Destruction and restoration of the Amazon Forest

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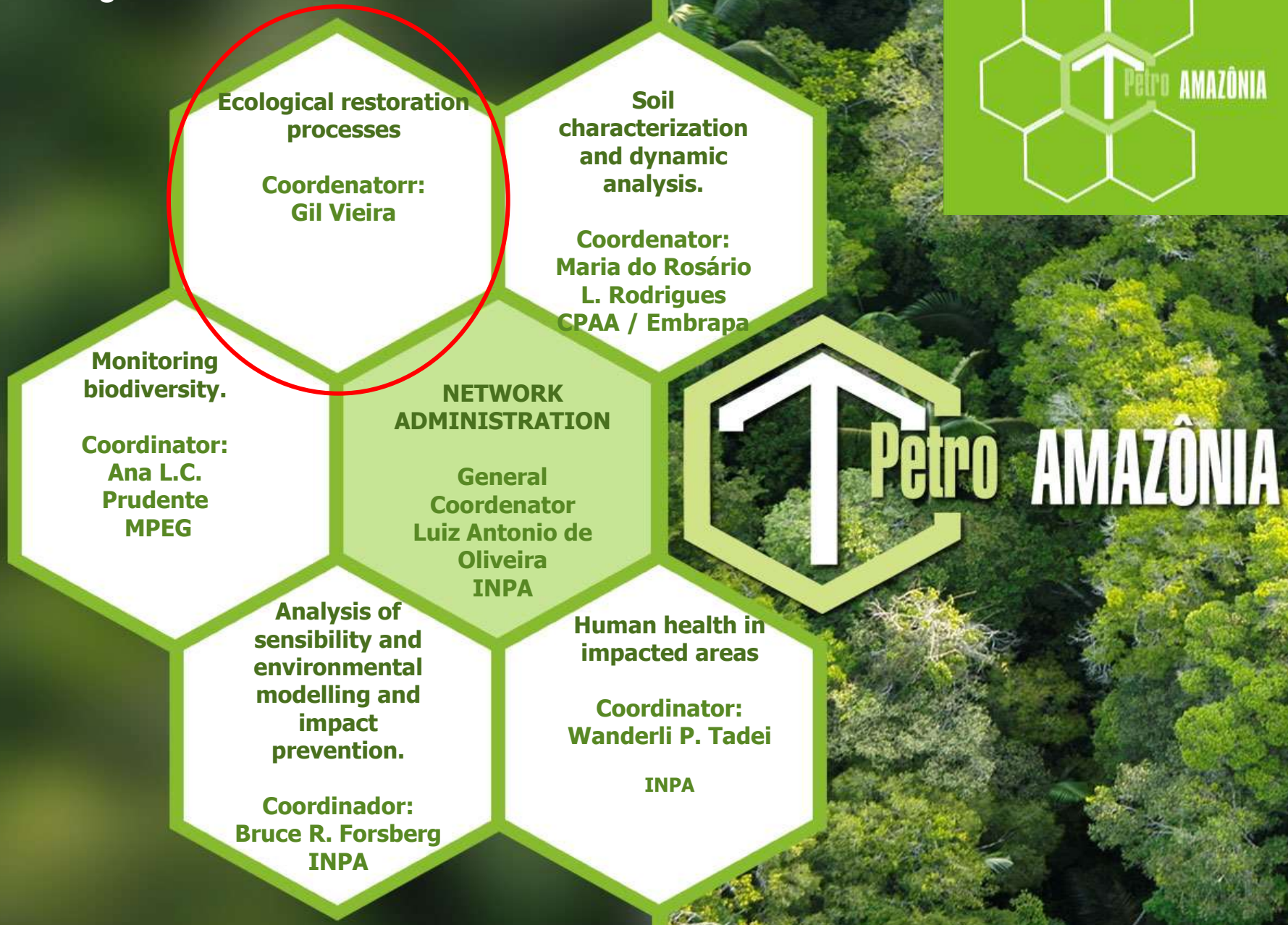
Network organization



What cause forest destructions?

The main causes are:

- Familiar agriculture (early 70 governmental incentives (agrarian reform)
- Hydroelectric Dams
- Mining companies (iron, gold, diamond, bauxite, oil prospecting, silvinite)
- New roads -----→ illegal logging
- Cattle ranching
- Extensive soy beans plantation

Deforestation in the Amazon

Estimated forest losses annually, in square miles (square kilometers), according to the Brazilian government:

Source: National Institute of Space Research (Brazil), rainforests.mongabay.com
Graphic: Angela Smith

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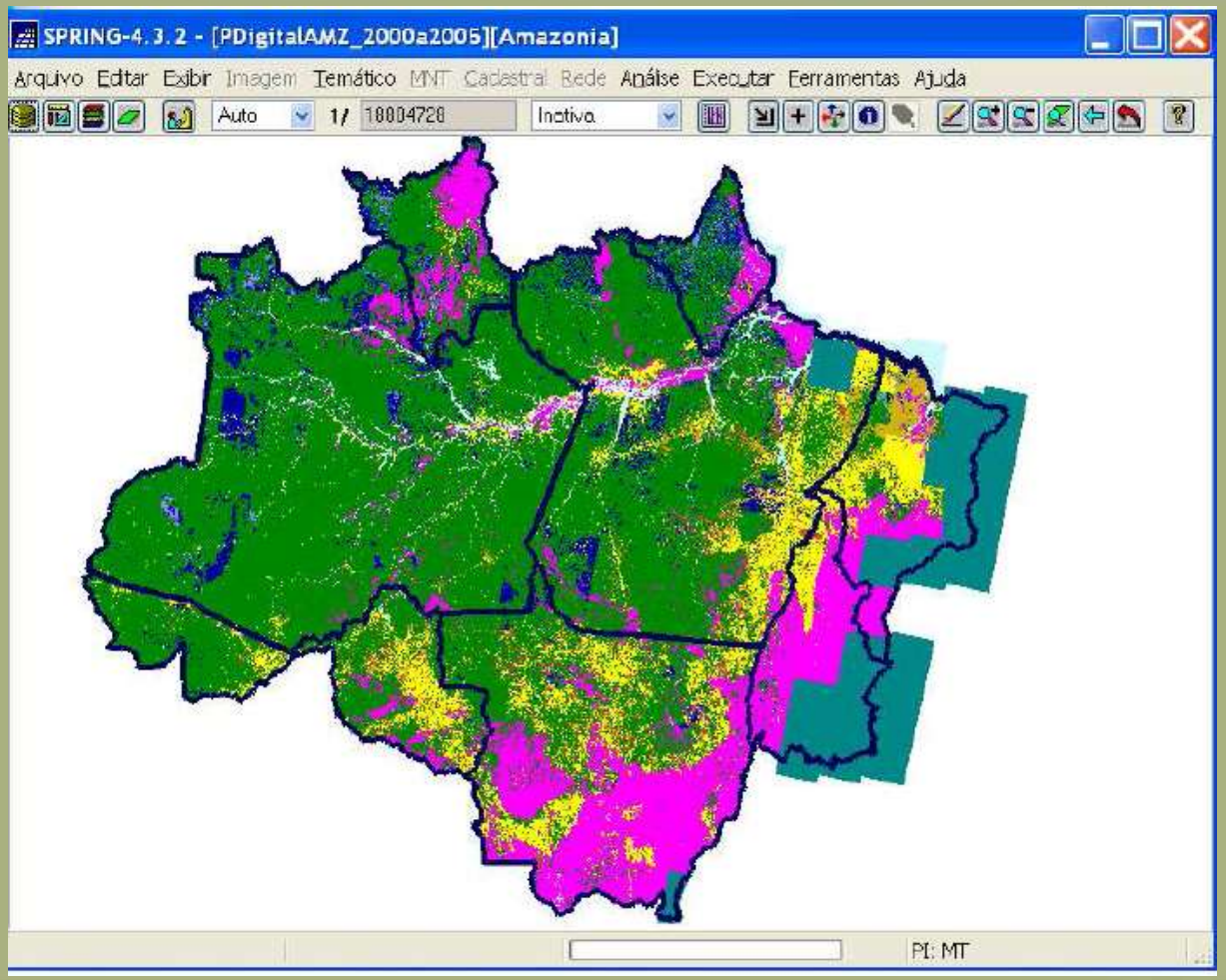
Monitoring and preventing deforestation



Source: PRODES-INPE-MCT-IBAMA

Conservation units

80% of the private area must be natural vegetation (Legal reserve)

CAR: Environmental Registration of Rural areas

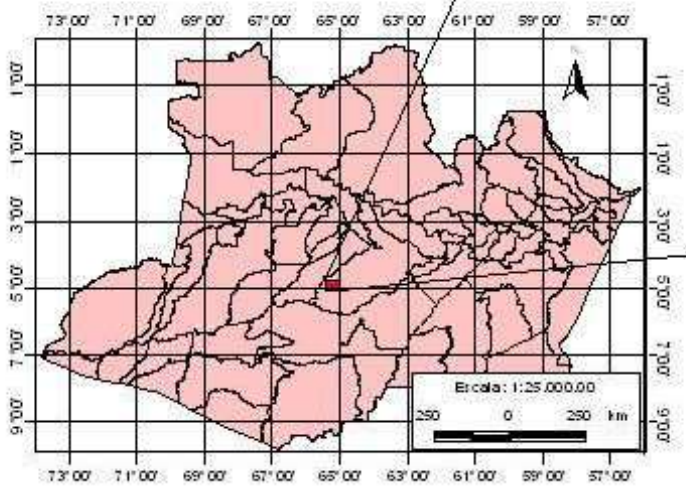
RESTORATION NEEDS

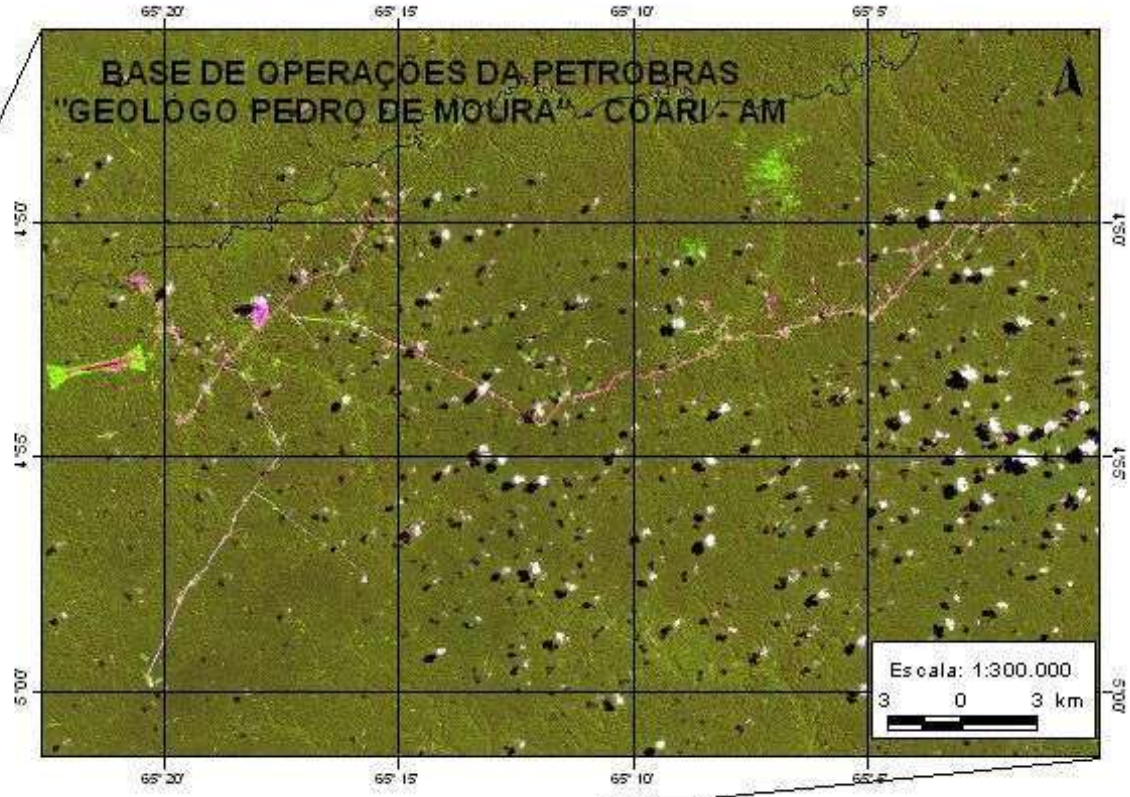
- To revegetate private lands that destroyed more than 20%
- To restore primary forests removed to set up mining and oil industries (obligation by law)

CT-PETRO Research Network started in 2004
Several projects have developed researches on impact prevention, soil conservation, monitoring biodiversity and health issues caused by environmental impact

Our group has focused in developing new techniques in forest restoration

LOCALIZATION





Fonte: Imagem Landsat 7 ETM + de 30 de julho de 2001 (ftp://ftp.glcf.umiacs.umd.edu/glcf)

Urucu- 1987

A BIG CHALLENGE FOR SCIENCES

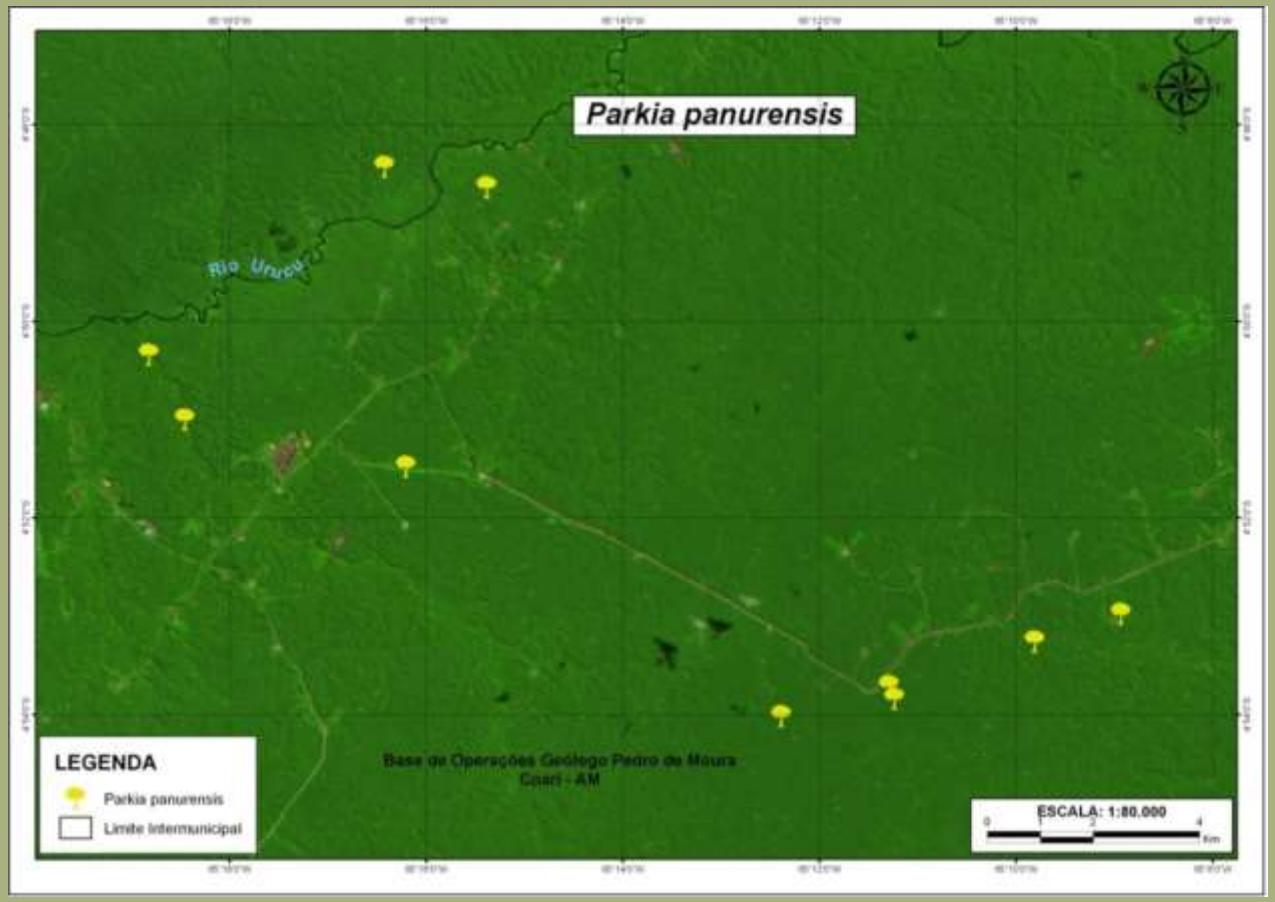
Highly impacted areas but small sizes (0.5 to 1.5 ha)

80 researchers + under graduate, M.Sc. And PhD students

MULTI-DISCIPLINARY APROACHES

- Silviculture
- Agronomy
- Genetic
- Ecology
- Entomology
- Biology
- Soil Science
- Ecophysiology
- Medical Science
- Social Science

First years we had focused on the role of mixed plantation



SCA: Seed collection with genetic basis

Diversity of species from several mother trees will produce well adapted seedlings

Source: Ferraz, 2006.

+

Source : Melo, 2007.

Source : Melo, 2007.

Source : Melo, 2007.

For restoration project many sp. should be incorporate to the system but only few commercial timber species were well known

Fonte: Pinto, 2008.

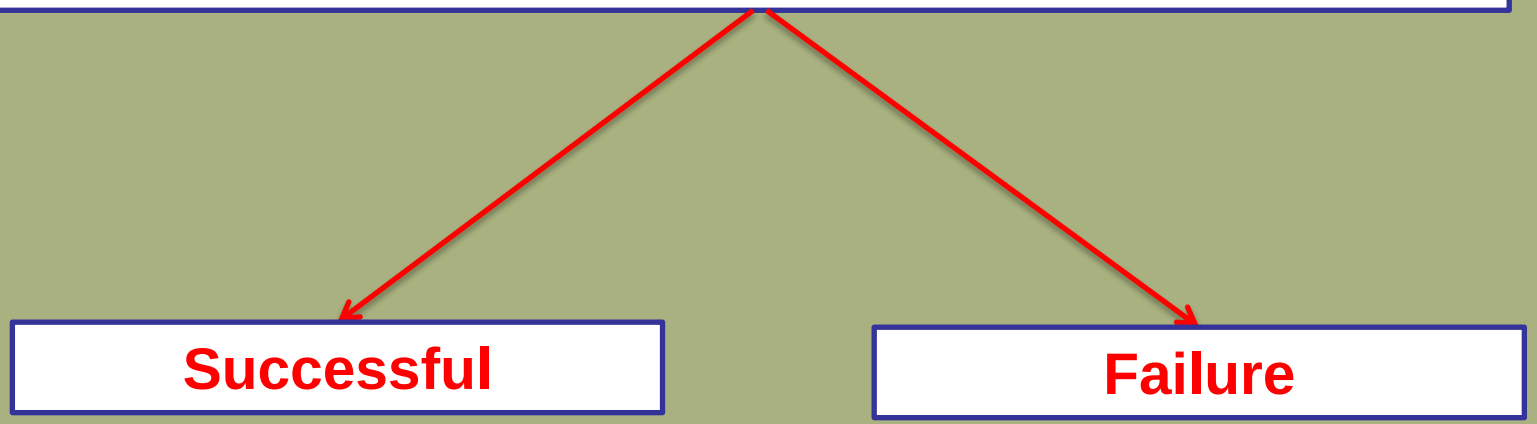
Fonte: Melo, 2008.

Seed technology for new species

78 new species

Handbook of seeds and fruits description (Melo et al. in press.)

We have tested several silvicultural systems based on secondary succession: mixed plantation, nucleation, palm rich mixed system

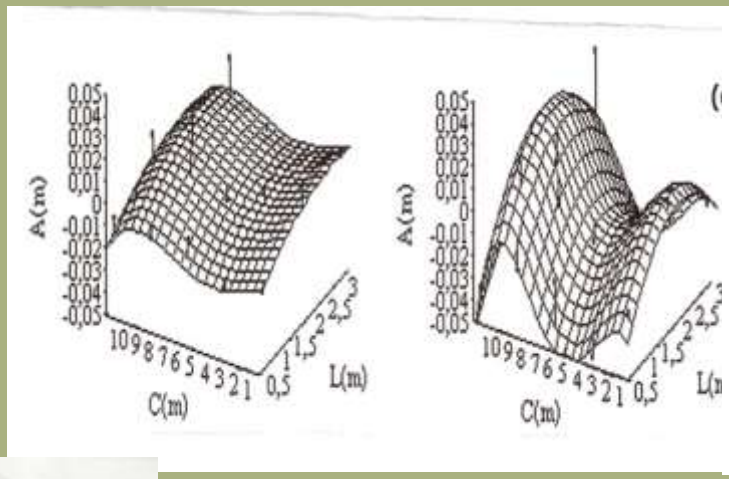


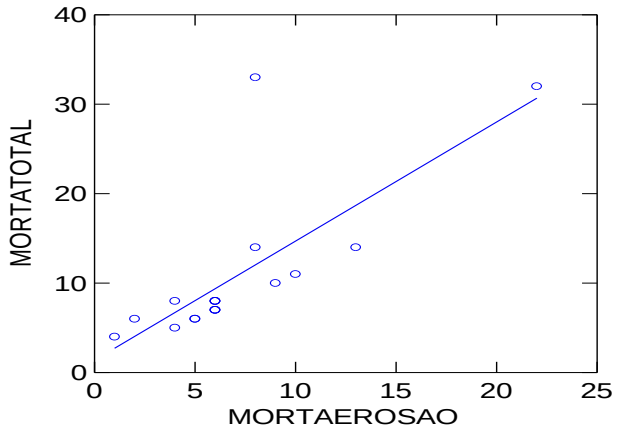
Based on the principle that as many species is incorporated to system, is the regeneration processes will facilitated?

Not always → it depends on several "filters" that prevents natural regeneration to establish

- **Soil degration**
- **Soil erosion**
- **Source of propagules**

Secondary succession showed difficulties due to soil erosion and invasive species´s establishment.

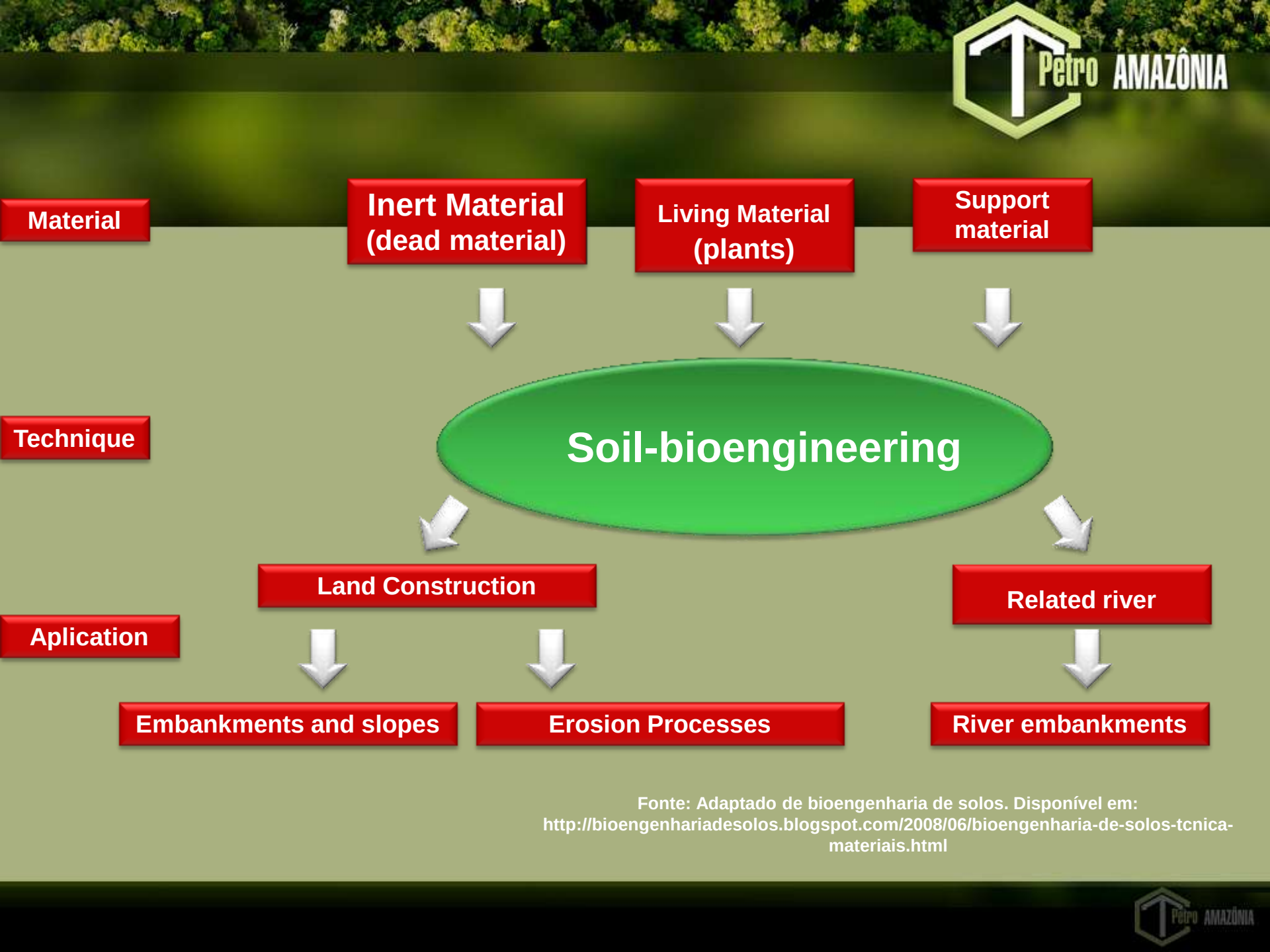




New approach should be tested based on primary succession

From soil highly degraded and sterile the principle of primary succession should works

Soil bioengineering or natural engineering



Fonte: Adaptado de bioengenharia de solos. Disponível em: http://bioengenhariadesolos.blogspot.com/2008/06/bioengenharia-de-solos-tcnica-materiais.html

Detail of living beams

Detail after 2 months

bioengenhariadesolos.blogspot.com/

http://www.mercatorgeo.com.br/

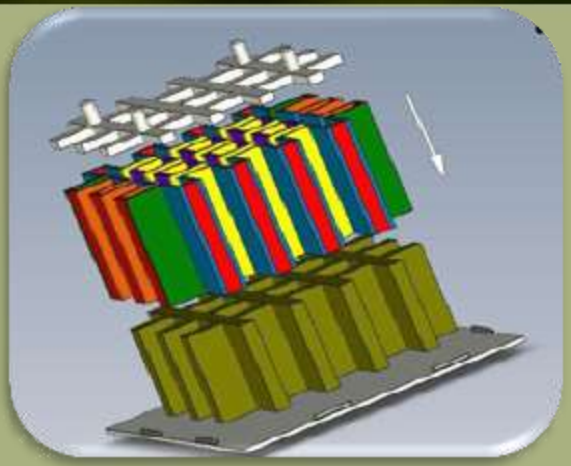
http://www.mercatorgeo.com.br/

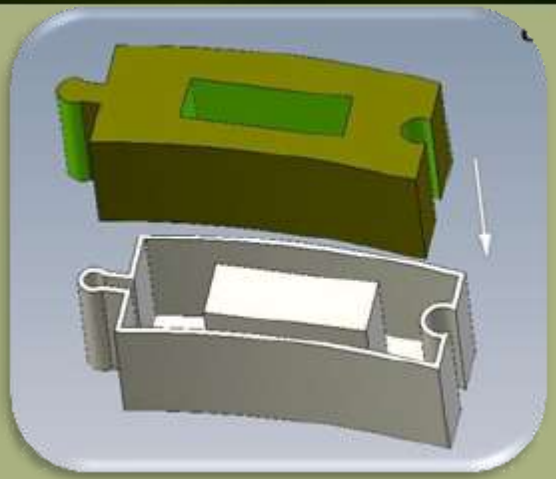
www.lagesolos.ufrj.br/?op=rehabilitation

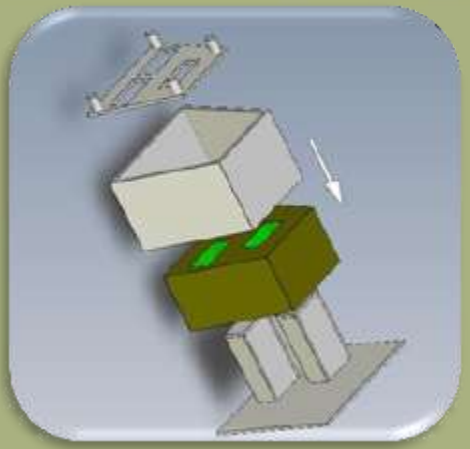
Bioengineering Applied to Ecological Restoration

Inovative studies carried out to control soil erosion and to facilitate natural regeneration from outside colonizers or/and to induce regeneration by using propagules (seeds or cuttings)

Prototypes of artificial structures to be used in restoration processes



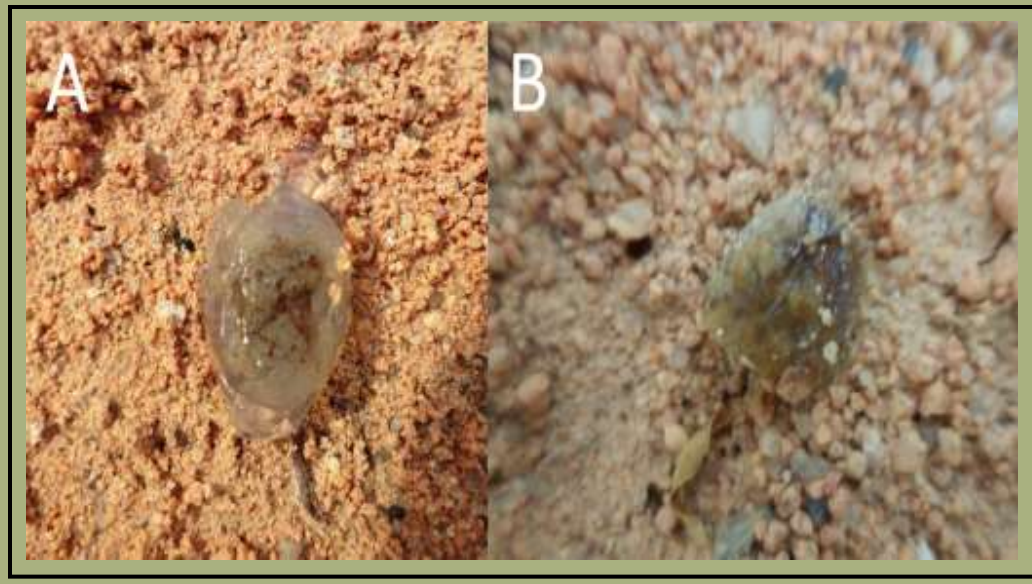




Erosion retainer and natural regeneration nucleator

Regenerative mat e coneplant

Peletização de sementes com hidrogel



Testing rooting ability of different species to find out if they are suitable to be used in bioengineering projects

Bellucia grossularioides
Vismia guianensis
Croton lanjouwensis
Clusia insignis

	Resprouting
Warszewiczia coccinea	58%
Vismia cayennensis	39%
Goupia glabra	3%

Biotechnical traits

Rooting ability and uprooting resistance of tree species

Specie	Famíly	Local name
Bellucia grossularioides (L.) Triana	Melastomataceae	Goiaba-de-anta
Vismia guianensis (Aubl.) Pers.	Clusiaceae	Lacre-vermelho
Vismia cayennensis (Jacq.) Pers.	Clusiaceae	Lacre-branco
Clusia insignis Mart.	Clusiaceae	Clusia
Warszewiczia coccinea (Vahl) Klotzsch	Rubiaceae	Rabo-de-arara
Salix humboldtiana var. martiana (Leyb.)	Salicaceae	Oeirana-folha-fina
Piper hispidinervum C. DC.	Piperaceae	Pimenta-longa
Goupia glabra Aubl.	Celastraceae	Cupiúba
Alchornea castaneifolia (Humb. & Bonpl. ex Willd.) A. Juss.	Euphorbiaceae	Oeirana-folha-grossa
Croton lanjouwensis Jabl.	Euphorbiaceae	Dima
Spondias mombin L.	Anacardeaceae	Taperebá

Studies of uprooting resistance

Studies of vegetative propagation with liannas and ruderal species

Liannas showed high root development and high foraging strategies

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