

# Prioritizing Areas for Reforestation of Private Lands in the Brazilian Amazon

The Colider microregion case (MT state), criteria for choosing the focus, and costs opportunities with the Forest Code.

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We propose a protocol for strategic decision-making in the implementation of reforestation requirements in the New Forest Code. We worked with the microregion of Colíder to identify priority levels for reforestation in private lands. In addition, we estimated the investment levels required for three distinct reforestation scenarios.

## 1. CONTEXT

Amazon deforestation has been a critical social and environmental issue in Brazil since the 1960s. To combat this, the government has had a Forest Code in place for the conservation and recuperation of forests, and in 2012 it was redrafted as the New Forest Code. It provides opportunities to contribute to forest recovery, and it is estimated that 24 million ha of forest can be restored with its full implementation.

Additionally, it could foster efforts to achieve Brazil's Nationally Determined Contribution from the 2015 Paris Climate Agreement. Brazil committed to restoring 12 million ha of forest, thereby reducing the country's emissions.

Currently, private landowners are assessed and assisted by the Environmental Regularization Program (PRA, in Portuguese). PRA could be furthered with analyses of lands that have the highest potential to bring environmental benefits and lands that are most suitable for reforestation. The challenge now is to determine the optimal way to coordinate efforts for the abidance of the New Forest Code and harness Brazil's potential for environmental restoration.

## 2. METHODS

To identify the sequence in which reforestation should be carried out in Colíder, we built a "Priority Map" using a mix of geospatial methods and multi-attribute analysis. The priority areas on the map were plotted as a function of indicators of possible ecological benefits (such as biodiversity and distance from waterways) and indicators of feasibility measures (such as distance from remaining forests and temperature).

First, we consulted experts to identify relevant variables for the Benefits and Feasibility Maps. These variables were then ranked by the experts in order of importance. We then developed functions for each variable, assigning scores from 0 to 1 for each attribute; 0 being least favourable and 1 being most favourable. For example, areas closer to waterways received a score of 1, and areas far away received a score closer to 0. Consequently, we used the functions to create a distinct map layer for each variable. These layers were used to create the Benefits Map and the Feasibility Maps. Next, the Benefits and Feasibility Maps were overlapped to create the final Priority Map. This final map was masked with deforested areas in the microregion, excluding protected areas and urban areas. Then, thresholds were decided to distinguish areas of High, Medium, and Low Priority. Last, we projected the investments required for three reforestation scenarios using 'Quanto é?' from Instituto Escolha<sup>2</sup>.

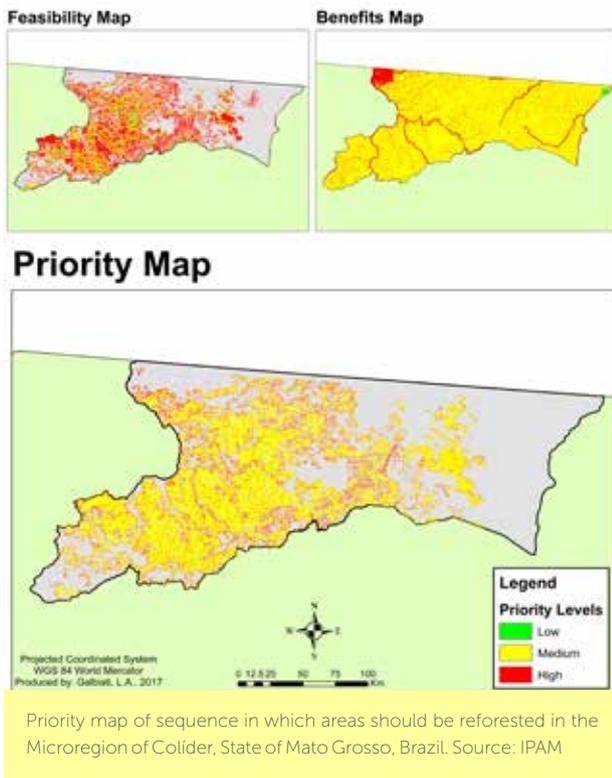
## 3. RESULTS

The total area with potential of being reforested

<sup>1</sup> Andersen, L. E., Granger, C. W. J. 2007. Modeling Amazon deforestation for policy purposes: reconciling conservation priorities and human development. *Environmental Economics and Policy Studies* 8(3), 201–210.

<sup>2</sup> Instituto Escolhas. 2017. Quanto é? Plantar Floresta. <http://quantoefloresta.escolhas.org/> (Accessed August 1, 2017).

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in Colider is 1,608,182 ha. Within the different levels, High Priority amounts to 268,467 ha, Medium Priority amounts to 1,338,730 ha, and Low Priority amounts to 984 ha. The largest priority level by area is Medium, followed by High and then by Low. In the Map, the High Priority denotes areas that have the best combination of potential benefits and feasibility measures.

Here, maximum amount of ecological conservation would be achieved, since planting in those areas is viable and very likely to succeed. We consider that these areas should be tackled first. Medium Priority constitutes the second best area to reforest, followed by Low Priority.

The estimated costs for each reforestation scenario are:

**Scenario 1:** The High Priority level would have an average cost of R\$ 3,430,000,000 (roughly US\$ 1,091 million).

**Scenario 2:** High and Medium Priority levels would have an average cost of R\$ 20,531,000,000 (roughly US\$ 6,529 million).

**Scenario 3:** High, Medium, and Low Priority levels would have an average cost of R\$ 20,544,000,000 (roughly US\$ 6,533 million).

Reforesting the High Priority area alone requires approximately 17% of the cost of recovering all areas.

## 4. RECOMMENDATIONS

- More emphasis could be placed on reforestation as an active way to pursue environmental benefits:

Reducing deforestation is not enough to attain sustainable use of natural resources. Active recuperation of lost forests is key to restoring ecosystem functions and to fulfilling the country's commitments to the international community.

- Reforestation could be better addressed by prioritizing those areas with high potential to maximize ecological benefits and reforestation feasibility

Given the limited resources available, those properties in High Priority areas should be approached and evaluated first by PRA, followed by those in Medium Priority and Low Priority lands.

- The protocol developed here can be converted into an accessible and comprehensive tool for landowners to carry out their own reforestation efforts

Understanding of context-specific variables is important in order to customize local maps and narrow in on their specific characteristics. This information could then be made publically available for small- and large-scale uses in forest recovery.

- Rural Credit Lines could use this protocol as a requirement for financing reforestation activities

As reforestation is a costly process, some landowners will seek additional funding to fulfill their legal requirements. Financial institutions could have a significant impact in ensuring optimal reforestation efforts by encouraging their clients to comply with given standards.

Citation:

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