, omissions, or positional accuracy or be held responsible for any damages due to errors or omissions in these maps.

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Objetivos estratégicos

Objetivo estratégico 1 Mejorar el estado de los ecosistemas afectados, combatir la desertificación o degradación de la tierra, promover la ordenación sostenible de la tierra y contribuir a la neutralidad en la degradación de la tierra.

S01 — Proporción de tierra degradada en relación con la superficie total de la tierra (Indicador del objetivo de Desarrollo Sostenible 15.3.1)

Proporción de tierra degradada — Indique el área terrestre total degradada (en km²) y la proporción de tierra degradada relativa al área terrestre total (definida como la superficie total de un país menos el área cubierta por aguas interiores, como grandes ríos o lagos) y el año.
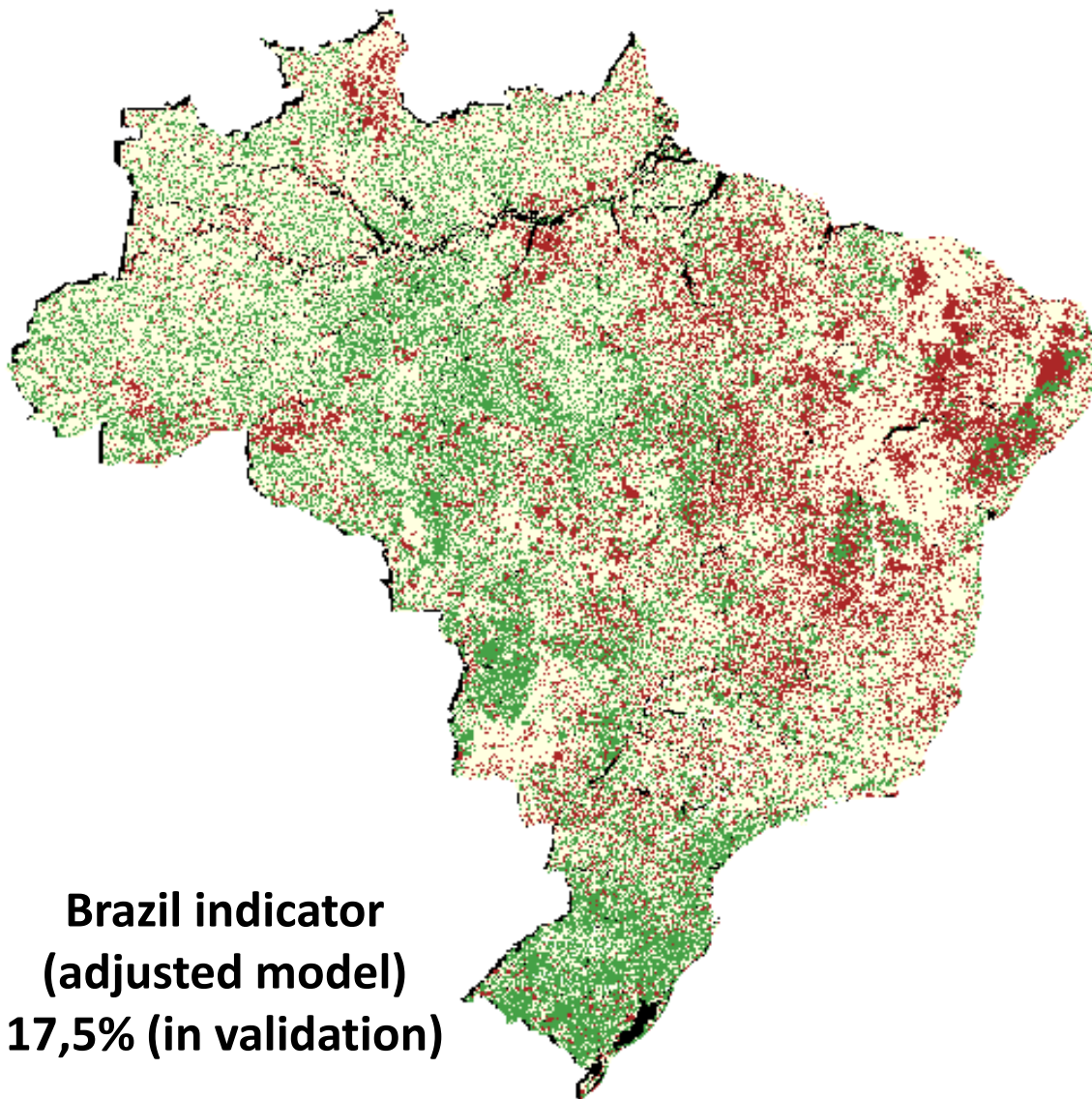
Área total de tierra degradada (Km²)	Proporción de tierra degradada	Año
2.217.402	26,4	2000-2015

26,4% (global model)

Source: United Nations Convention to Combat Desertification3

Examples of Indicators Using Earth Observation

15.3.1. Proportion of land that is degraded over total land area

(produced, in validation process)

Brazil indicator (adjusted model) 17,5% (in validation)

Amazonia

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	4.129.989,4	100,00%
Land area improved:	1.018.978,5	24,67%
Land area stable:	2.473.782,9	59,90%
Land area degraded:	509.483,8	12,34%
Land area with no data:	127.744,1	3,09%

Caatinga (rue)

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	850.103,1	100,00%
Land area improved:	90.809,2	10,68%
Land area stable:	469.216,9	55,20%
Land area degraded:	284.794,2	33,50%
Land area with no data:	5.282,8	0,62%

Cerrado (res)

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	1.973.874,0	100,00%
Land area improved:	383.679,4	19,44%
Land area stable:	1.124.568,8	56,97%
Land area degraded:	456.177,2	23,11%
Land area with no data:	9.448,6	0,48%

Pampa

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	178.868,4	100,00%
Land area improved:	102.607,7	57,36%
Land area stable:	49.974,1	27,94%
Land area degraded:	13.874,8	7,76%
Land area with no data:	12.411,8	6,94%

Mata Atlantica

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	1.092.573,5	100,00%
Land area improved:	292.648,9	26,79%
Land area stable:	596.837,7	54,63%
Land area degraded:	184.341,9	16,87%
Land area with no data:	18.745,0	1,72%

Pantanal

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	150.149,4	100,00%
Land area improved:	79.352,4	52,85%
Land area stable:	50.336,0	33,52%
Land area degraded:	12.142,4	8,09%
Land area with no data:	8.318,6	5,54%

Source: IBGE

Next Steps

Future Challenges...

11.3.1. Ratio of land consumption rate to population growth rate

The main sources for this indicator are the mapping of built-up areas and the Demographic Censuses. The project is to compare the 2021 data with the 2030 data.

11.7.1 Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

A study is being carried out, in partnership with INPE, to identify green areas and open areas in cities. The limit of the cities is given by the mapping of the built areas.

Thanks for your attention!