INSIGHTS

# WHAT DOES THE SURGE IN AMAZON REGENERATION MEAN FOR BRAZIL?

## NEW EVIDENCE RAISES IMPORTANT CONSIDERATIONS FOR POLICYMAKERS

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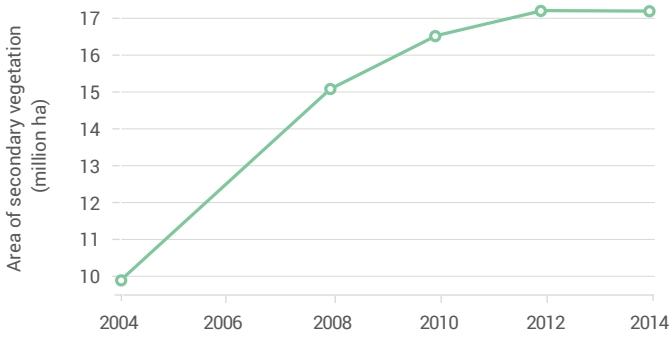
New data released by the Brazilian Institute for Space Research (INPE) reveal a surprising phenomenon in the Amazon that occurred during Brazil s deforestation drop in the second half of the 2000s.[1] Tropical secondary vegetation regrowth that occurs on deforested lands in the Amazon jumped by more than 70% between 2004 and 2014, rising from 10 million hectares to more than 17 million hectares (Figure 1).[2] The magnitude of this increase means that by 2014 tropical regeneration was underway in nearly a quarter of the total area cleared in the Brazilian Amazon *throughout its history.*

While regeneration of the Amazon is striking and welcome news, it is premature to draw many firm conclusions about this surge. What is known for certain is that the regrowth is sizable and ongoing, but the true drivers and consequences have yet to be identified and understood. This brief outlines some of the most important questions raised by Climate Policy Initiative (CPI)/ PUC-Rio analysts with INPUT. It provides early guidance for policymakers and stakeholders about how to interpret the news that the deforested Amazon is growing back.

**Figure 1:** Growth of Secondary Vegetation in Deforested Areas in the Brazilian Amazon




**Approximately 25%**
of the total area cleared in the Brazilian Amazon

***Source:*** *TerraClass/ INPE, 2016*

An important disclaimer should be kept in mind while reading this brief. As intriguing as it is to discover that deforested areas of the Amazon have begun to regenerate, this regeneration does not necessarily share biological or ecological equivalence with primary forested areas, nor does it fully make up for the devastation caused to the Brazilian Amazon by years of deforestation.

1 After a sharp decrease in the second half of the 2000s, Brazilian Amazon deforestation appears to be on the rise. The latest estimates indicate rates in 2016 increased by nearly 30%. Source: PRODES/INPE. Available at http://www.obt.inpe.br/prodes/prodes_1988_2016n.htm.

2 The full dataset, known as TerraClass, provides information on land use in deforested areas in the years 2004, 2008, 2010, 2012, and 2014. Data from 2004 and 2014 were only released in July 2016. TerraClass is a joint effort between INPE and the Brazilian Enterprise for Agricultural Research (Embrapa).

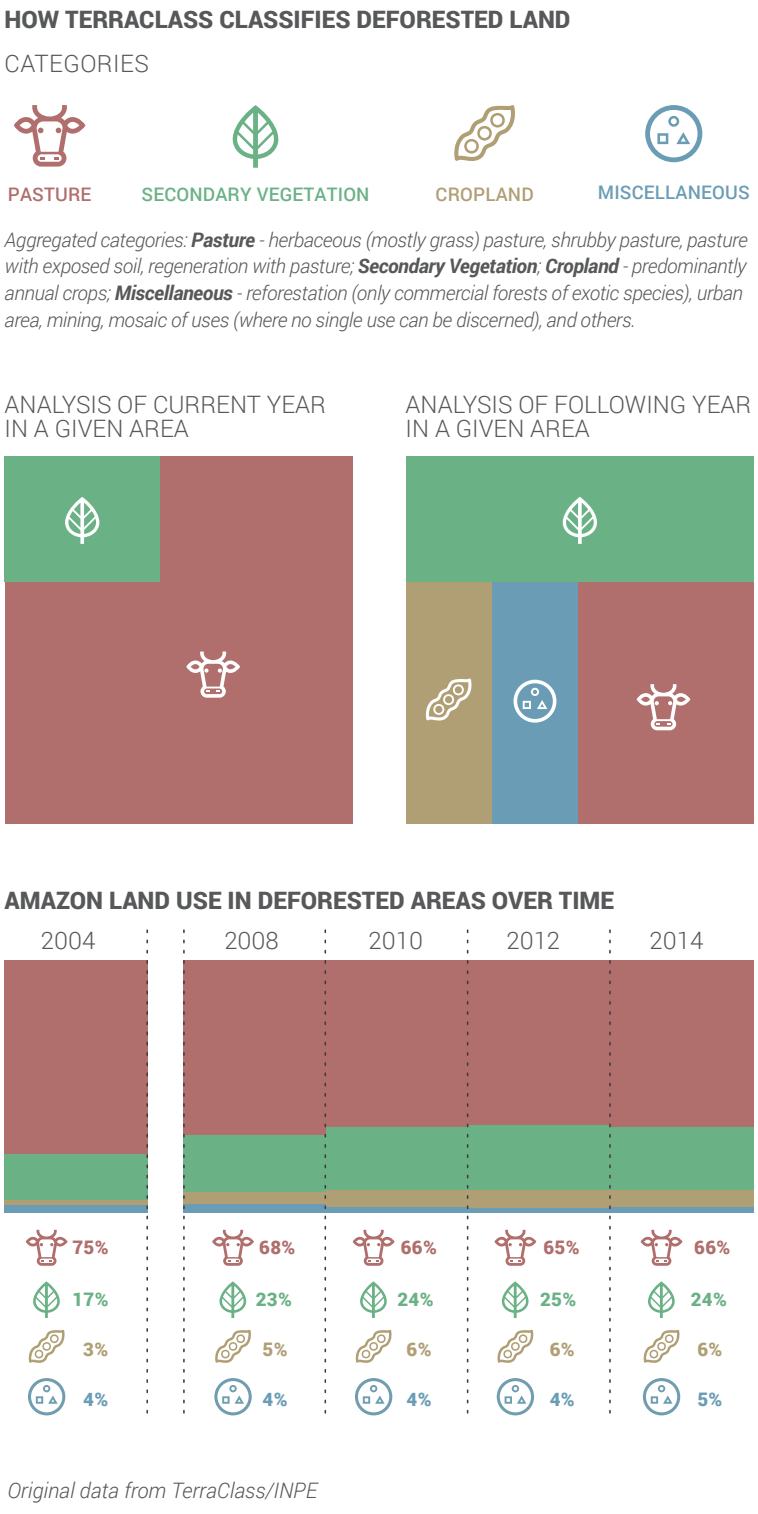
## AMAZON REGENERATION: THE FACTS

The TerraClass dataset released by INPE classifies land use in all Brazilian Amazon areas that were once occupied by tropical forest but have since, at some point, been cut down. Because TerraClass data were not released in chronological order, it was not until recently that researchers were able to piece together a rough portrait of activity that occurred across cleared lands before Brazil adopted its Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm).[3]

The newly released TerraClass data reveal that tropical secondary growth is not a new phenomenon. Signs of advanced tropical regeneration could already be detected in nearly 10 million hectares by 2004, before the PPCDAm had been adopted. Over the next decade, secondary vegetation coverage grew by more than 70% and in 2014 totaled more than 17 million hectares.

For every year TerraClass data are collected, deforested land in the Brazilian Amazon is classified according to its current use. This classification allows researchers to observe how land use in cleared areas has changed over time and over the course of different phases of the policy action plan (Figure 2). It also shows transitions both into and out of tropical regrowth.

**Figure 2:** TerraClass Land Use Classifications




*Original data from TerraClass/INPE*

3 The PPCDAm, launched in 2004, introduced a novel strategic approach to combat tropical deforestation. It contributed to reduce Amazon deforestation rates from a peak of about 2.7 million hectares per year in 2004 to about 600,000 hectares per year by the early 2010s. See more at https://climatepolicyinitiative.org/publication/deterring-deforestation-in-the-brazilian-amazon-environmental-monitoring-and-law-enforcement/

## THE NEED FOR RIGOROUS ANALYSIS

The facts discussed in the previous section provide a picture of how deforested land use in the Amazon has been shifting. However, the data alone cannot identify what policies and factors actually drove those changes. CPI analysts seek to pair rigorous analysis and methods with these data to more fully understand regeneration in its context and its complexity. The goal is to advise policymakers on how they can build on regrowth in the Amazon and how to deal with the intended and unintended consequences of existing policies.

One intriguing aspect of the rise of tropical regeneration in the Amazon is that, despite its magnitude, the regrowth escaped detection for so long. Not until the release of 2004 and 2014 data in 2016, did researchers, policymakers, and stakeholders gain the opportunity to identify and assess the regeneration over the first decade of the PPCDAm. This was in part due to a characteristic of Brazil s current systems for monitoring and quantifying tropical deforestation: the satellite-based systems do not, by design, capture tropical regrowth (see Page 4 for details). Therefore, meaningful data about what happens on the deforested lands after they are cleared does not get regularly collected. This means that regeneration typically goes unnoticed and Brazil's official figures for its Amazon deforestation rate do not include the loss of secondary vegetation.

## HOW BRAZIL S SATELLITE-BASED SYSTEMS TRACK DEFORESTATION BUT OVERLOOK REGENERATION


### PRODES | Project for Satellite Monitoring of the Brazilian Amazon (1988 - Present)

The PRODES system s purpose is to quantify and spatially locate annual tropical deforestation increments. PRODES only detects clearing of forest that has never before been cut down.

#### How PRODES Tracks Deforestation

When PRODES satellites identify an area as deforested, it is classified as part of that year's deforestation increment; in the following year, this area is classified as accumulated deforestation, and it is incorporated into what is known as the PRODES deforestation mask.

#### How PRODES Misses Regeneration

By design, once an area becomes part of the PRODES deforestation mask, it is never reclassified. Thus, PRODES does not detect deforestation of areas covered by secondary forest, nor does it include this type of forest clearing in its calculation of the annual deforestation rate. Secondary regrowth is therefore invisible within the current scope of PRODES.

### DETER | Real Time Detection of Deforestation (2006 - Present)[4]

The DETER system s purpose is to rapidly and frequently detect deforestation hotspots, which then serves to target law enforcement.

#### How DETER Tracks Deforestation

Once DETER detects forest clearing, it issues a deforestation alert, which pinpoints the geographical location of the deforestation activity. The Brazilian environmental police, who receive the DETER alerts, use them to prioritize and target law enforcement activities.

#### How DETER Misses Regeneration

DETER builds on PRODES data to the extent that it only scans for deforestation activity in areas outside the PRODES deforestation mask. Thus, DETER is only capable of detecting degradation and clearing of Amazon vegetation that has never been cut down.

4 DETER: start date: 2004 (launched, test phase), 2006 (fully operational).

## PRIORITIES FOR ANALYSIS

During the time period that secondary regeneration in the Amazon increased, Brazil s policies exclusively targeted combating primary deforestation (clearing in areas that have never before been cut down). Little is known, therefore, about the role these policies might have played in either driving or inhibiting regeneration in cleared lands. CPI researchers have identified four priorities for policy analysis.

**1** **Determine the impact of deforestation policies on regeneration.**

During the time that regrowth increased in cleared areas, deforestation continued to advance in primary forest. Given that stricter monitoring and law enforcement efforts introduced under PPCDAm drove up the costs of illegally clearing primary forests, the rise in regeneration on already cleared lands is surprising. It would have been cheaper for the clearers to instead cut secondary forest because that clearing would have been much more likely to go undetected by monitoring procedures and to evade sanctions. Investigating the impact of deforestation policies on regeneration may help uncover what is driving this behavior and possibly reveal new approaches to more effective enforcement policies.

**2** **Explore land use dynamics underlying the regeneration phenomenon.**

The rise in tropical regrowth might reflect inefficiencies in the way land is used in the Amazon. If forested areas are cleared only to be abandoned and allowed to regenerate, rather than put to a productive use, such as growing crops, why was the area cleared in the first place? What determines its abandonment? Moreover, once vegetation has grown back, could these areas be used productively as a low-cost option for forest restoration? Without more in-depth analysis of the nature of regeneration, these questions remain unanswered.

**3** **Determine how regeneration fits into the new Brazilian Forest Code.**

In accordance with the new Brazilian Forest Code, illegally deforested areas must be restored.[5] This amounts to an estimated nine million hectares in the Amazon.[6] Does the existing regeneration count toward this requirement? If so, how many hectares still need to be restored in the Amazon? Understanding how the observed regeneration can be used to reduce the cost of Forest Code implementation may help facilitate compliance.

**4** **Identify how regeneration affects carbon reduction goals.**

As part of Brazil s proposed strategy to achieve its emissions reduction target (as committed under the United Nations Framework Convention on Climate Change),[7] the nation intends to restore or reforest 12 million hectares of forest countrywide by 2030. As secondary forests develop, increasing biomass could contribute to heightened carbon capture and thereby help mitigate emissions. Meeting the 2030 goal will require enforcement of existing laws and targeted efforts by policymakers and rural landowners. Understanding what may have contributed to the newly documented tropical regrowth of seven million hectares and how to build on it will be important for shaping future policy.

5 Read more about the new Brazilian Forest Code rules at https://climatepolicyinitiative.org/publication/brazils-new-forest-code-how-to-navigate-the-complexity/

6 Source: Soares-Filho et al, 2014. Cracking Brazil s Forest Code . *Science*, 344, p.363-364.

7 Brazil ratified its intended Nationally Determined Contribution (NDC) to the UNFCCC in September 2016. With it, the country formalized its intention to commit to reduce greenhouse gas emissions by 37% below 2005 levels in 2025. The country s NDCs lays out an overview of the proposed strategy to achieve this target, including efforts in energy, forestry, agriculture, industry, and transportation sectors. Reforestation targets are set for 2030.

# CONCLUSION

In light of the many questions surrounding the rise of secondary vegetation in the Amazon, CPI researchers recommend that policymakers act to capitalize on the important opportunity this regeneration presents. With the ratification of the Paris Climate Agreement, meeting the NDCs will not only require Brazil to strengthen its efforts to combat illegal deforestation, but also begin planning and incorporating the regeneration phenomenon into policymaking. By pursuing a better understanding of the nature and dynamics of Amazon regeneration through improved data collection and rigorous analysis, Brazil can continue to advance effective and evidence-based conservation and land use policy.

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*The **Land Use Initiative (INPUT Iniciativa para o Uso da Terra)** is a dedicated team of specialists who work at the forefront of how to increase environmental protection and food production. INPUT engages stakeholders in Brazil s public and private sectors and maps the challenges for a better management of its natural resources. Research conducted under INPUT is generously supported by the Children s Investment Fund Foundation (CIFF) through a grant to the Climate Policy Initiative.*