



# Biodiversity and sustainability in Amazonia

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# Summary

- Biodiversity encompasses many different meanings. Sustainability has many meanings as well.
- I will focus on sustainability with regards to how human activities can promote the maintenance of biodiversity in the long term, and I will explore the potentialities and risks for sustainable development in Amazonia.
- Finally I would like to present some sustainable experiences developed by Amazonian indigenous peoples.

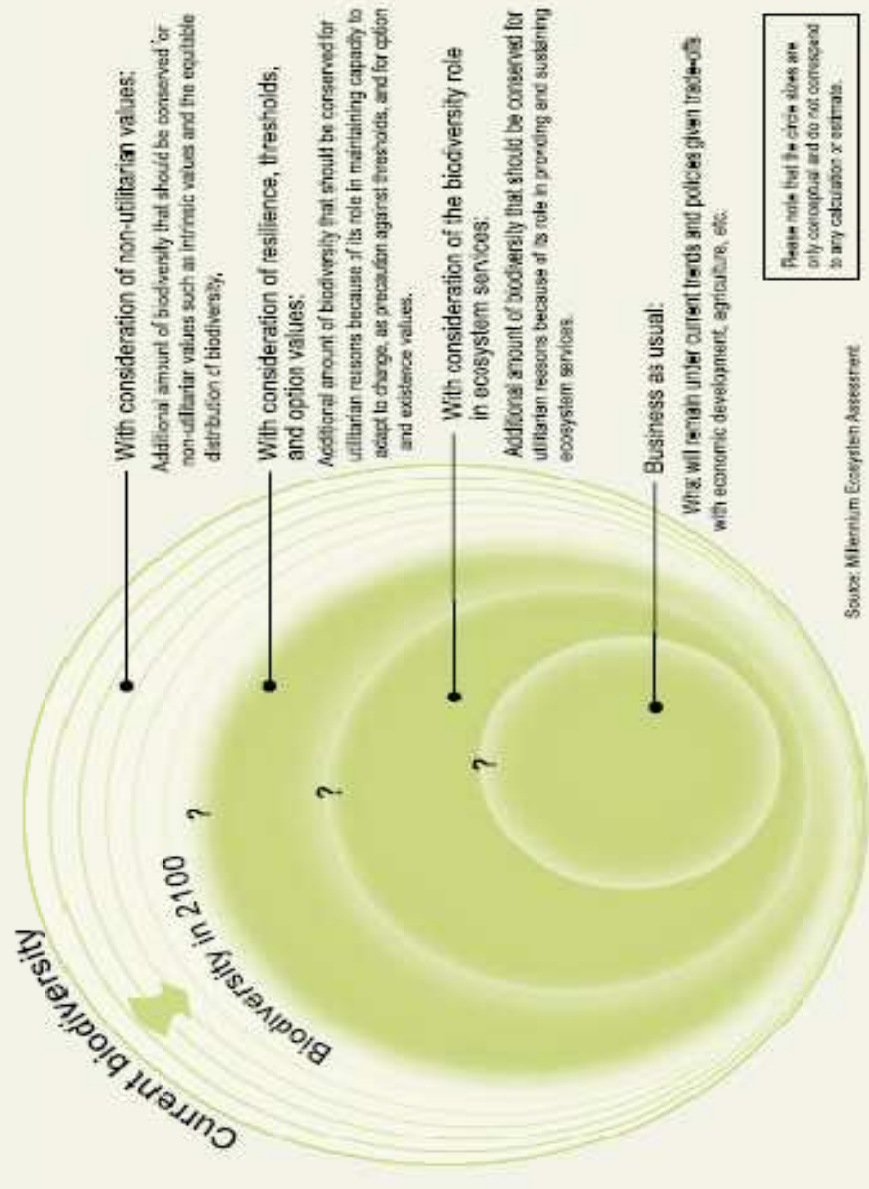
# The Concept of Biodiversity

- Biodiversity constitutes a stock of genetic and ecological information. Under conditions of rapid global pressure and change, the protection of this information stock will involve attention to ecological and evolutionary processes by which biodiversity is produced and maintained.

# The future of biodiversity

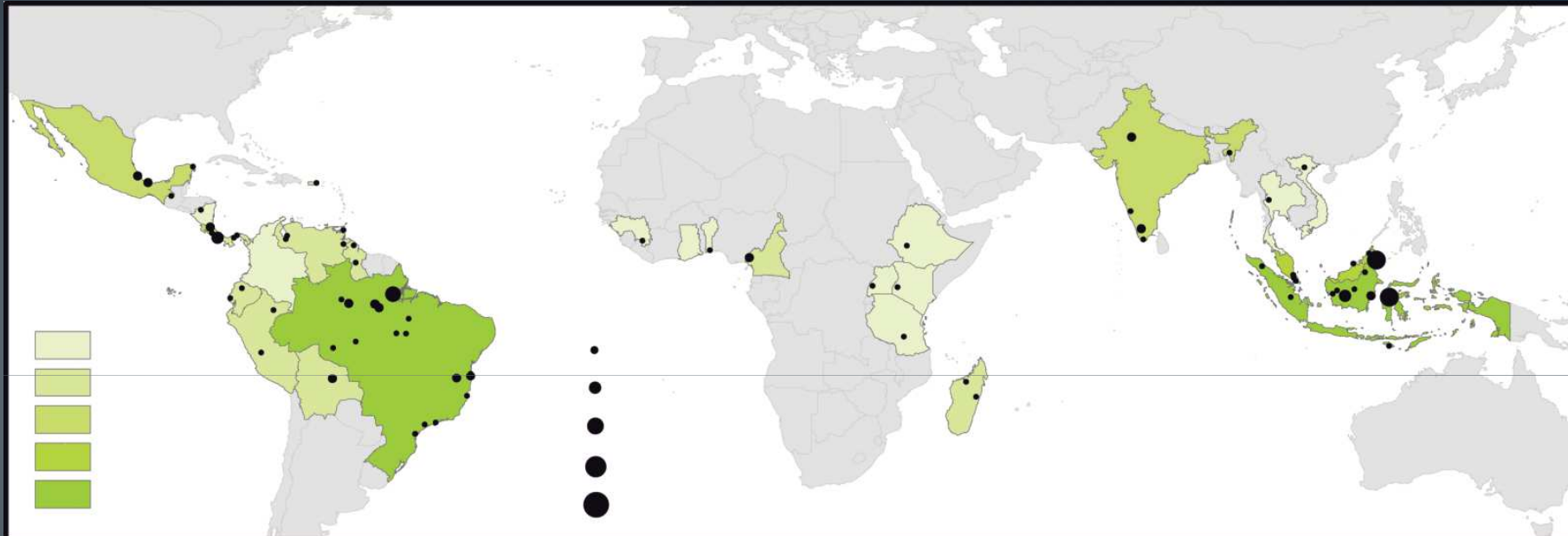
**Figure 6.1. How Much Biodiversity Will Remain a Century from Now under Different Value Frameworks?**

The outer circle in the figure represents the present level of global biodiversity. Each inner circle represents the level of biodiversity under different value frameworks. The white area represents non-utilitarian values like ensuring equitable access to biodiversity and intrinsic values. Question marks indicate uncertainties where the boundaries exist.





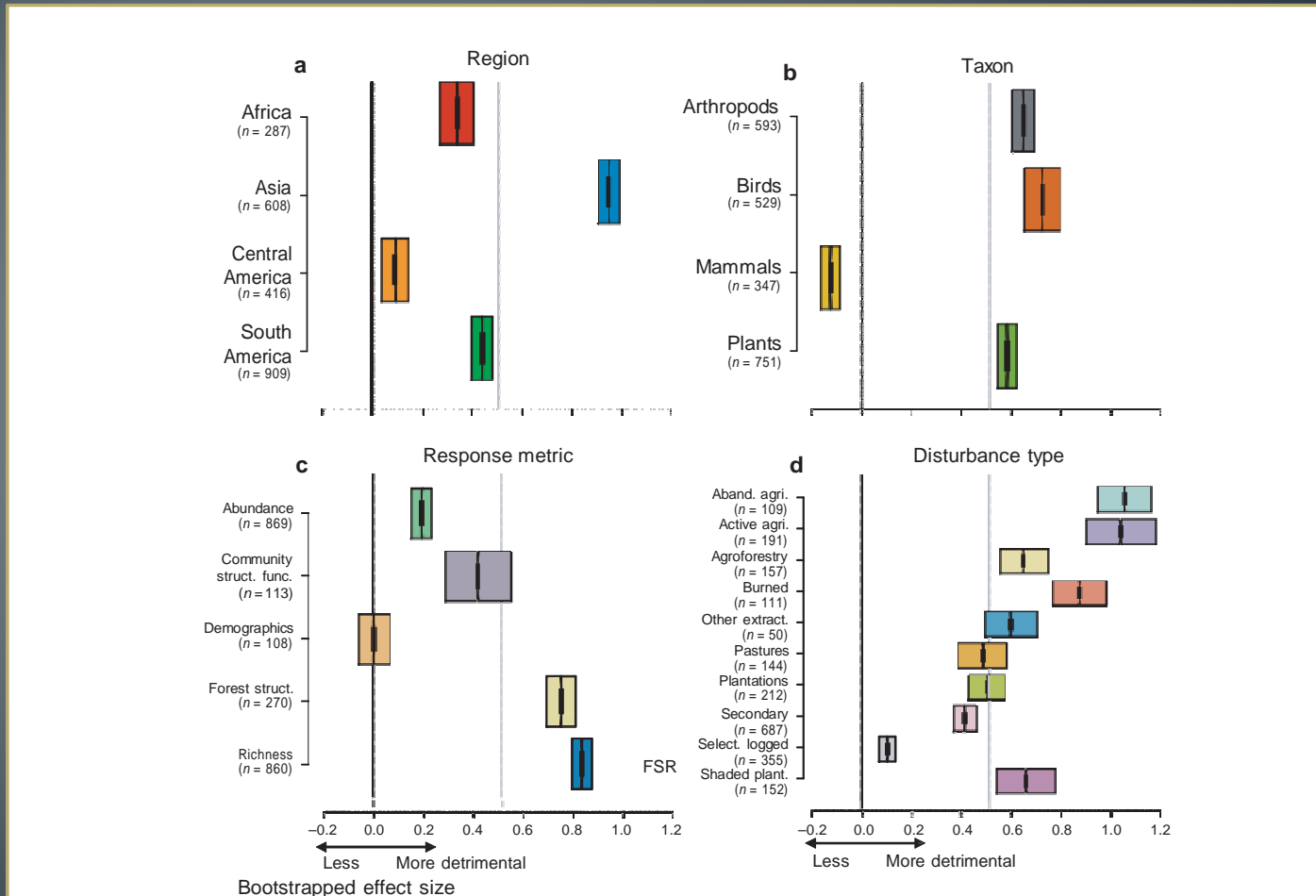
# Studies on Biodiversity



Map of study sites by country and by study location. Country colour represents the number of studies per country (n=528 total countries) and circle size represents the number of studies at each site (n=592 total sites; only 82 sites with Global Positioning System coordinates are shown).

Gibson *et al.*, Nature 2011

# Changes in Biodiversity



# Concepts of Sustainability

Components	Objectives
Social sustainability	To reduce social inequality
Economic sustainability	To increase production and richness without external dependency
Ecological sustainability	To improve environmental quality and preserve biodiversity
Spatial sustainability	To avoid population agglomeration
Cultural sustainability	To reduce cultural conflicts

Enriquez, 2008, adapted from Sachs, 2004

# Ecological sustainability in the Amazonian forest

- Services for environmental quality

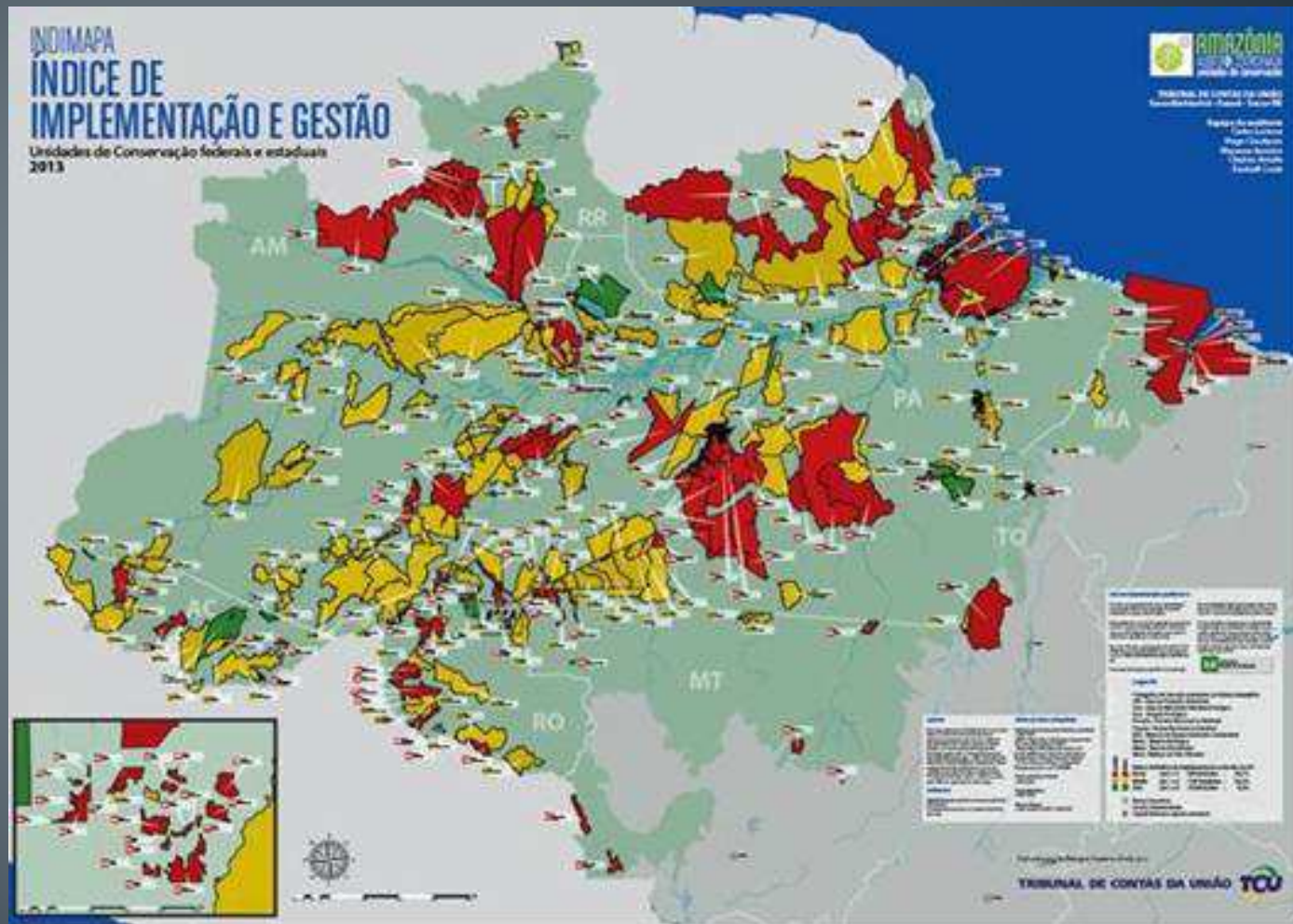




# Protected Areas System to prevent deforestation



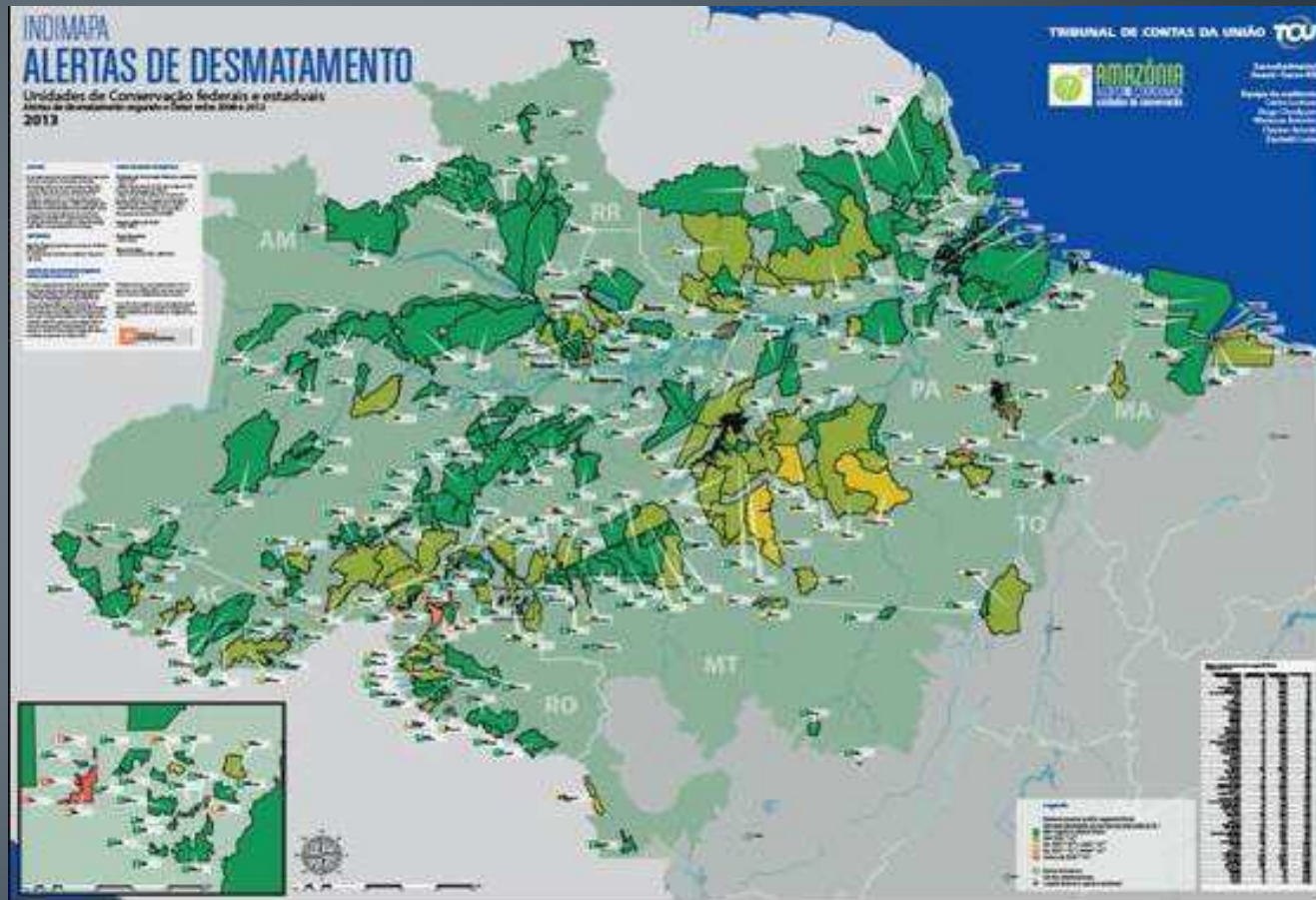
# Implementation level of CU's



Only 4% are well implemented

TCU report, 2013

# Deforestation within CU's (2008-2012)

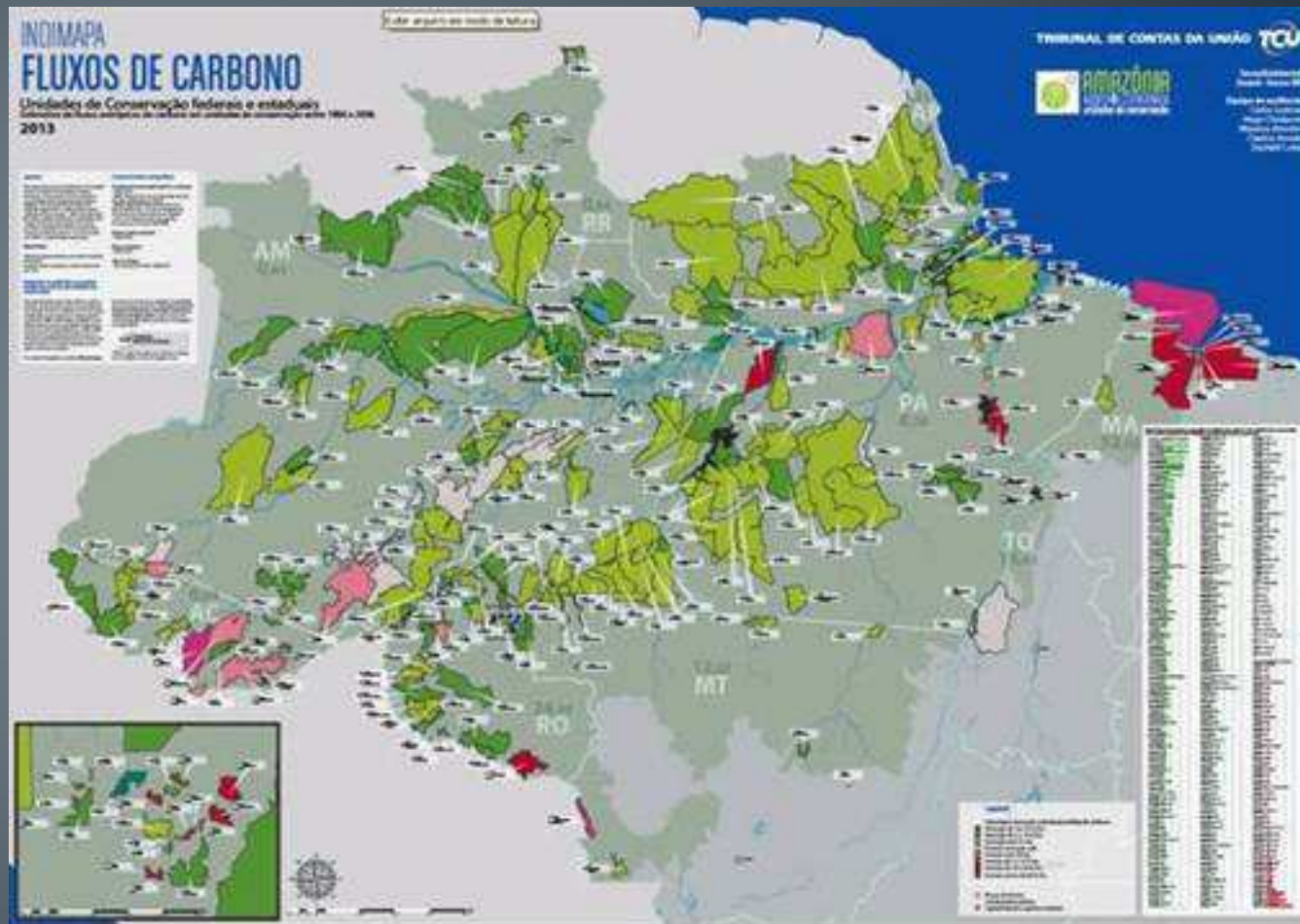


Average reduction of deforestation: 82%

TCU report, 2013



# Carbon flux (1996-2006)



CU's reduce emission by 34%

TCU report, 2013



# Ecological sustainability of Amazonia

- Despite its low level of implementation, the Brazilian Natural System of Conservation Units (SNUC, created by Legislative Act 9985/2000) has allowed for the protection of biodiversity in Amazonia, promoting socioenvironmental sustainable development and reducing carbon emission.
- The sustainability of Amazonia depends on a powerful system of protected areas.

# Ecological sustainability of Amazonia

- For Amazonia, sustainability should be guaranteed by keeping the maximum amount of standup forest with or without human presence.



# Economically sustainable Amazonian products





## Amazonian products

- Amazonia has considerable potentialities with regards of biodiversity in terms of products (food, medicine, cosmetics, industrial supplies).
- Such potentialities are due not only to the large number of species found there, but to the fact most of those species are yet to be fully investigated.



# Economic sustainability of Amazonia

## Amazonian Plants for the Future

<b>CATEGORY</b>	<b>POTENTIAL SPECIES</b>	<b>PLANTS ALREADY USED</b>
<b>MEDICINAL PLANTS</b>	<b>116</b>	<b>13</b>
<b>OIL CROPS</b>	<b>75</b>	<b>11</b>
<b>AROMATICS</b>	<b>56</b>	<b>07</b>
<b>FIBROUS PLANTS</b>	<b>56</b>	<b>08</b>
<b>POISONOUS PLANTS</b>	<b>72</b>	<b>03</b>
<b>FOOD PLANTS</b>	<b>123</b>	<b>13</b>
<b>FORAGE PLANTS</b>	<b>89</b>	<b>10</b>
<b>ORNAMENTAL PLANTS</b>	<b>71</b>	<b>09</b>

Almeida, 2007

## Food plants

Scientific name	Famíly	Commom name
<i>Astrocaryum aculeatum</i>	Arecaceae	tucumã-açu
<i>Byrsonima crassifolia</i>	Malpighiaceae	muruci
<i>Capsicum chinensis</i>	Solanaceae	Pimenta-de-cheiro, murupi
<i>Capsicum frutescens</i>	Solanaceae	Pimenta-malagueta
<i>Dioscorea trifida</i>	Dioscoreaceae	Cará-amazônico
<i>Eugenia stipitata</i>	Myrtaceae	araçá-boi
<i>Euterpe oleracea</i>	Arecaceae	açaí
<i>Euterpe precatoria</i>	Arecaceae	Açaí-solteiro
<i>Myrciaria dubia</i>	Myrtaceae	camu-camu, caçari
<i>Oenocarpus bacaba</i> , <i>O. distichus</i> , <i>O. mapora</i> , <i>O. minor</i>	Arecaceae	bacaba
<i>Platonia insignis</i>	Clusiaceae	bacuri
<i>Spondias mombin</i>	Anacardiaceae	taperebá
<i>Theobroma grandiflorum</i>	Sterculiaceae	cupuaçu

Samuel Almeida, MPEG, 2007

# Açaí





# Copaíba (*Copaifera multijuga*)





# Brazil nut (*Bertholletia excelsa*)



# Economic sustainability of Amazonia

- The economic value of biodiversity for Amazonian communities is expressed in the direct use (products) of this biodiversity.
- Is extractive production enough to sustain the economy of Amazonia?
- How to aggregate value in favors of those communities?

# Challenges facing biotechnology in Amazonia

- Low level of technology
- Lack of qualified or trained people
- Few institutions dedicated to development of technology
- No interest on prospective research by the industrial segment
- Difficult transportation of goods from extractive communities



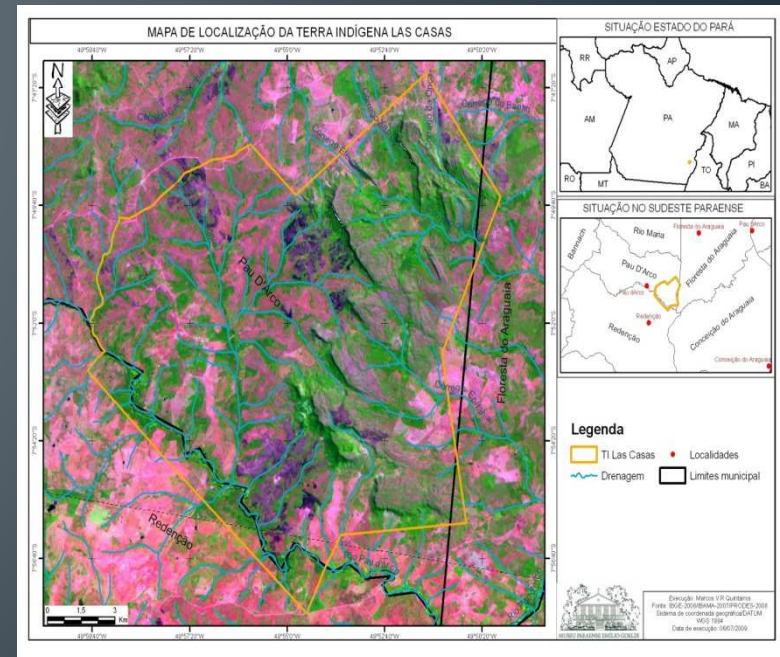
## Successful initiatives

- MMA/PROBEM BIOAMAZONIA - molecular ecology program for pharmaceutical production
- EXTRACTA – UFRJ/UFPA/GlaxoSmithKline (UK) joint enterprise - pharmaceutical production
- NATURA/communities of Comaru, Amapá - cosmetics

# Sustainability and values



Mebêngôkre Kayapo



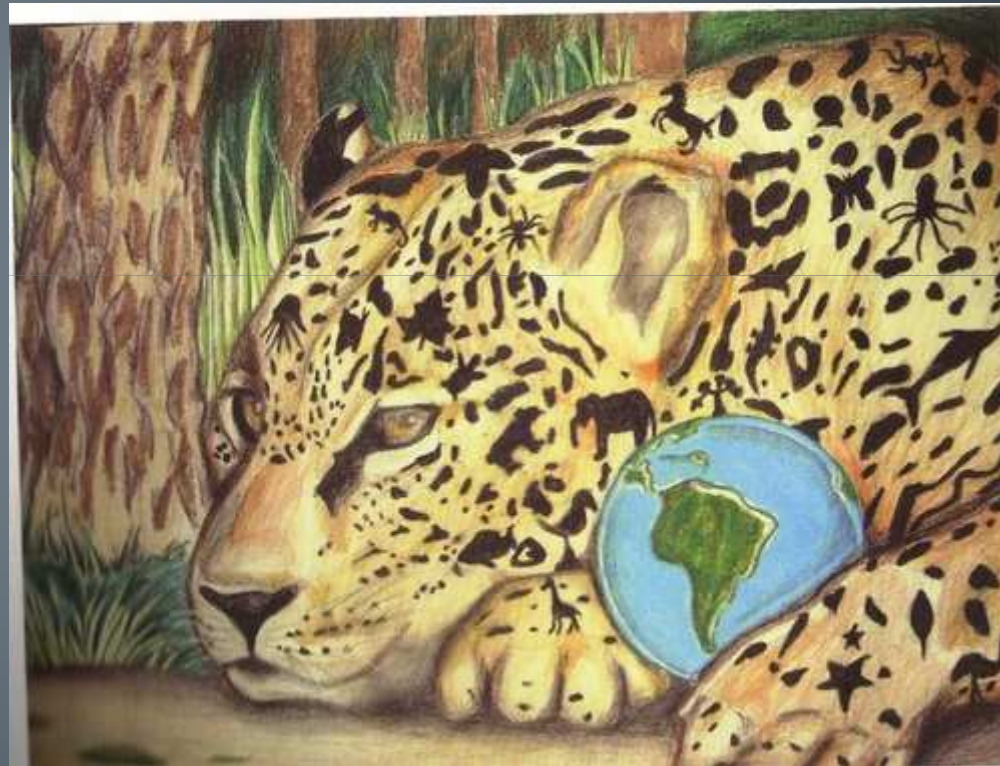
## *mex kumrex*

- The principles of the Mebêngôkre working with biodiversity are associated with the concept of 'beauty' (*mex*), that values -- far beyond landscapes and agricultural techniques -- the good condition of social networks within and outside the village, as well as essential Mebêngôkre values.

De Robert *et al.*, 2012



**Sustainability is  
taking good care of the world!**



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