

The use of image analysis to understand Brazil's worst natural disaster

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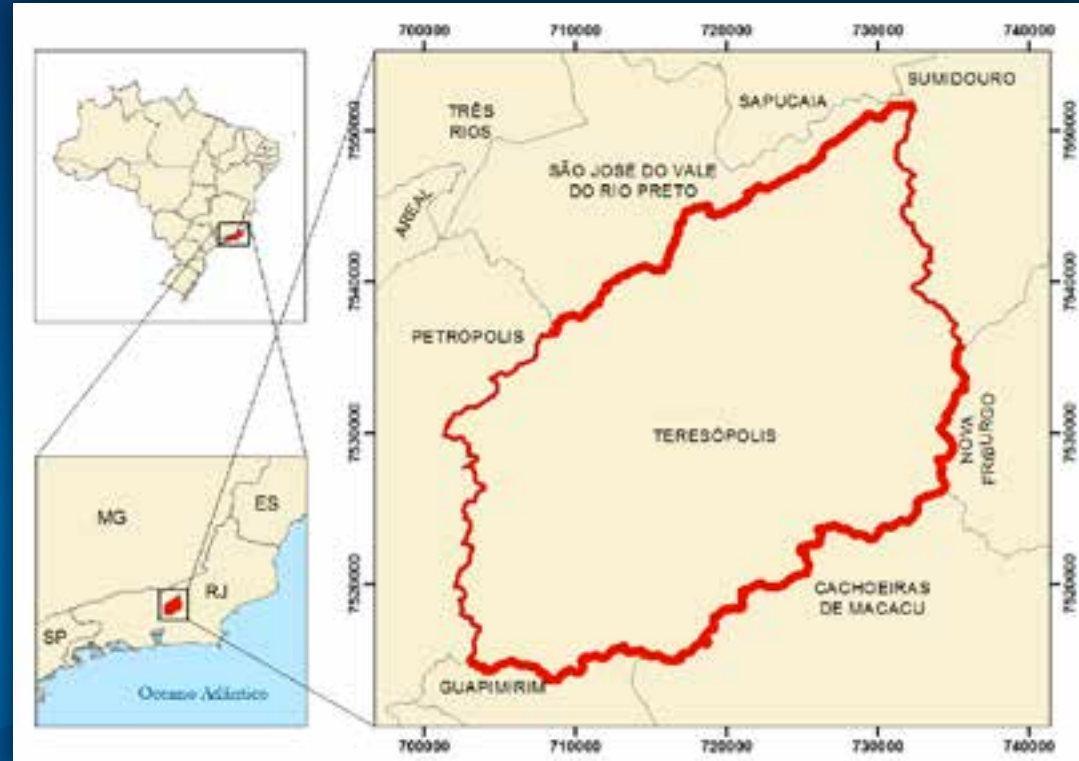


Contents

- Introduction
- Objectives
- Development
- Results
- Demo

Teresópolis

- A touristic city in the mountainous region of the State of Rio de Janeiro, Brazil
- Elevation ≈ 900 m
- Population $\approx 164,000$ (2010)
- Area ≈ 770 km²
- 100km away from the city of Rio de Janeiro
- Known as the home of Brazilian National Soccer Team



Teresópolis – the tragedy

The uncontrolled growth of Teresópolis and other cities of the mountainous region near Rio de Janeiro led to the construction of a great number of houses in mountainous terrain or on the banks of rivers.

This fact, together with a 24-hour rainfall that exceeded what was expected for the entire month, caused a series of floods and mudslides in January 2011.

More than 300 people died and thousands lost their houses in the event, which is considered the worst natural tragedy in Brazilian history.



Objectives

**Identify areas affected
by the natural disaster
using image analysis
and ArcGIS 10.2**

Objectives

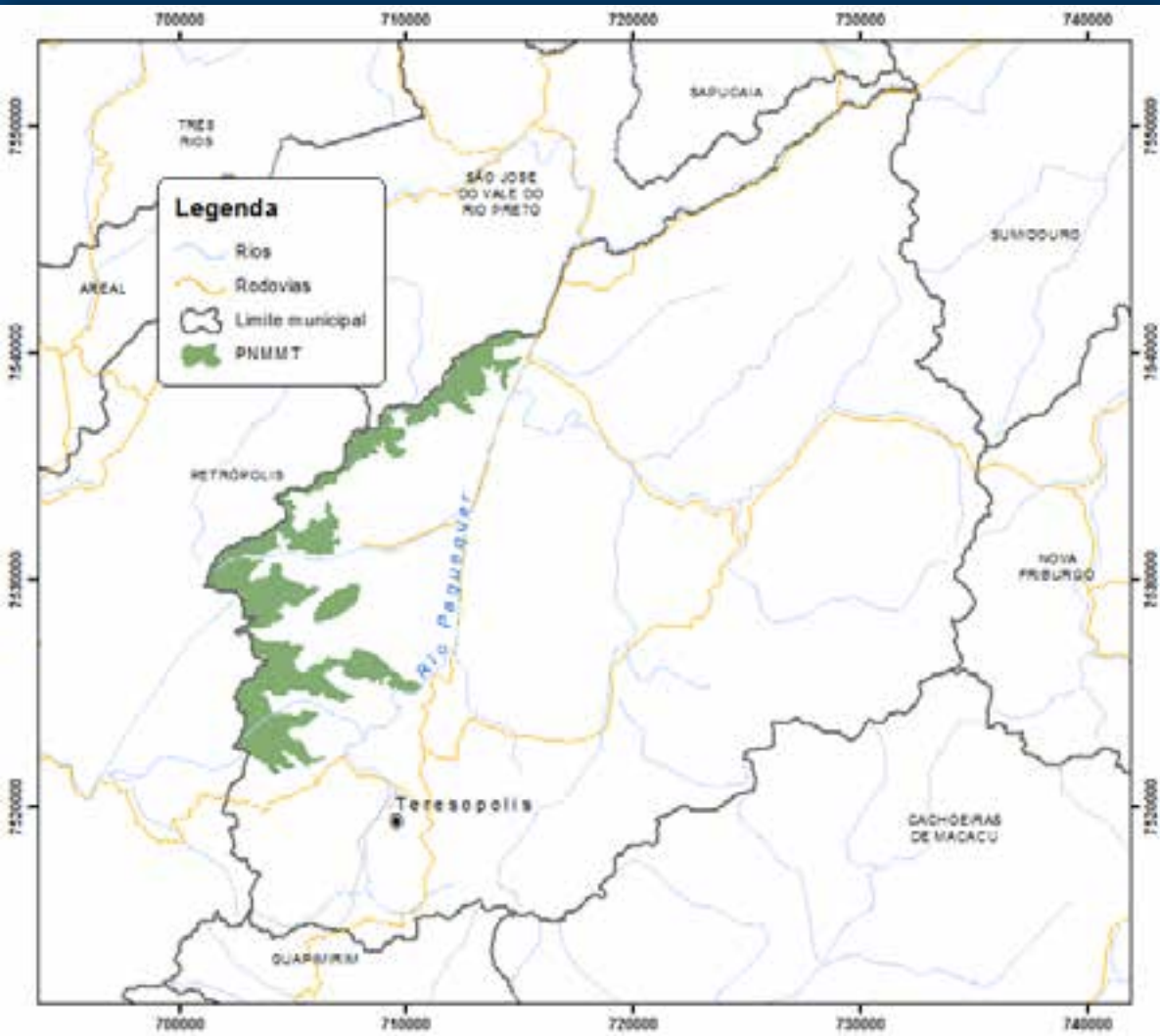
Use ArcGIS 10.2 new Image Analyst features: NDVI, Difference and Slider ...

... combined with Landsat 5 public images ...

... to generate a 3D virtual model with CityEngine Toolset ...

... that could be visualized in a Web Interface.

Area of study



Parque Natural Municipal Montanhas de Teresópolis (PNMMT)

Natural Park located in the northwestern portion of the county, has an area of $\approx 4,500$ acres and is considered the largest municipal park in the State of Rio de Janeiro.

Development

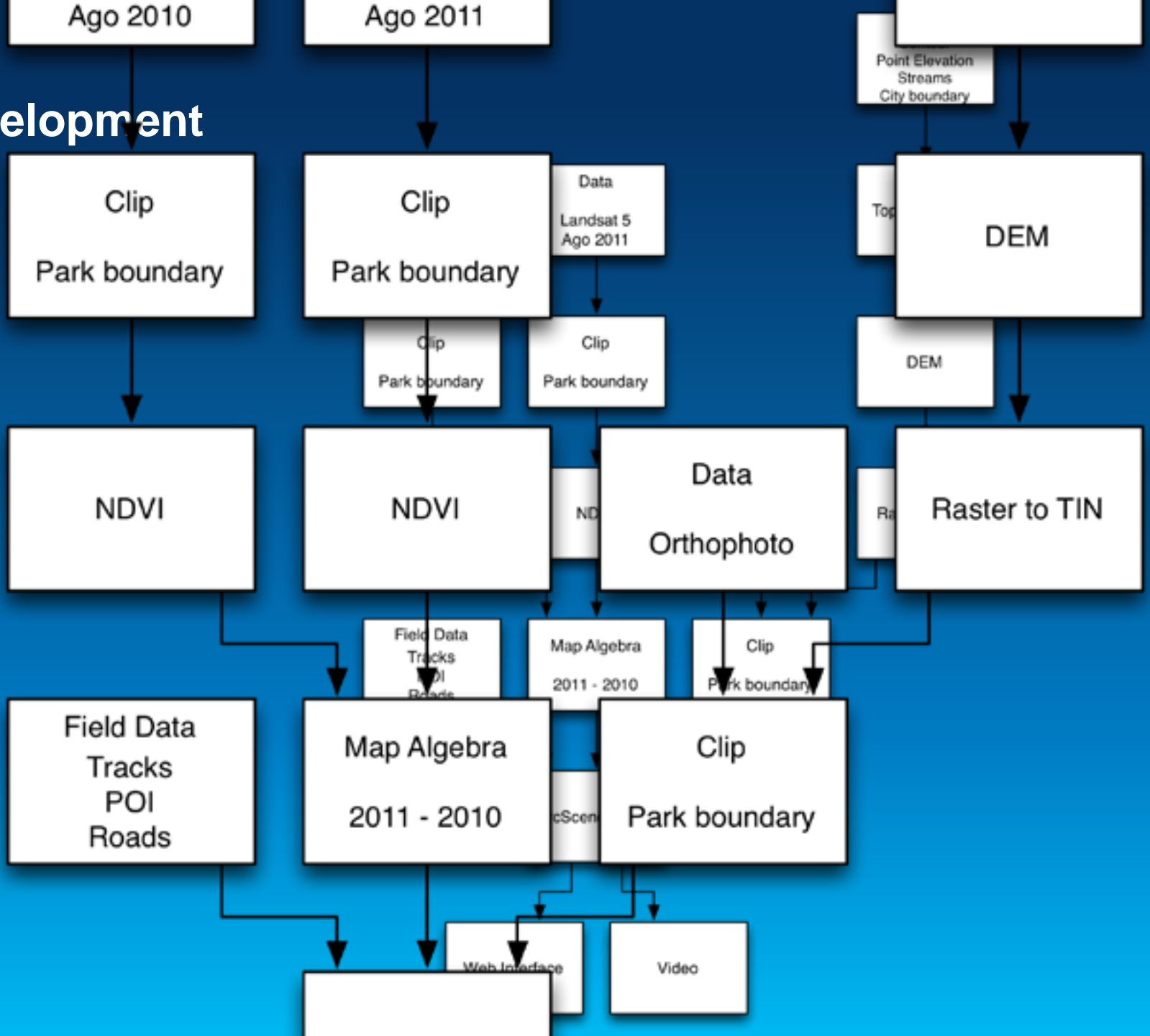
NDVI

A strong characteristic of the tragedy caused by the rains was the occurrence of landslides in many different places.

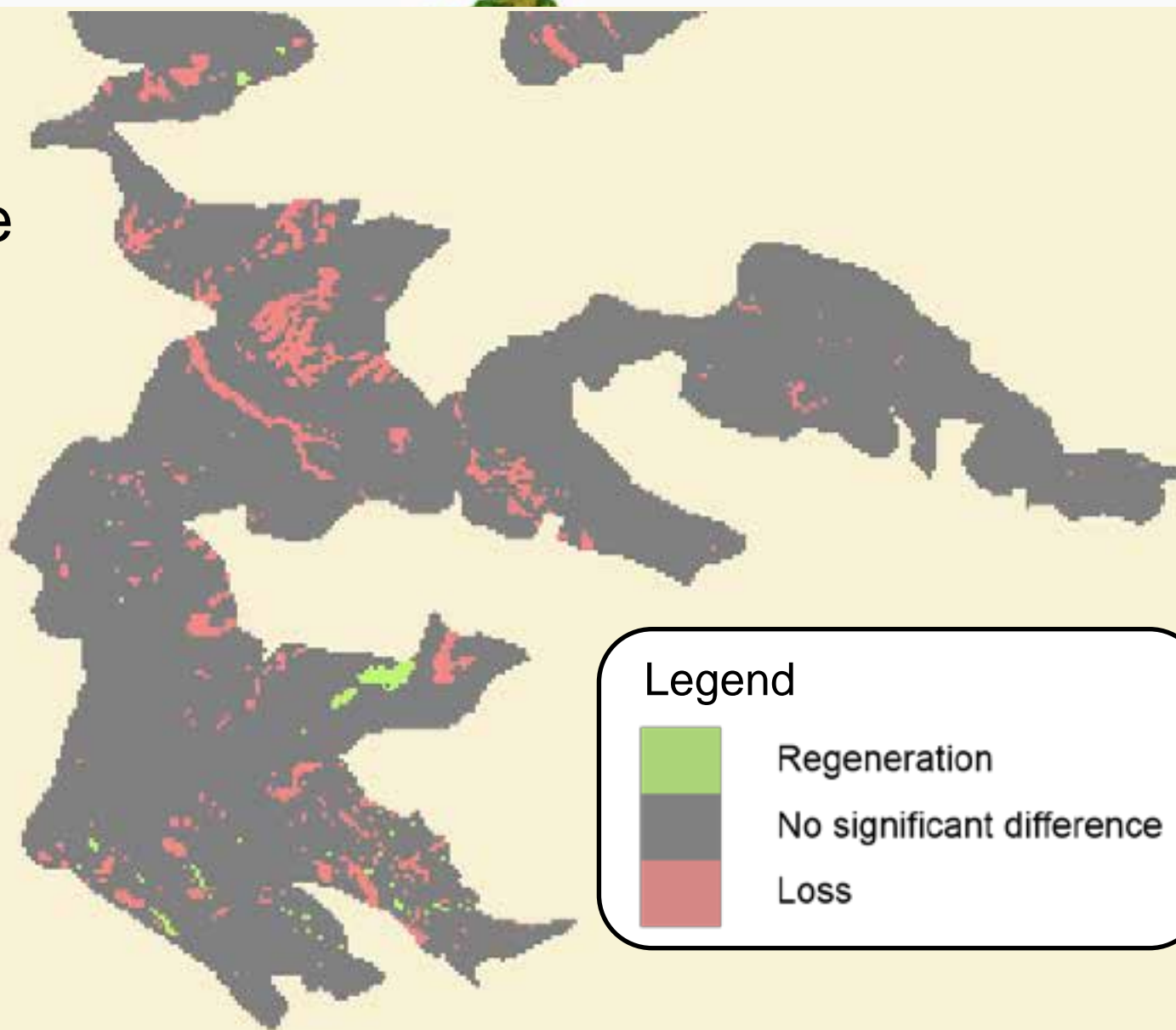
Using NDVI (Normalized Difference Vegetation Index), which operates in the red and infrared bands of Landsat 5 images, we were able to verify the difference between the vegetation cover in the months of August 2010 and August 2011.

NDVI is an index that shows significant results in the detection of changes in green vegetation cover caused by deforestation, fires and landslides.

Development



Difference



Legend



- Regeneration
- No significant difference
- Loss



Image Analysis

- Vegetação
- LANDSAT_5_TM_20100920
- LANDSAT_5_TM_20100923
- INDEX_NDVI_2010
- INDEX_NDVI_2011

Display

0 0 0 1.00

Data Fields

Background

Name: [dropdown]

Nearest Neighbor

Processing

[Icons]

[Color Scale]

Band: [dropdown]

Sharpen: [dropdown]

Measurement

Measure in 3D



Results

Once the model was finished, it was exported as a 3D Web Scene using CityEngine new toolset inside ArcScene.

With CityEngine Web Viewer provided by ESRI, the model was made available at www.unifeso.edu.br/lpp.

In a future update, it is planned to receive better images and new data to allow more detailed analysis of the vegetation cover dynamics.

Demo

Web interface



CityEngine

Web Viewer



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[Details](#)



Thanks!

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Questions?

