

# Households, Populations & Complex Socio-Ecological Systems in the Amazon



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Indiana University Bloomington, United States

SESYNC – University of Maryland  
Anthropology Immersion Workshop  
Feb 29-March 3, 2016

# **Illustrative research examples**

**Households change and urbanization**

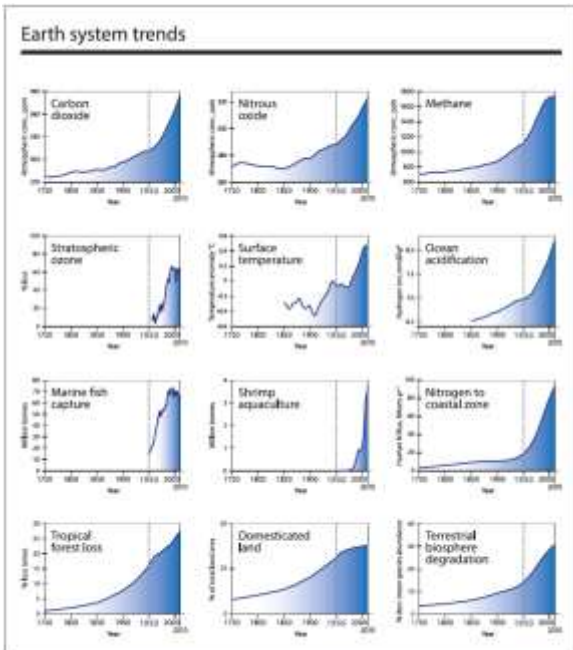
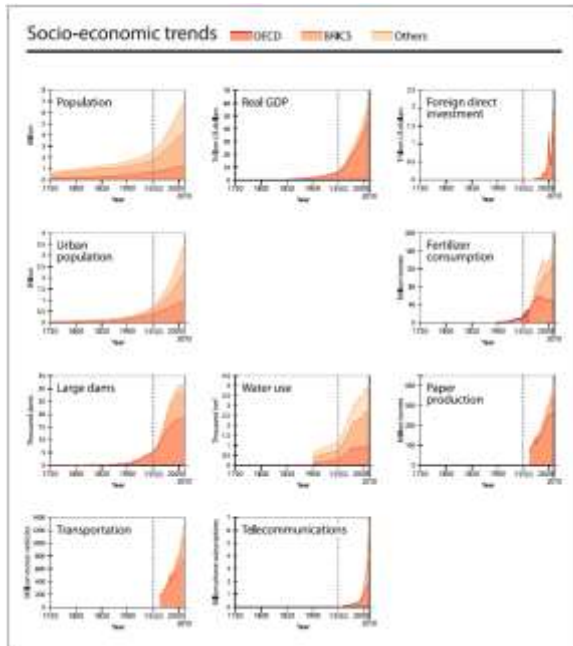
**Territorial governance and collective action**

**Connectivity and emergent regional complexity**

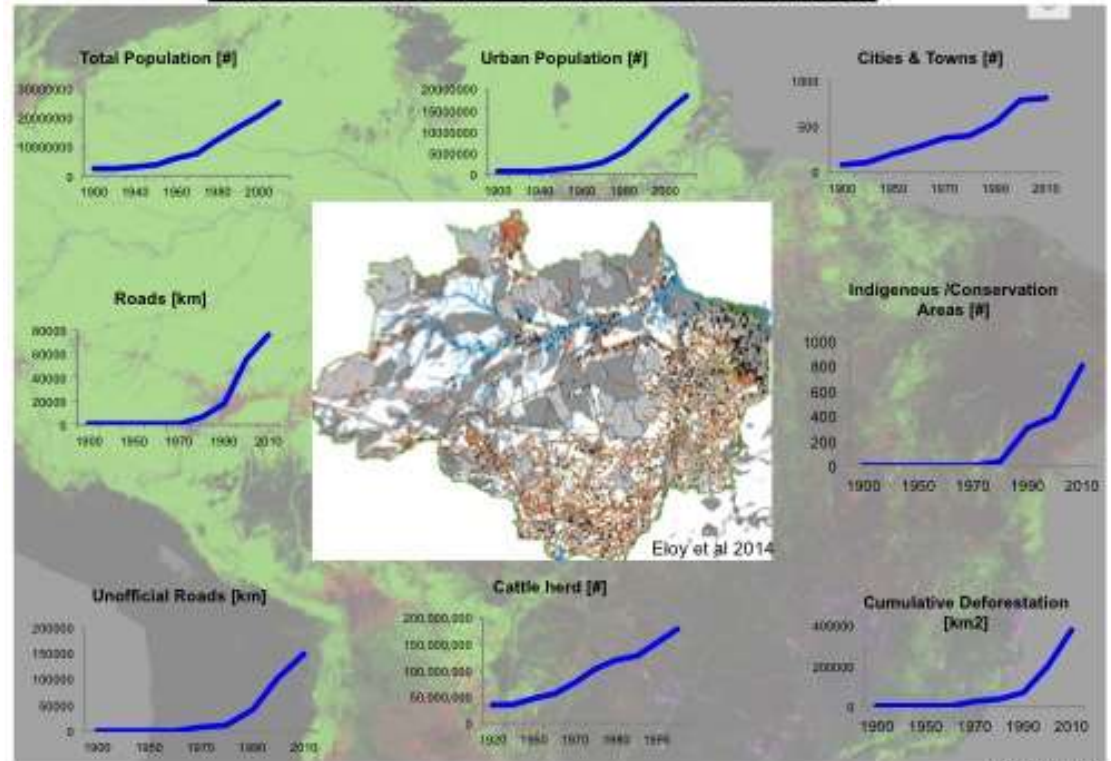
# The Great Global Acceleration

# ... and its regional manifestations

Steffen et al 2015.



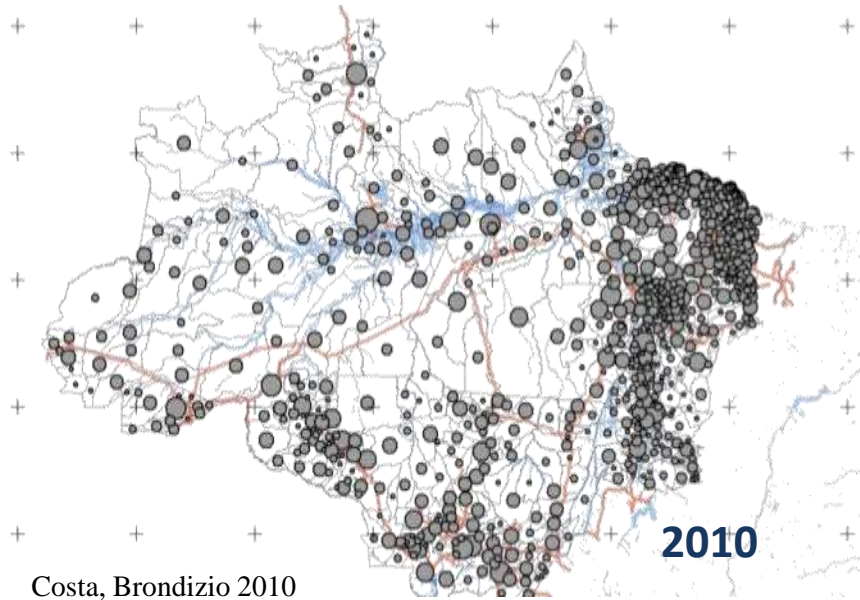
## The Great Amazonian Acceleration



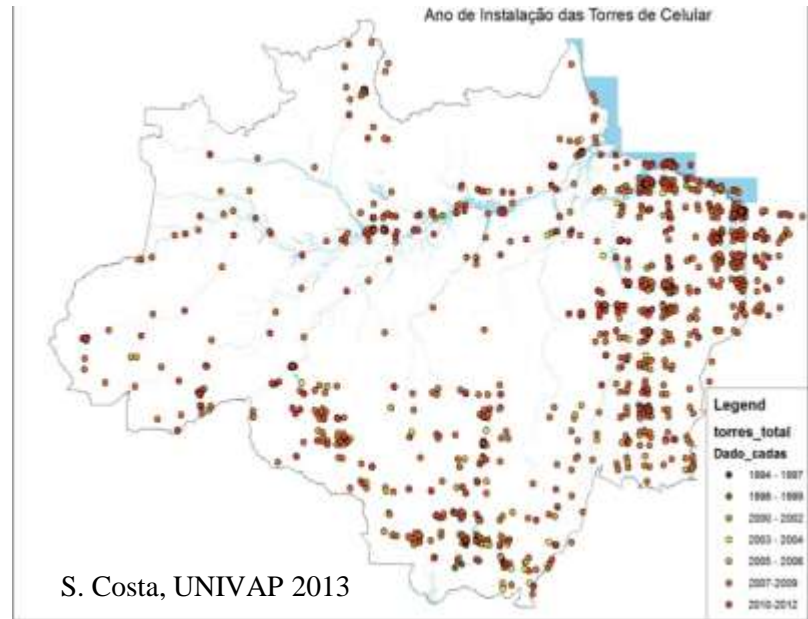
Brondizio 2013

Figure 3. Trends from 1750 to 2010 in indicators for the structure and functioning of the Earth System.

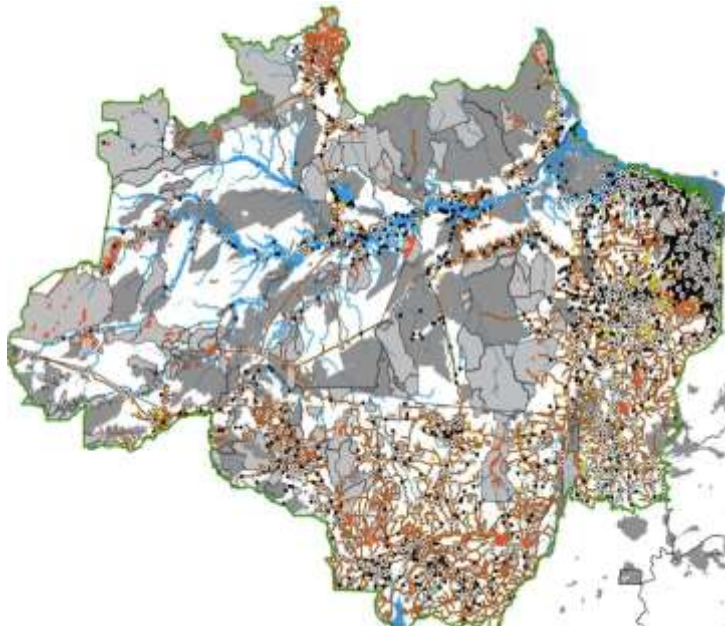
# Accelerated Inter-Connections



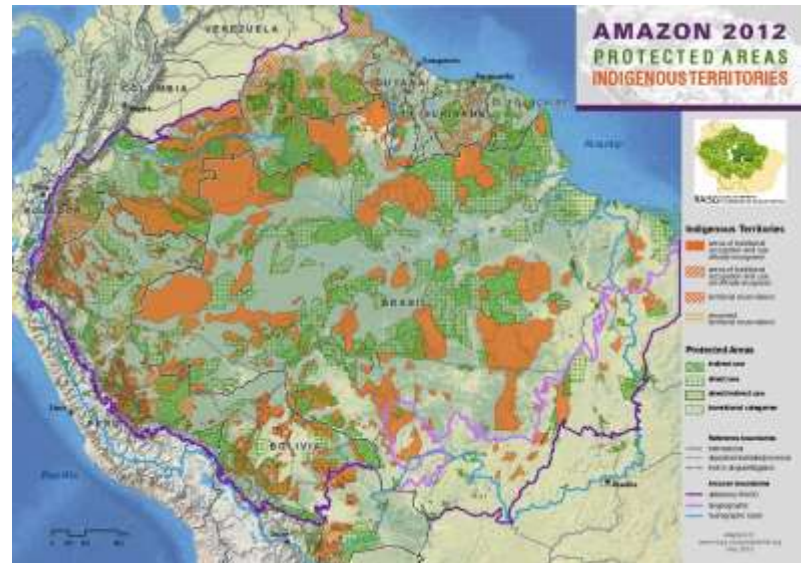
Urban Centers



Cell-phone Towers - 1994-2012



Road network



Reserves and protected areas

# A history of STRUCTURAL DETERMINISM:

Structural determinants – External factors

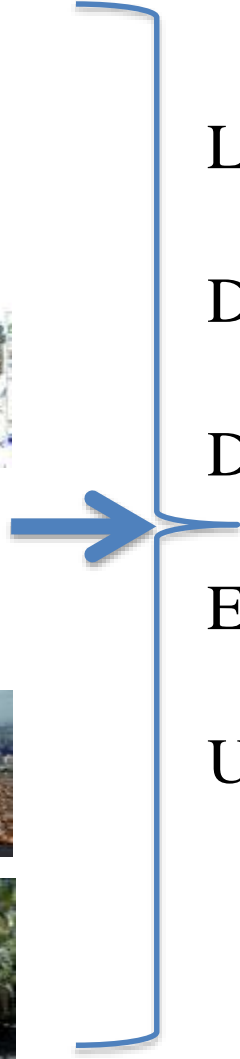
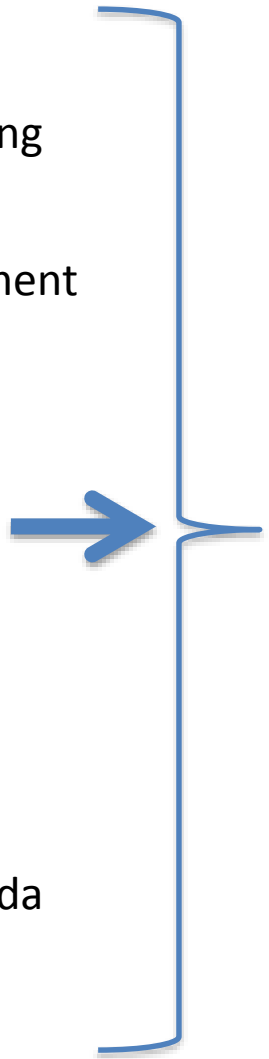
[Military] Central geopolitical planning

National Development programs

Infrastructure

Global/external markets

National & global conservation agenda



Land use decisions

Deforestation rates

Demographic trends

Economic development

Urbanization trends

# “State shift”: Changing regional context

1988 Constitutional reform

**Re-democratization**

1970s

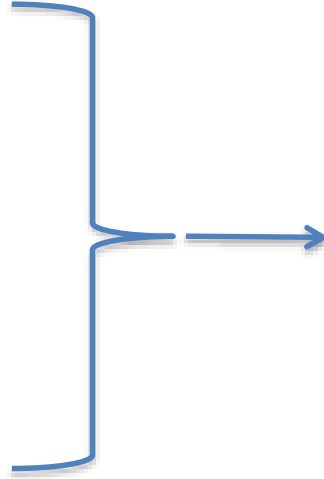
1980s

1990s

2000s

2010s

Geopolitical/national  
integration  
Infrastructure grid  
Structured colonization  
Socio-demographic  
Mining expansion  
Credit incentives



Municipal code changes  
Territorial recognition Indigenous and local populations  
Economic stabilization  
International pressures and agreements  
Deforestation policies  
Sustainable development subsidies  
Commodity expansion  
Multiculturalism and social movements

Cash transfer programs

Sectoral [economic] organization/Lobbying

Conservation territories

Forest code

REDD+ programs

.Connectivity of transportation

.Mobility

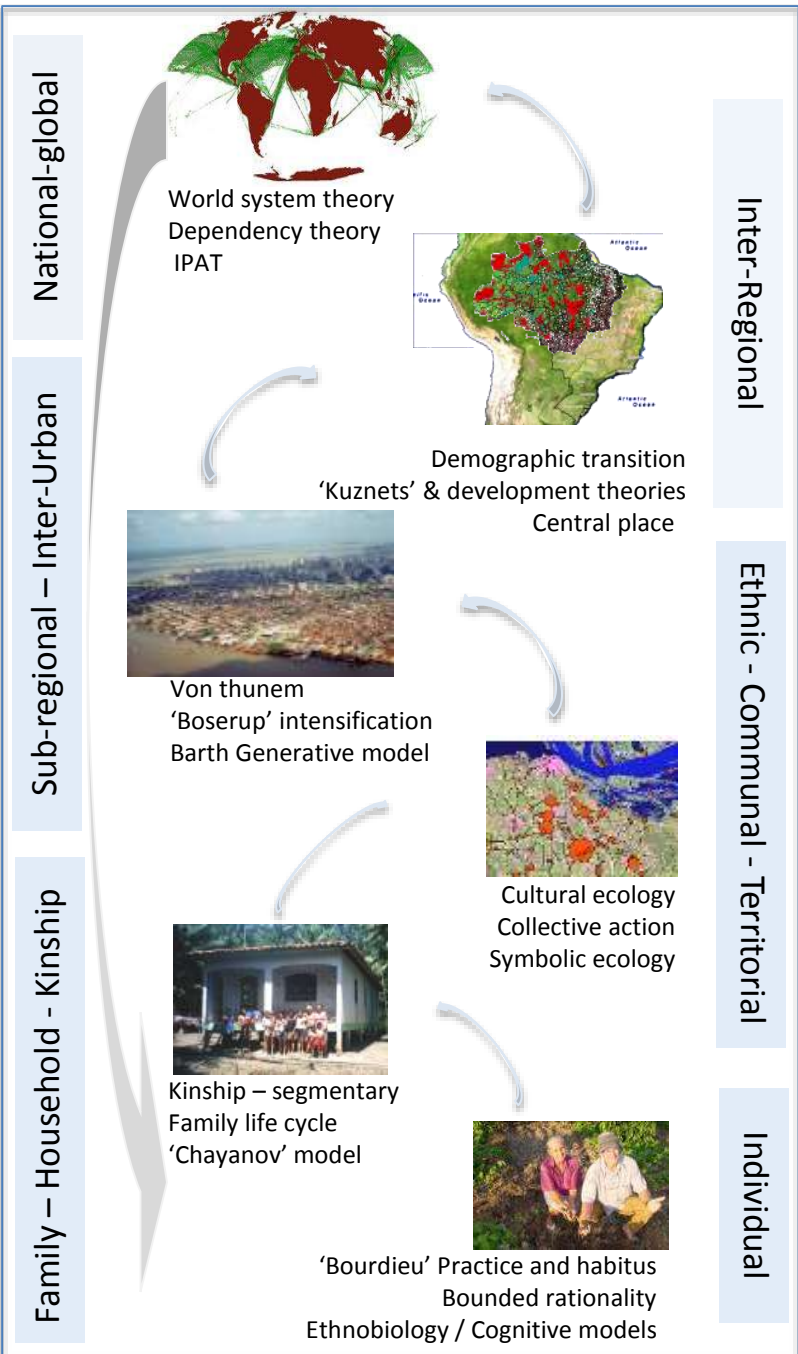
.Communications

.Energy

.Social movements

.Individual expectations

# Theoretical tools at different levels



## Examples of specific research topics:

Political Ecology and critique of development

Urbanization and inter-urban networks

Connectivity in social-ecological systems

Impact of global markets

Landscape patterns & Agrarian settlements

Institutional Analysis

Commodity chains

Land use and cover change

Adaptation to climate change

Agricultural intensification

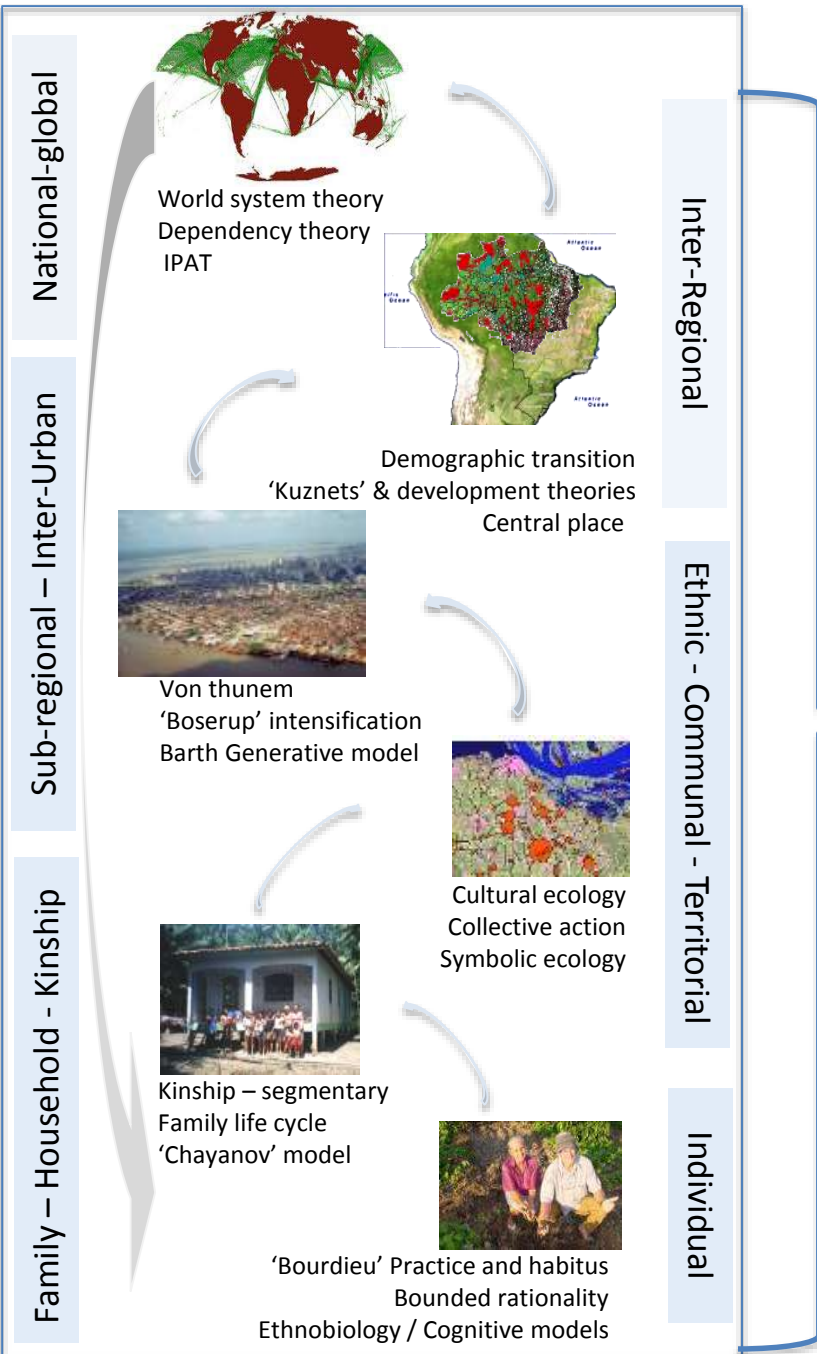
Institutional arrangements & social capital

Household socio-demography and life cycles

Household economy

Ethnobotanical and forest knowledge

# Theoretical tools at different levels



## Ex. Theoretical perspectives

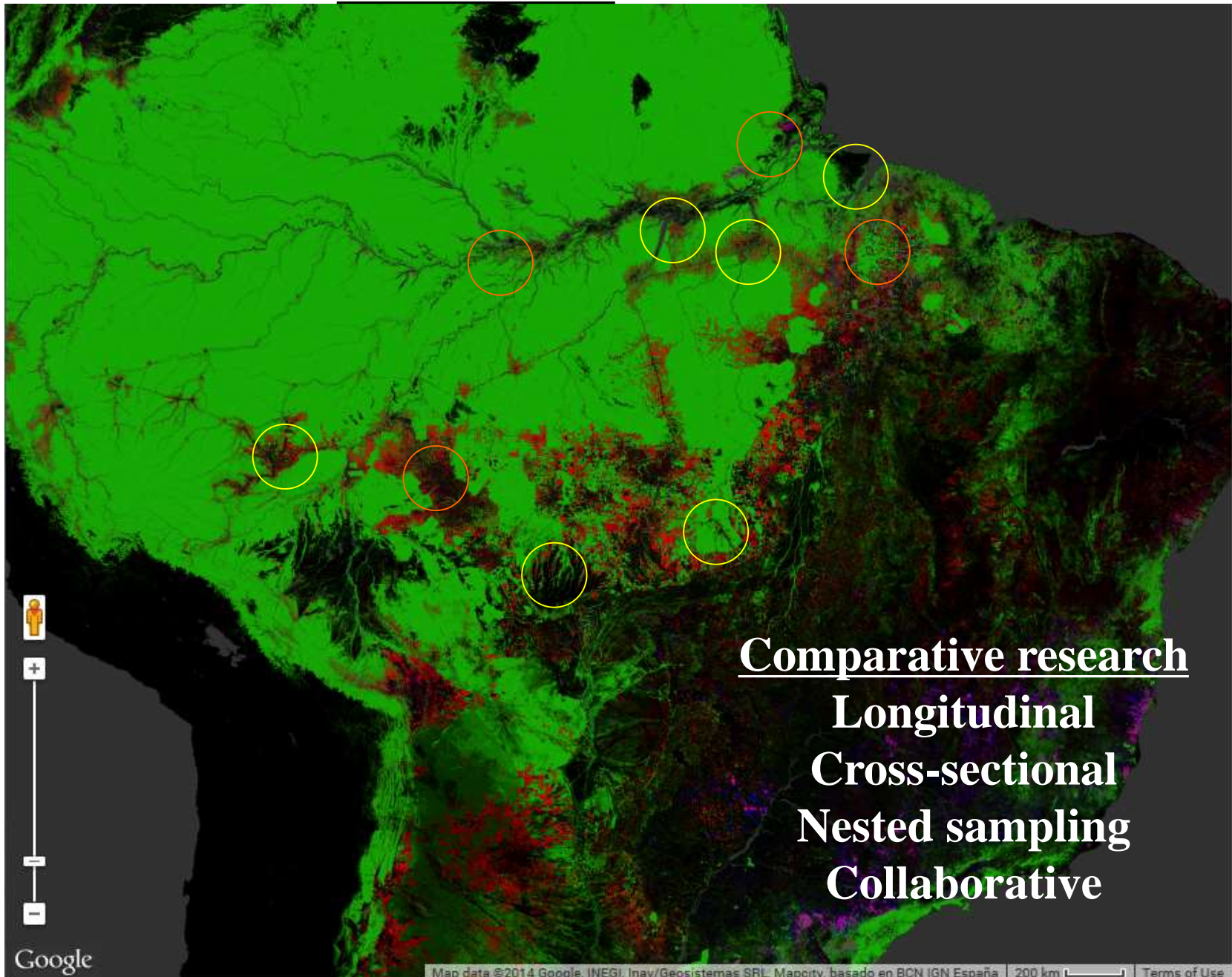
- Complex systems theories
- Giddens Structuration
- Sewell's theory of structures
- Barth's Generative model
- Steward's Levels of social integration

## Ex. Analytical frameworks

- Socio-Ecological Systems (SES)
- Driver-Pressure-State-Impact-Response (DPSIR)
- Urban teleconnections
- Land Use & Cover Change (LUCC) frameworks
- Institutional Analysis & Development (IAD)



# Research Sites



# Illustrative research examples

## Households change and urbanization



Historical and cultural differences, common problems

# Longitudinal Research

... 1960

1970

1980

1990

2000

2010

2015



## **Culture ecology and adaptation**

**Political ecology of land rights & resource tenure**

**Liberation theology interventions**

**Sustainable development projects**

**Intensification and market networks**

**Conditional Cash Transfers and consumption**

**Decline of annual crop agriculture**

**Multi-locality** and access to urban services

Changing intergenerational **expectations**

**Urban growth, violence, pollution**

# Land Tenure, Liberation Theology, Agricultural “Modernization”

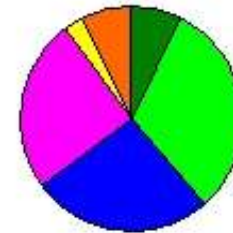
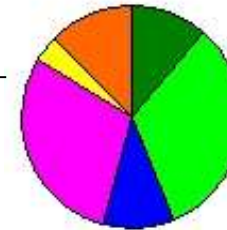
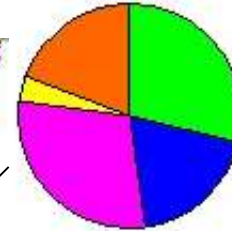
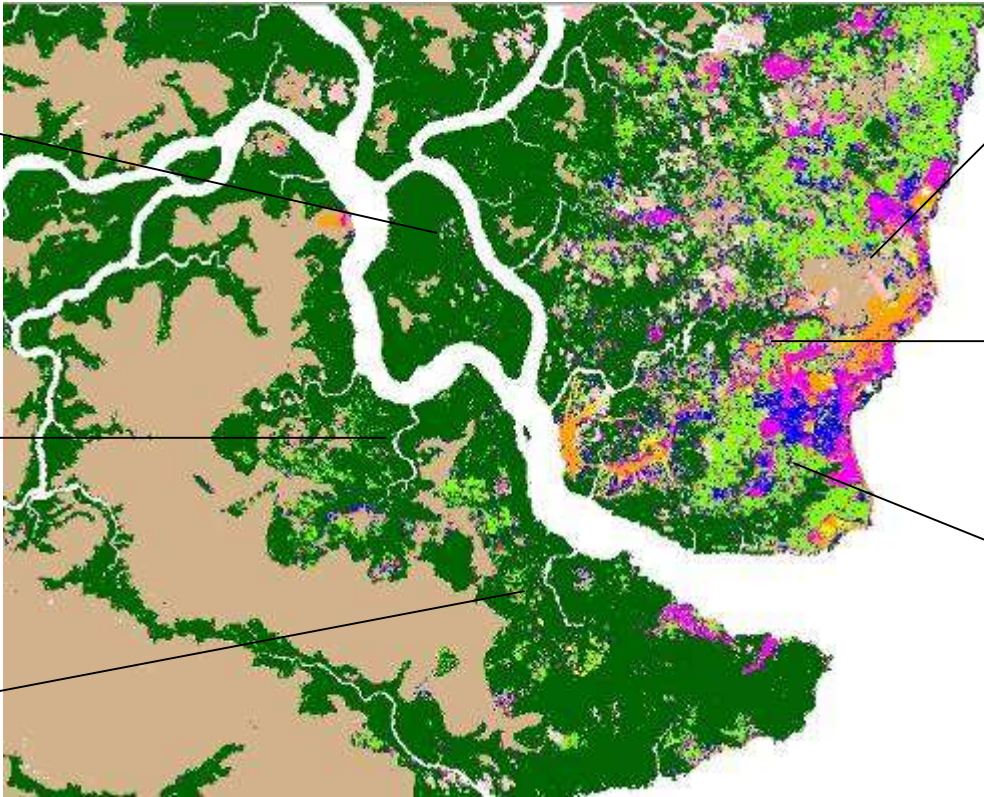
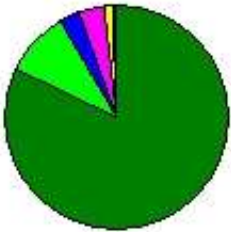
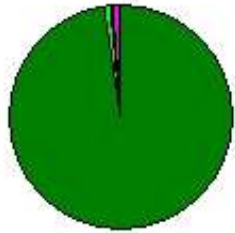


Marajo Island 1989

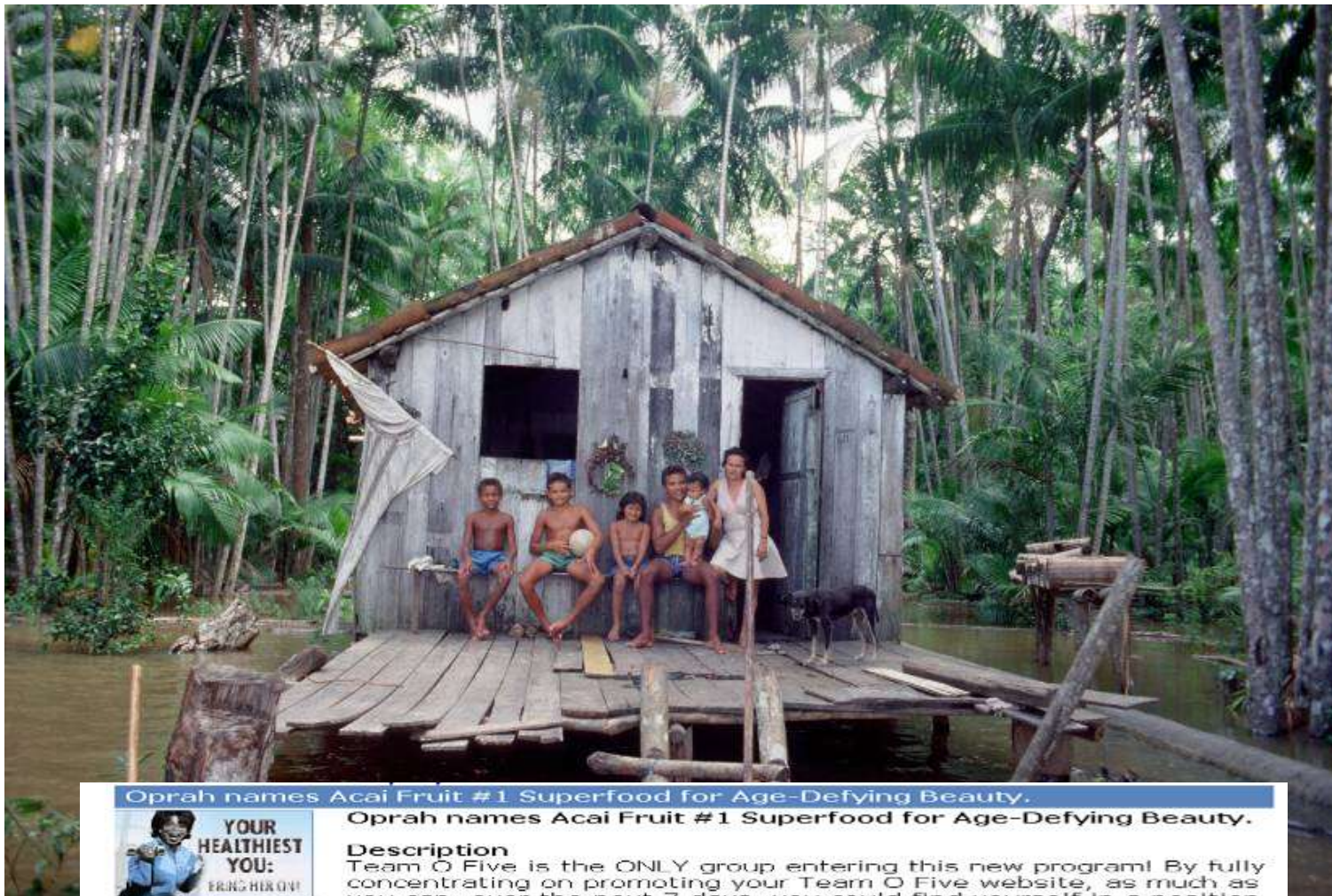
# Social Processes and Land Change

Riverine  
Communities  
(% area)

Cooperative  
Communities  
(% area)



# Forest farmers of the Amazon estuary



Oprah names Acai Fruit #1 Superfood for Age-Defying Beauty.



Added: Dec 07 04  
Expires: Dec 07 05  
Views: 218

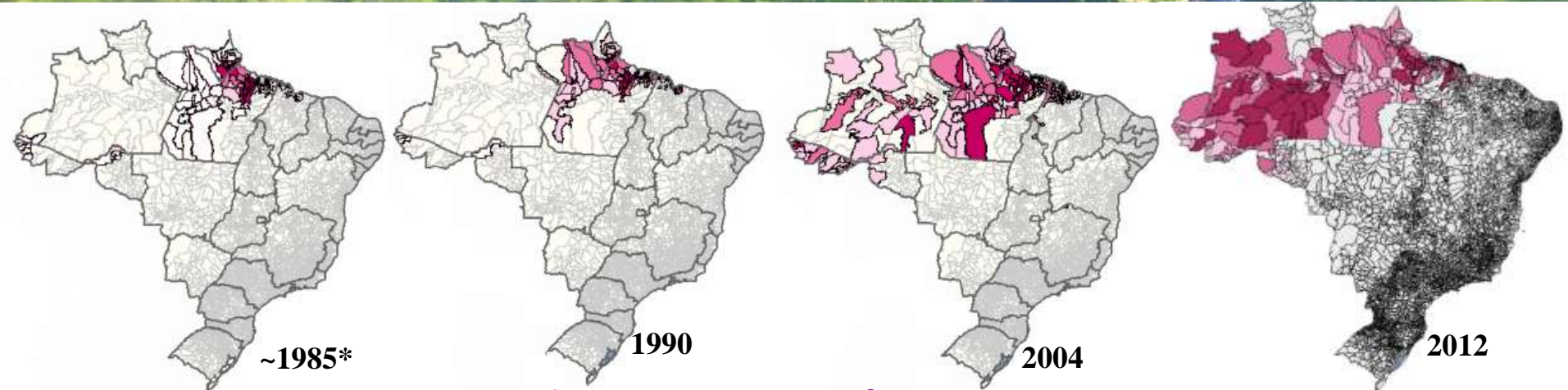
Oprah names Acai Fruit #1 Superfood for Age-Defying Beauty.

### Description

Team O Five is the ONLY group entering this new program! By fully concentrating on promoting your Team O Five website, as much as you can, over the next 7 days, you could find yourself in a position in 2005, that many others only dream of. Success is not just about being in the right place at the right time. It is about taking action, when you are in the right place at the right time. You've nothing



# Small scale management, large scale agroforestry intensification



Production expansion of Acai Fruit

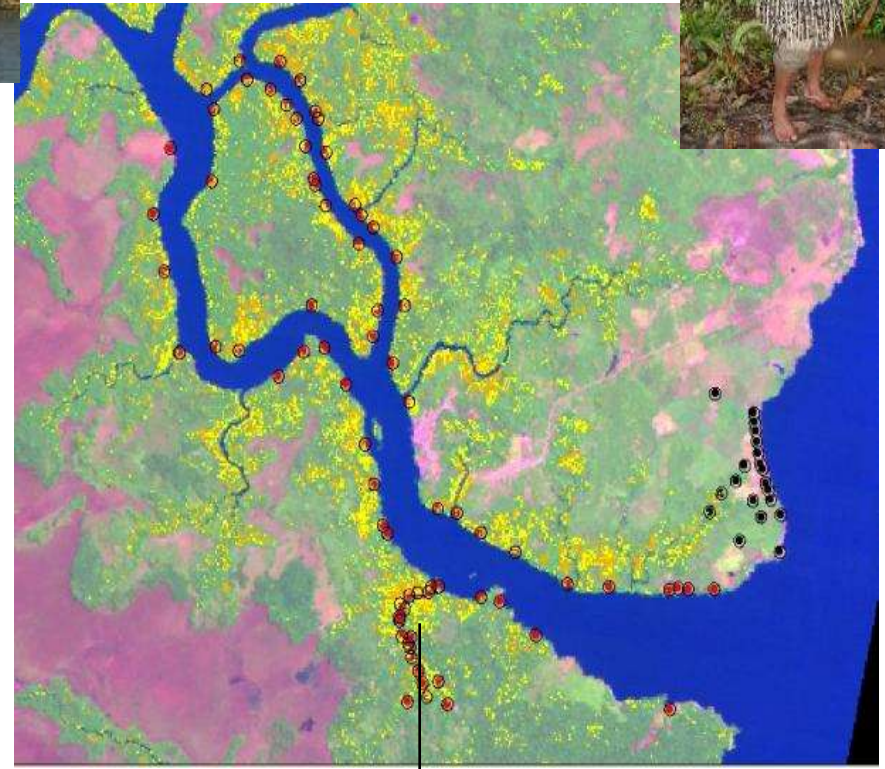
Brondizio 2008; 2013

Source: IBGE/SIDRA

# Views of Productive Land and the Political Ecology of Invisibility



*As 'native' forest*



*as intensive agroforestry*

“Invisible producer” → into → most significant regional land use system!



# Commodity Chains: Follow that Thing

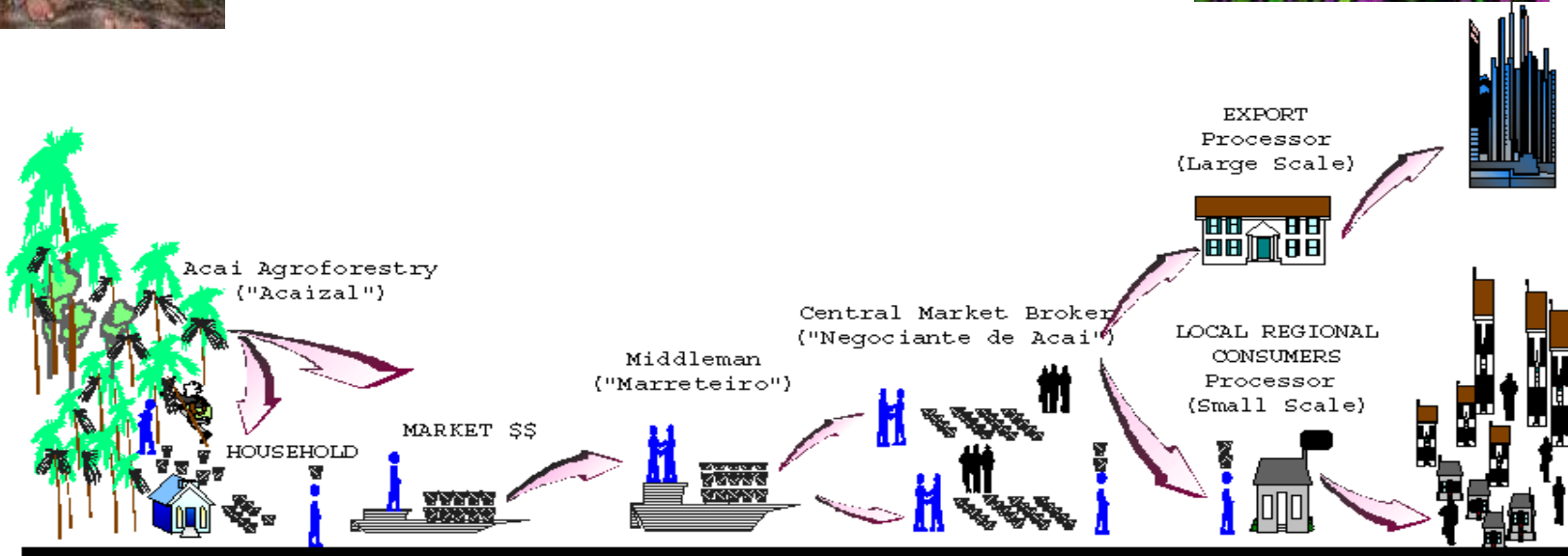


Oprah names Acai Fruit #1 Superfood for Age-Defying Beauty.

**YOUR HEALTHIEST YOU:**  
BRING HER ON!

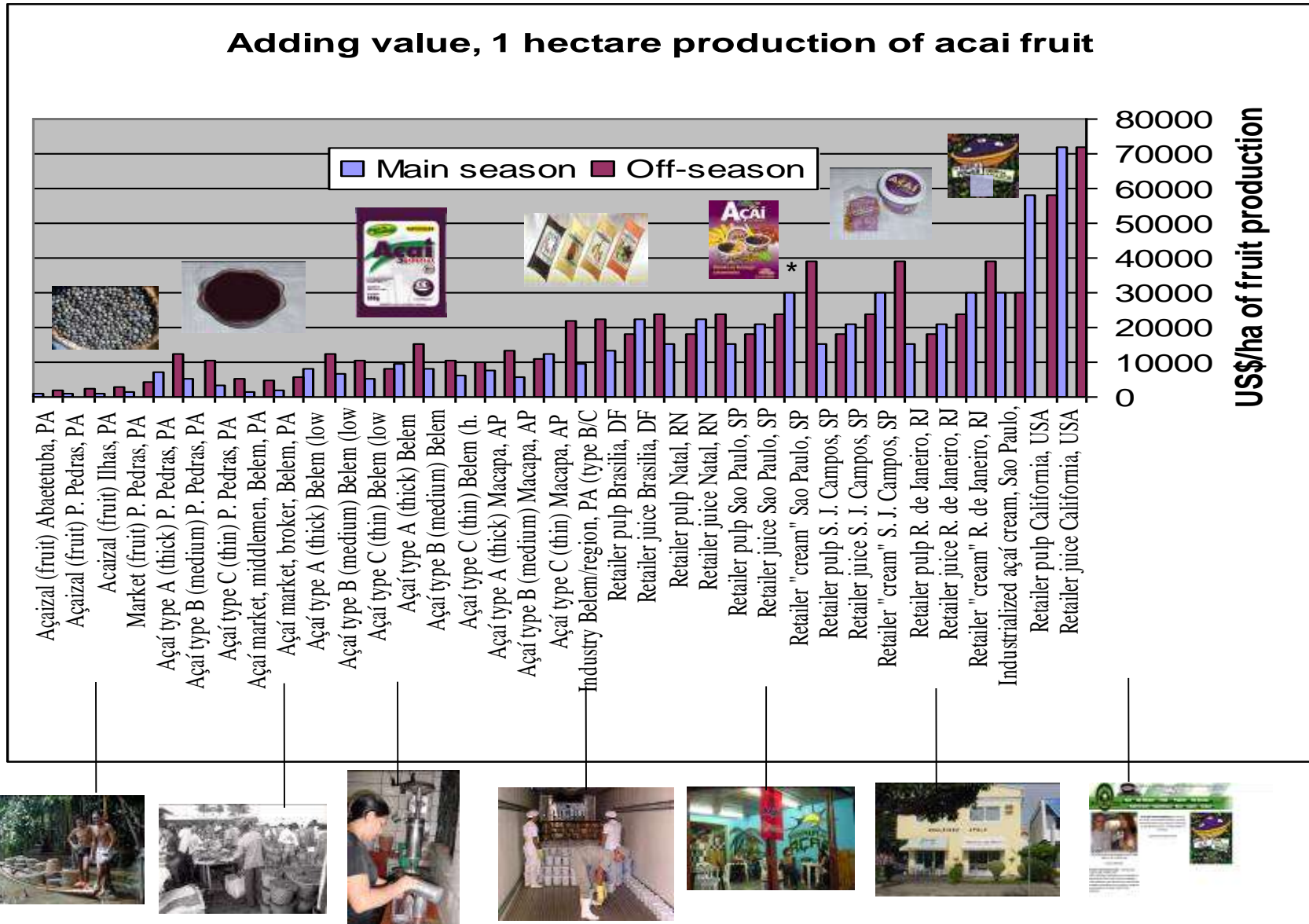
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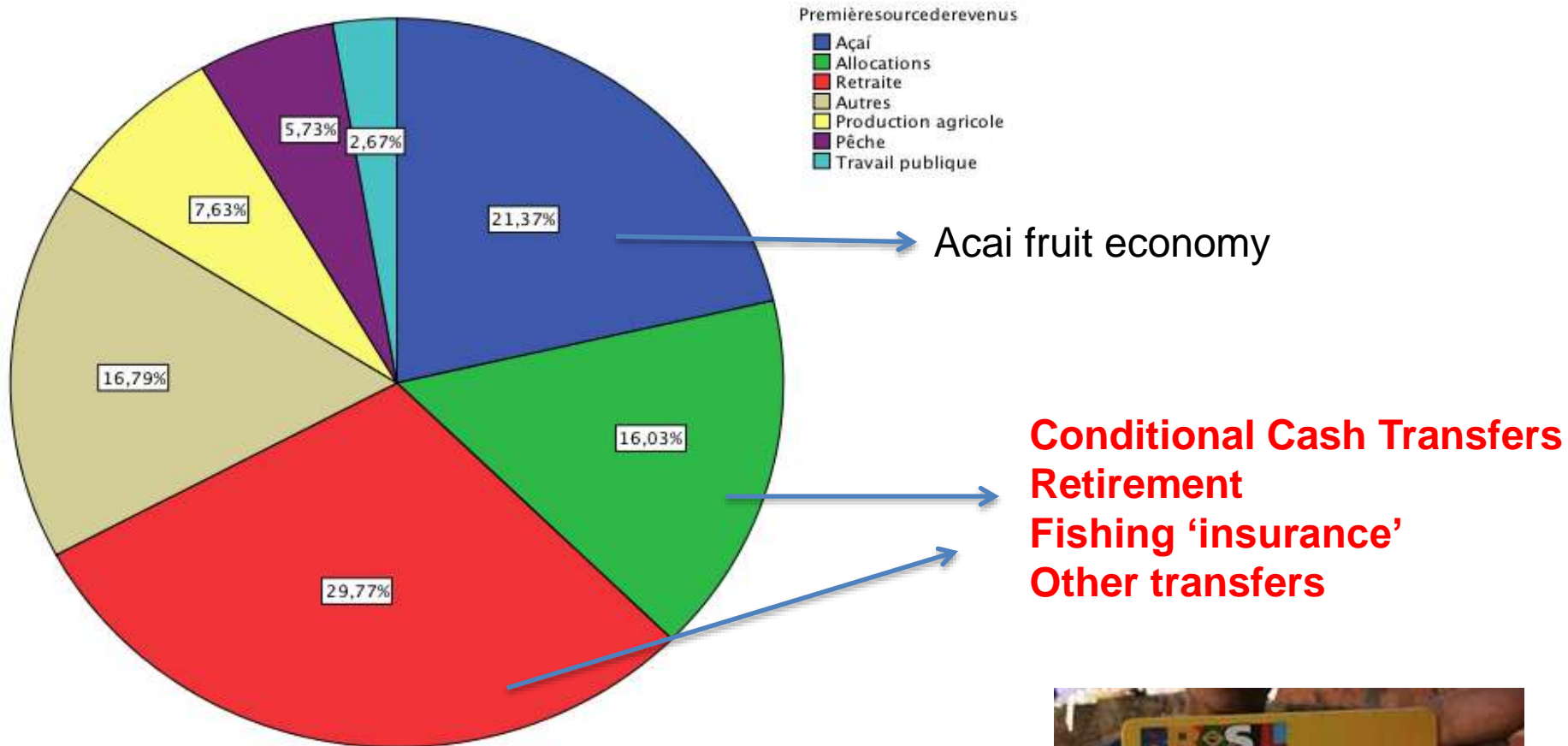


# Value chain and product transformation away from the region

An estimated economy of US\$2 Billion



# Household economy and dependency, Marajo Island, Brazil



Data: ACT, Indiana University  
MS. Thesis Gamez, L. 2013.

## Emergence of rural-urban and urban-urban social networks



## Facilitated by:



## Communications



## Transportation



Opportunities within urban economic niches

Family-based organization capturing control resources within family networks

From object to middlemen

Search for services and access to education

24

## Circulation



### City as part of daily life:

- Economy and Commerce
- Services, Education
- Social life and modernity

- Reciprocity & Friendship
- Labor arrangements
- Political alliances

# Rural-Urban Connections and Multi-Sited Households

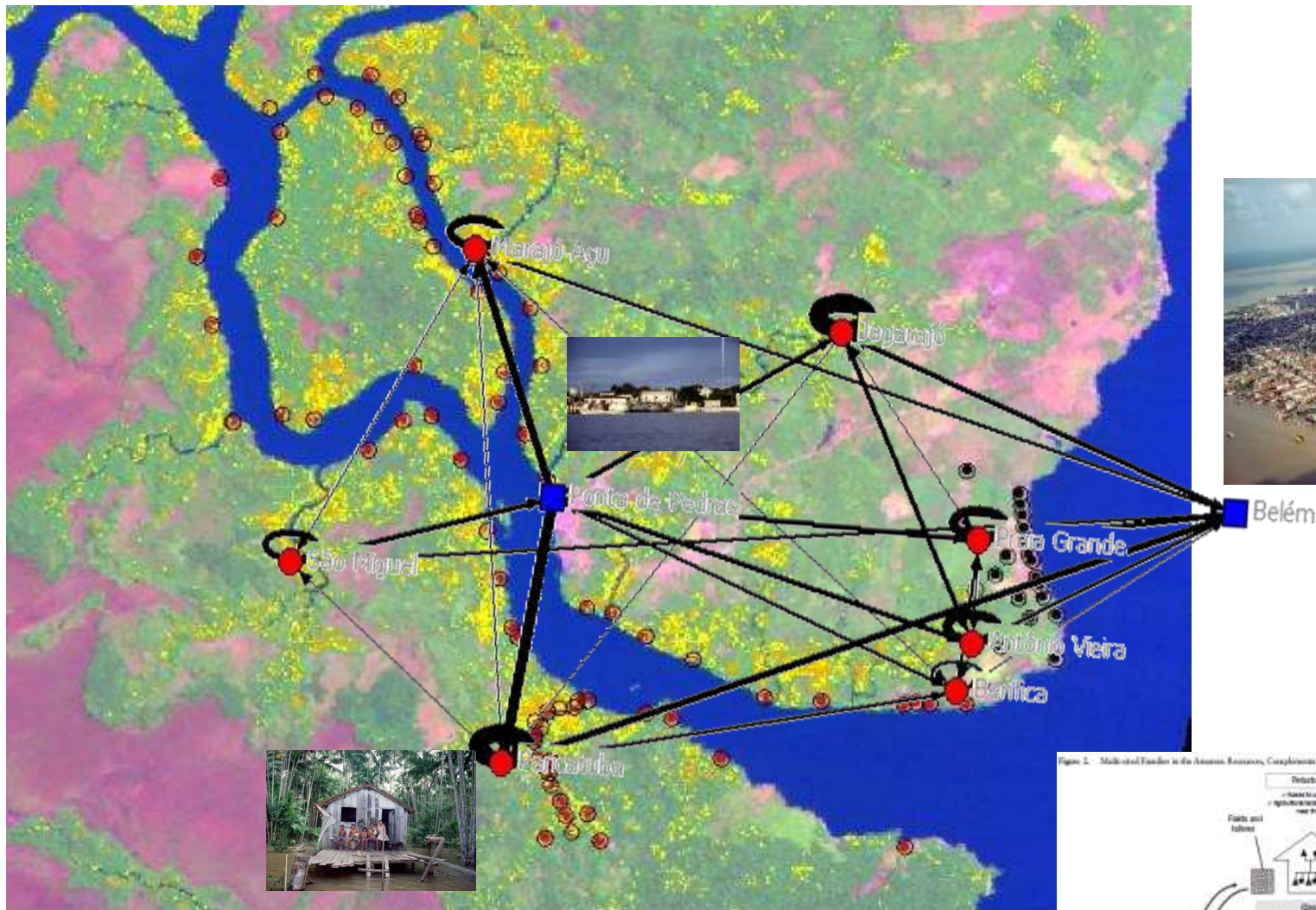
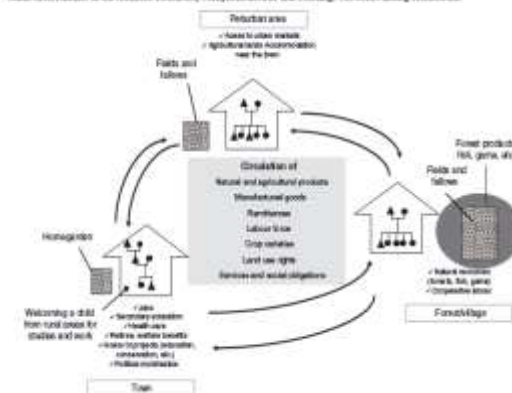
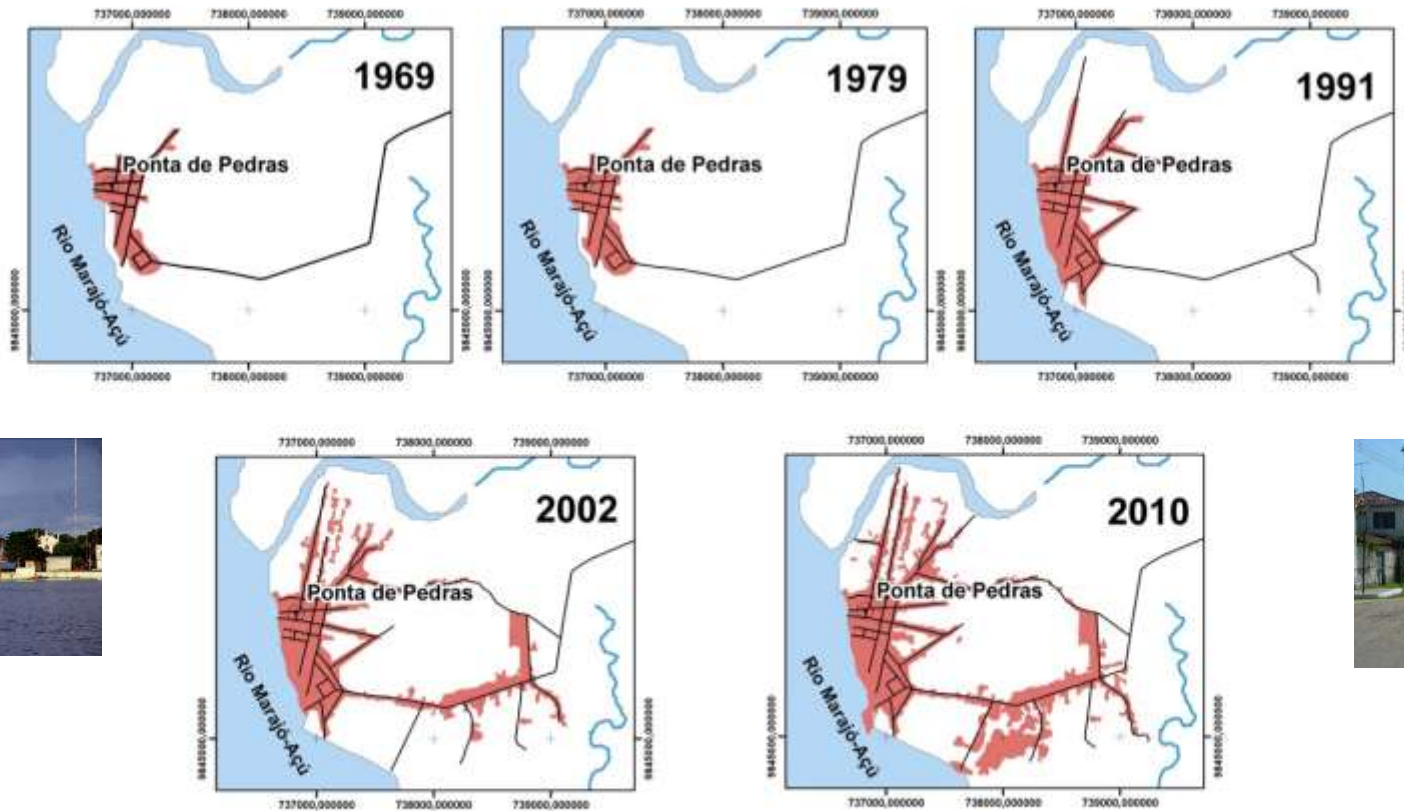


Figure 2. Multi-sited Families in the Amazon: Resources, Complementarity and Exchange Networks among Households.

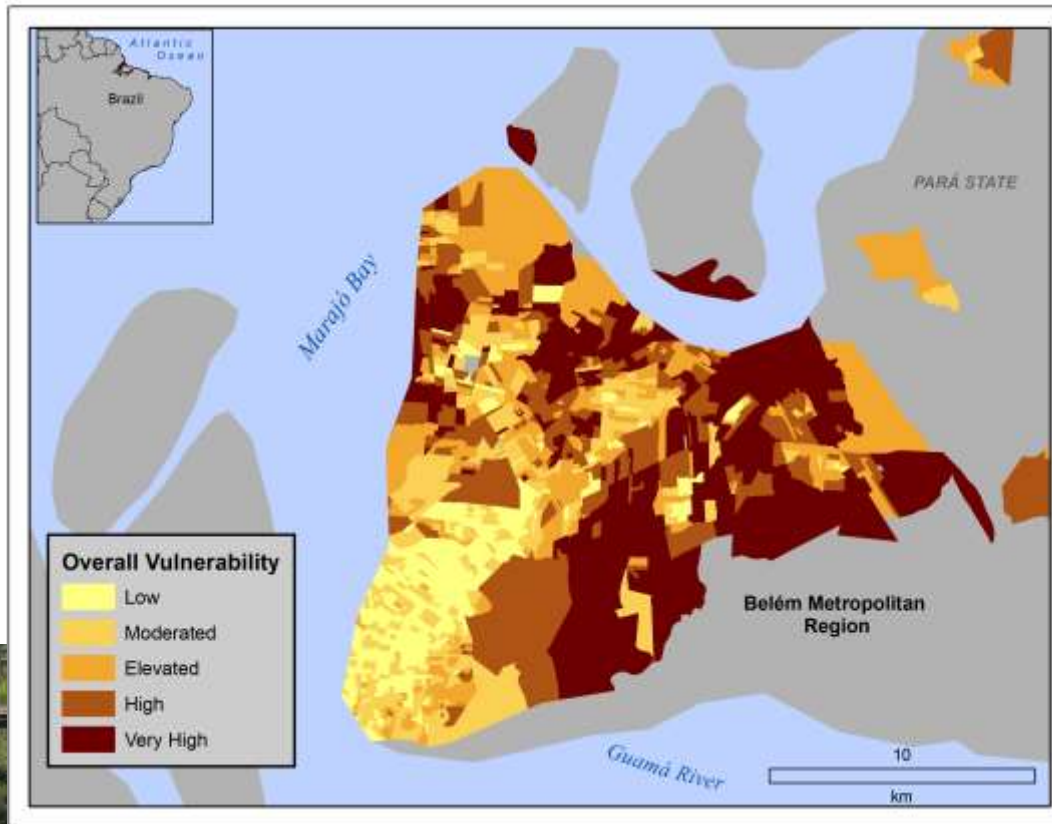


Brondizio, E. S., N. Vogt, and A. Siqueira 2013 *The Social Life of Forests*. The University of Chicago Press.  
 Padoch et al 2008. *Ecology and Society*  
 Pinedo-Vasquez et al 2010. *Cadernos do NAEA*  
 Cabrera et al 2010. ABM Modeling  
 Eloy et al 2014

# Urban expansion 1969-2010: Ponta de Pedras, Marajo Island, PA, Brazil



# Climate change: The face of urban vulnerability



**60-90% population moderate to very high degree of vulnerability**  
=[lack infrastructure, flood risk, income, social indicators]

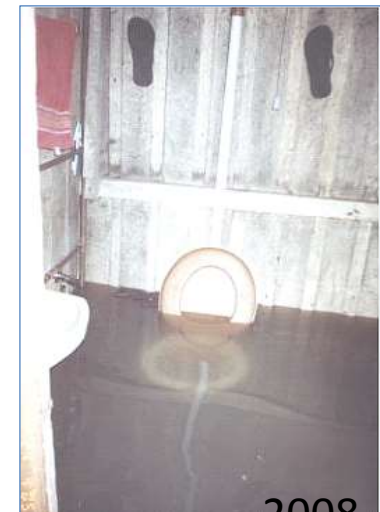


Figure 6: Belem residents document flooding and spill of sewage drainage channels

2005



2014



2008

Photos by: José Alexandre de Jesus Costa and members of the "Frente dos Moradores Prejudicados da Bacia do Una" Belem, PA, Brazil



# Linking Observed Hydrological Changes at the Basin Level to Local Knowledge in the Delta

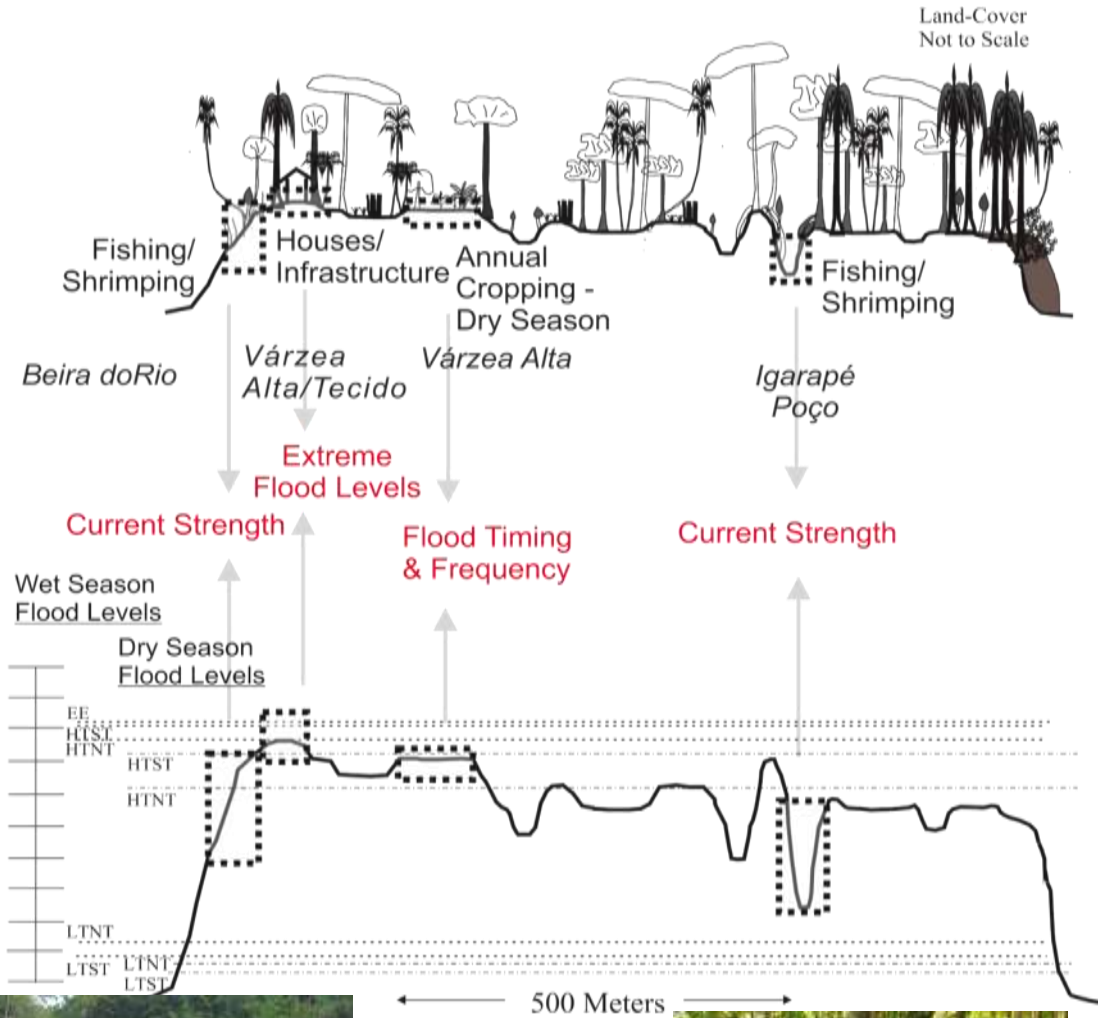


**Uses of Flood Sensitive Areas:**

**Local Elevation Category:**

**Salient Sensor Areas for Sensing Inter-Annual Variations:**

Acronyms of Tidal Flood Types	
	Scientific/Local Names
EE	Extreme Events/ <i>Lançante Grande</i>
HTST	High Tide of Spring Tides/ <i>Preamar das Aguas Vivas</i>
HTNT	High Tide of Neap Tides/ <i>Preamar das Aguas Mortas</i>
LTNT	Low Tide of Neap Tides/ <i>Baixamar das Aguas Mortas</i>
LTST	Low Tide of Spring Tides/ <i>Baixamar das Aguas Vivas</i>

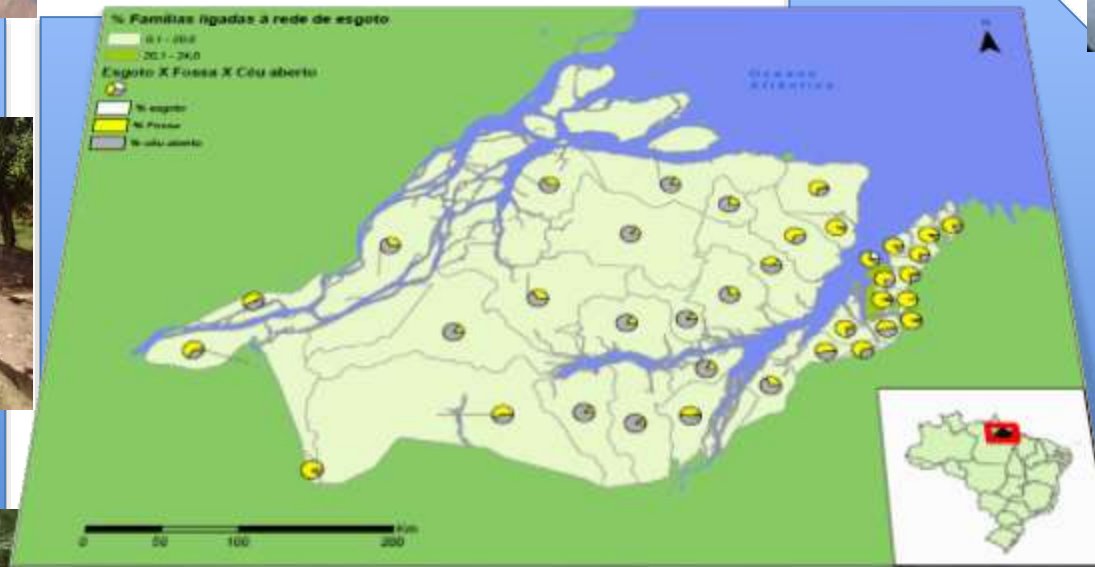


Vogt et al submitted  
PNAS



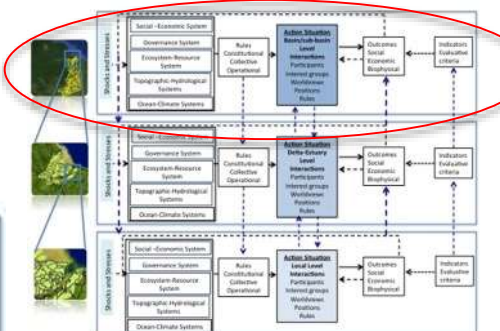
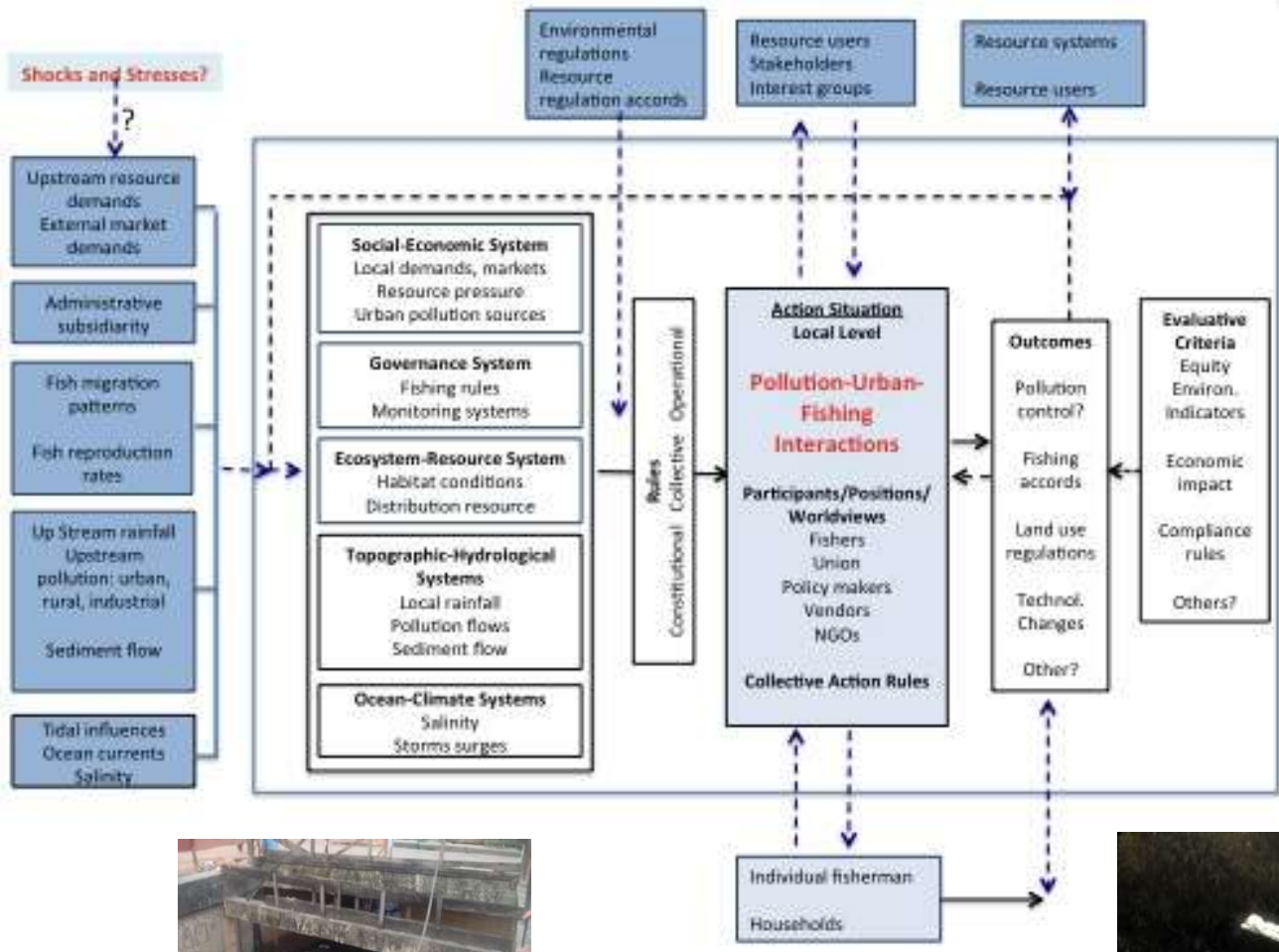
**Local Elevation Categories and Areas for Sensing Inter-Annual Variations in Flood Patterns**

# Urbanization and the Changing Nature of Collective Action Problems

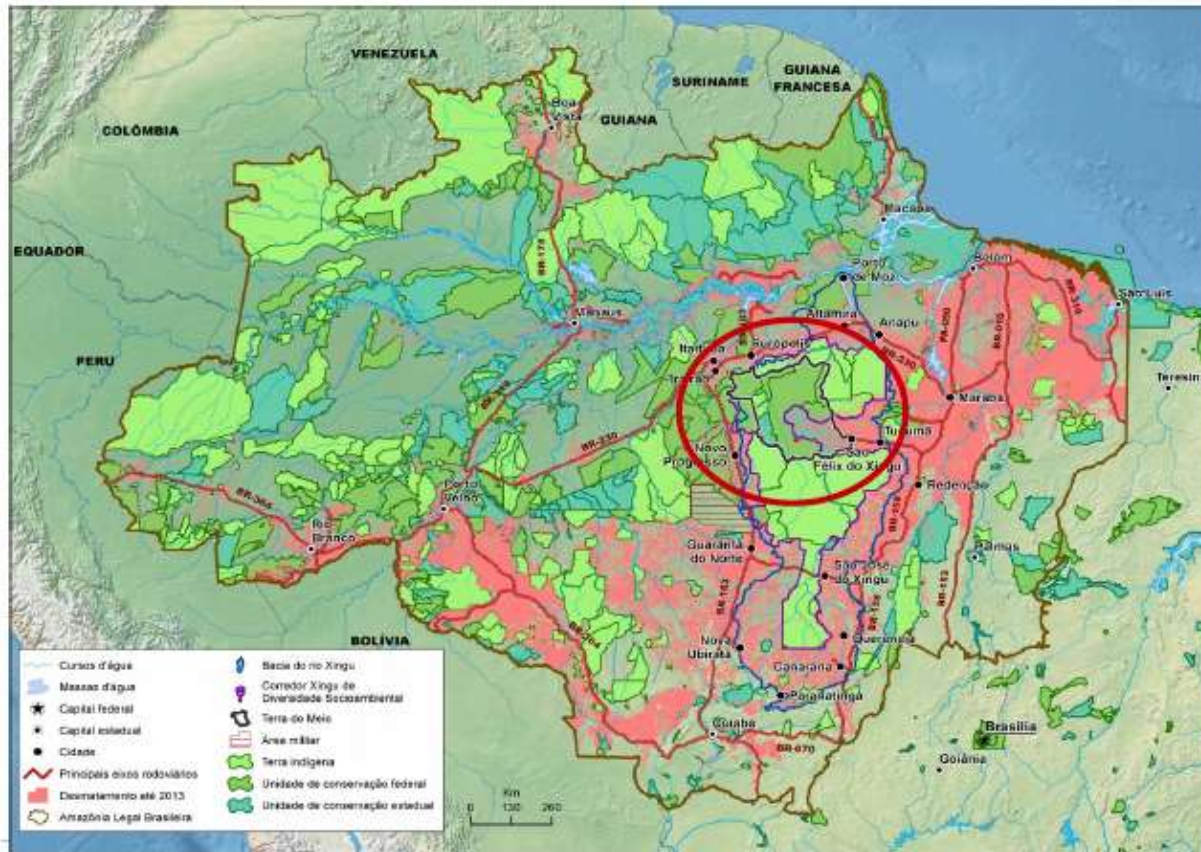


**Functional Inter-dependence: limits to local level responses**  
**Insolvent municipalities cannot respond to demand**

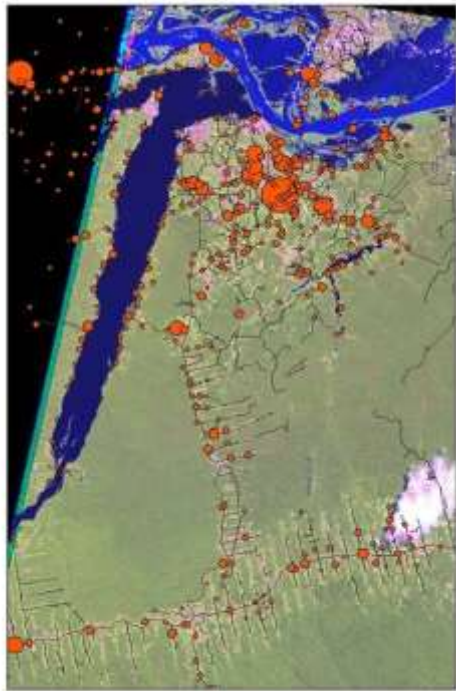
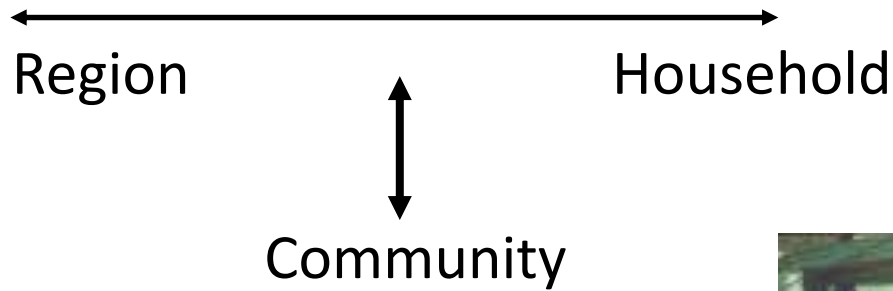
# A Social-Ecological Perspective to Collective action problems: Urban Pollution-Local Fishing grounds



# Territorial governance and collective action



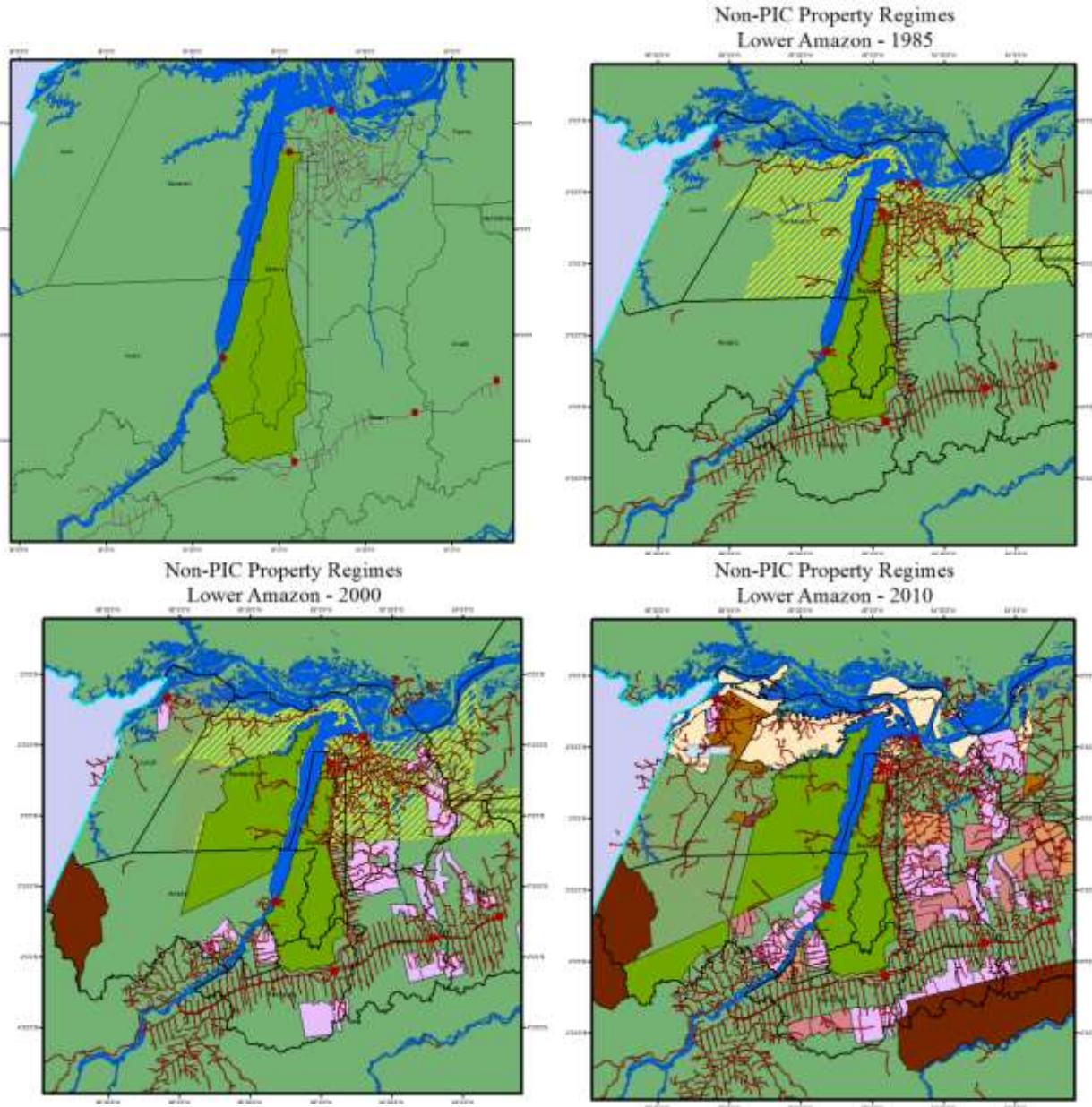
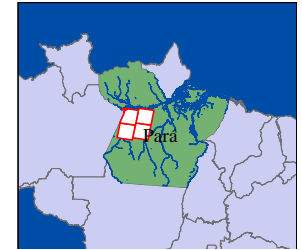
# Understanding community formation as a process







- History of settlement
- Kinship and social networks
- Demographic history
- Collective identity
  - Soccer
  - Religion
  - Rituals and celebration
  - Land Use and Economic identity

- Size and density
- Institutional and land tenure arrangement
- Political leadership
- Conflict history
- Public and private infrastructure
  - Transportation, water, school, health center

Figure 1: Evolving institutional complexity in the lower Amazon



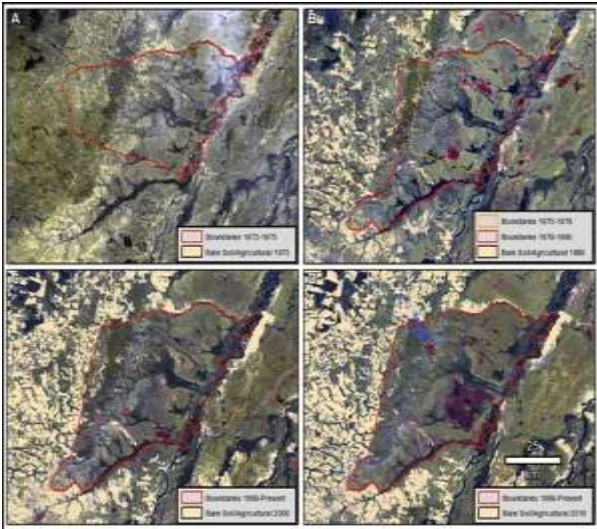
**Legend**

-  Municipal Capitals
-  Municipality Limits
-  Road and Trail Network - 2010
-  Primary Rivers
-  Federal Conservation Unit
-  Federal Land in Process of Land Tenure Regularization
-  State Land in Process of Land Tenure Regularization
-  Mining Concession
-  Federal Smallholder Settlement Project
-  State Smallholder Settlement Project
-  State Agro-Extractive Settlement Project
-  Federal Agro-Extractive Settlement Project
-  Federal Conservation Settlement Project
-  Federal Public Forest for Timber Concessions

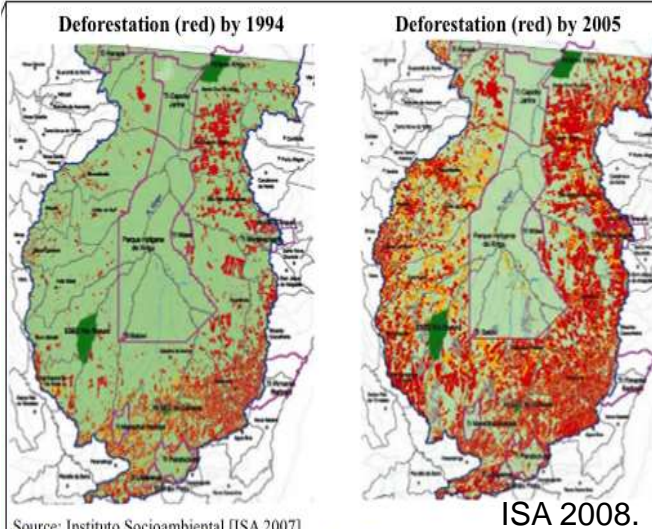
Nathan Vogt - INPE  
April 2013

# Island of Landscape Governance:

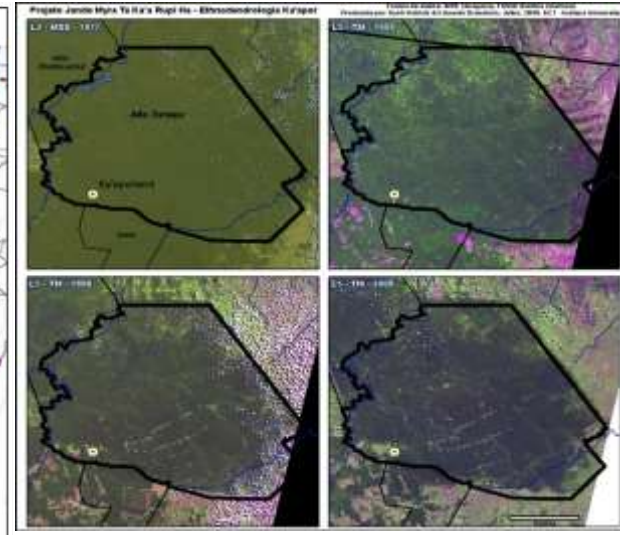
## Connectivity and the limits of level specific governance systems



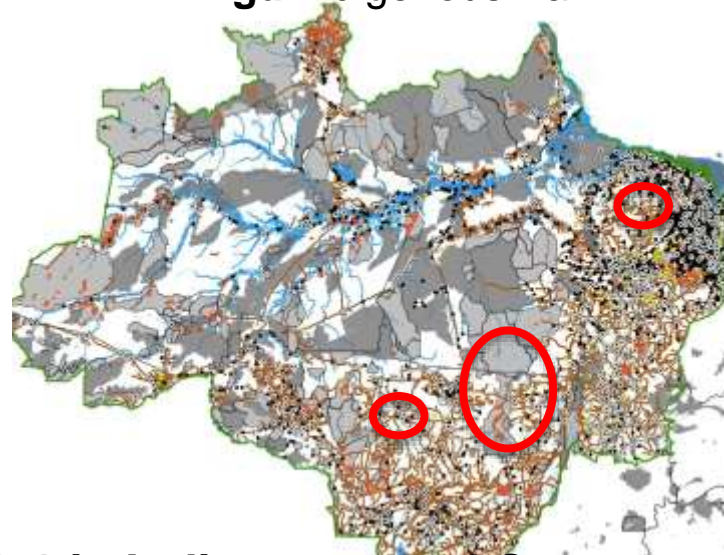
**Xavante Indigenous Reserve**



**Xingu Indigenous Park**



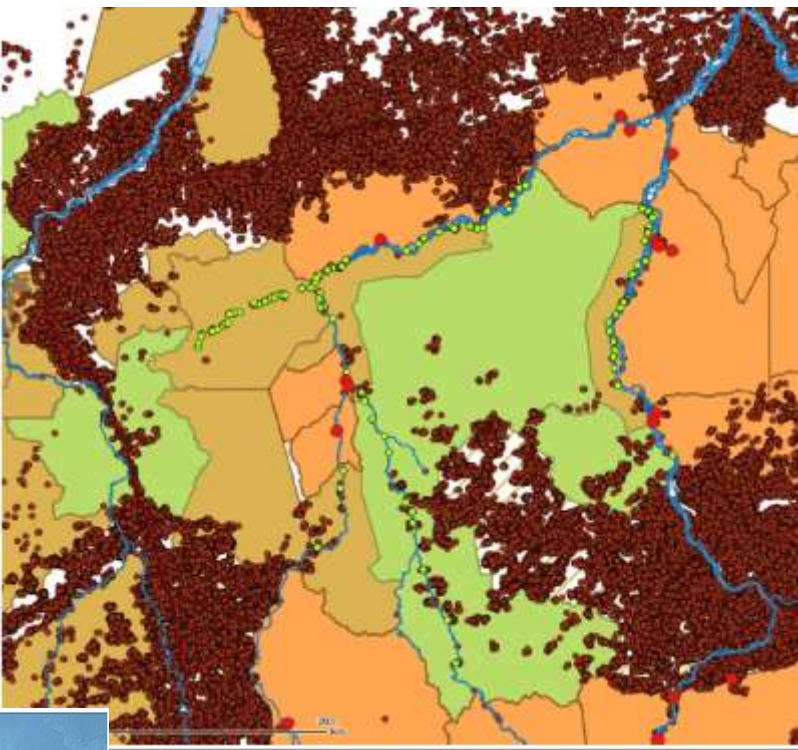
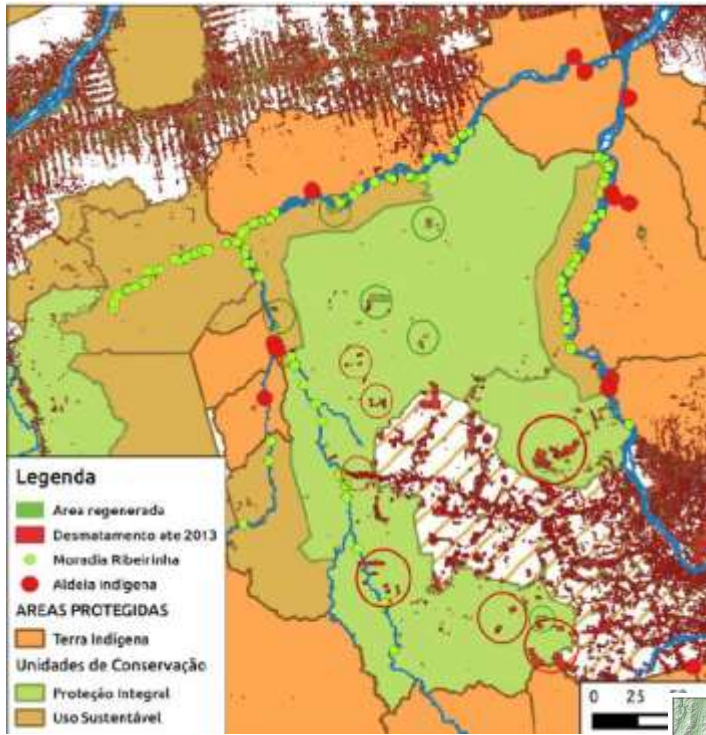
**Ka'apor Indigenous Reserve**



**> 40% in Indigenous and Conservation areas**

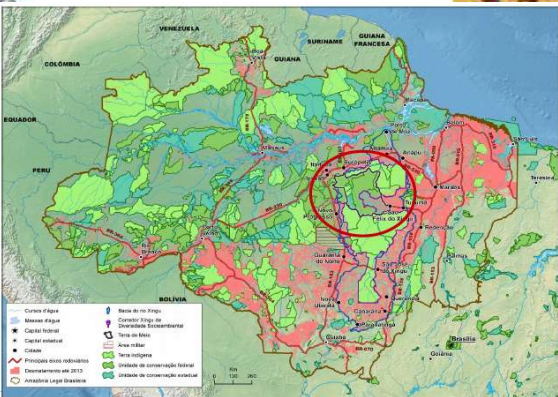


# Connectivity & pressures around Indigenous lands/conservation areas



**Deforestation [Prodes 2014]**

**● Fire events 2005-2015**



**Source:** Juan Doblaz, ISA/Programa Xingu “Populações tradicionais e proteção territorial: o caso da Terra do Meio” IPBES seminar Nov 15, 2015. University of Sao Paulo.



# Reaction and Pro-Action:



Small farmers, communities protesting soy expansion and water pollution (Santarem/BR 163, field photos)



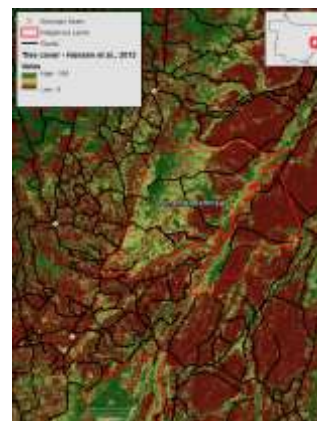
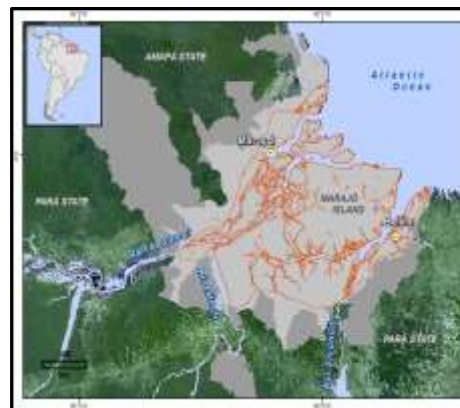
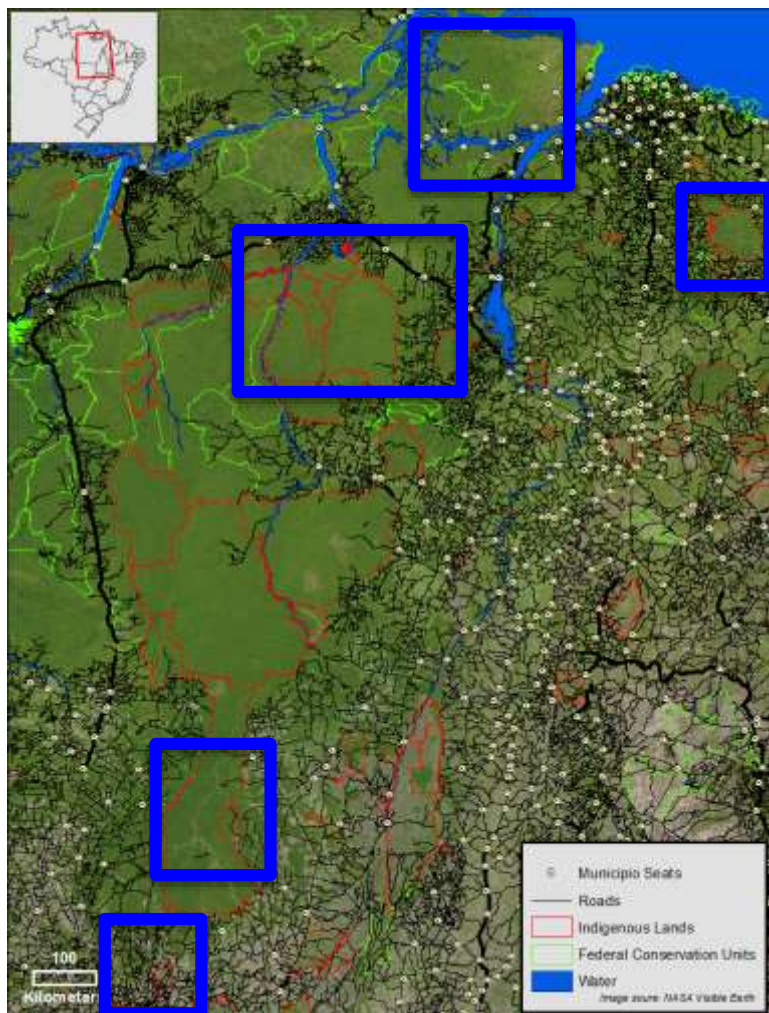
Indigenous Militia against loggers  
The Washington Post, Nov. 2015



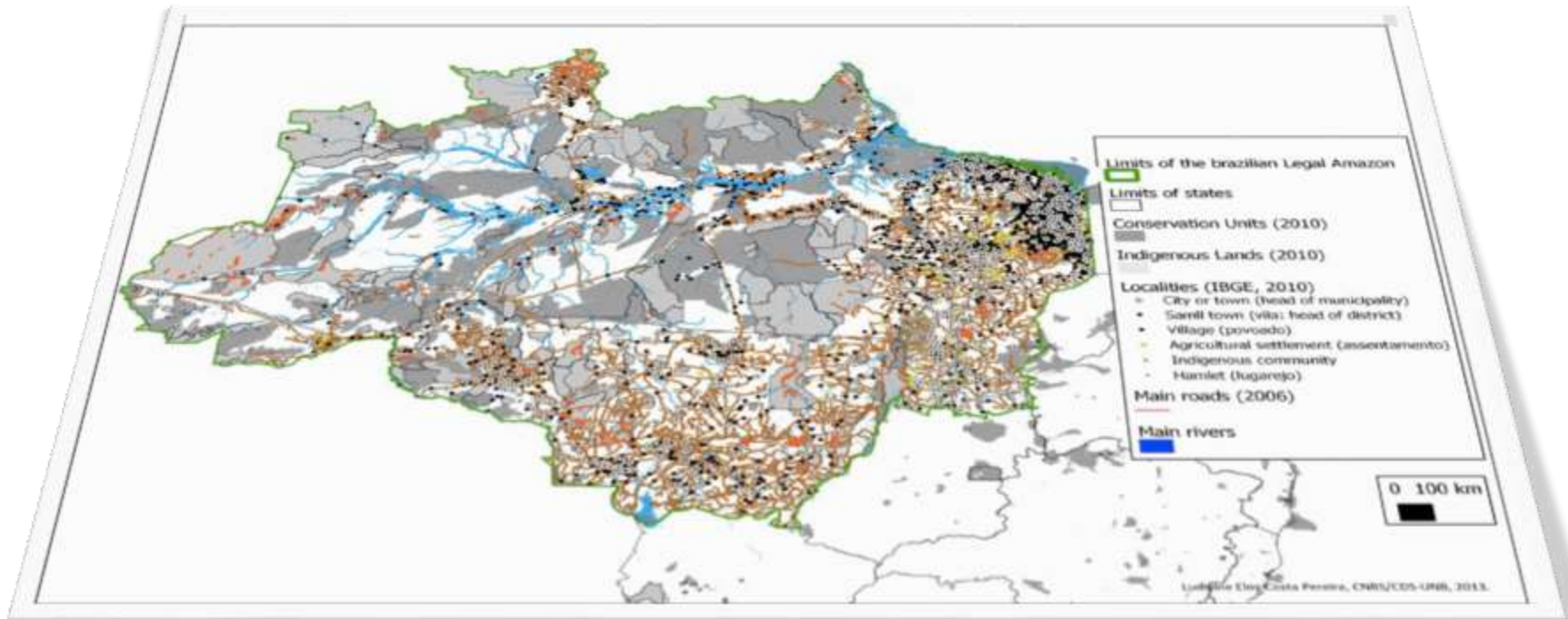
Discussing reforestation plans across boundaries (Canarana, Xingu Indigenous Park, Rosely A. Sanchez)

# New project:

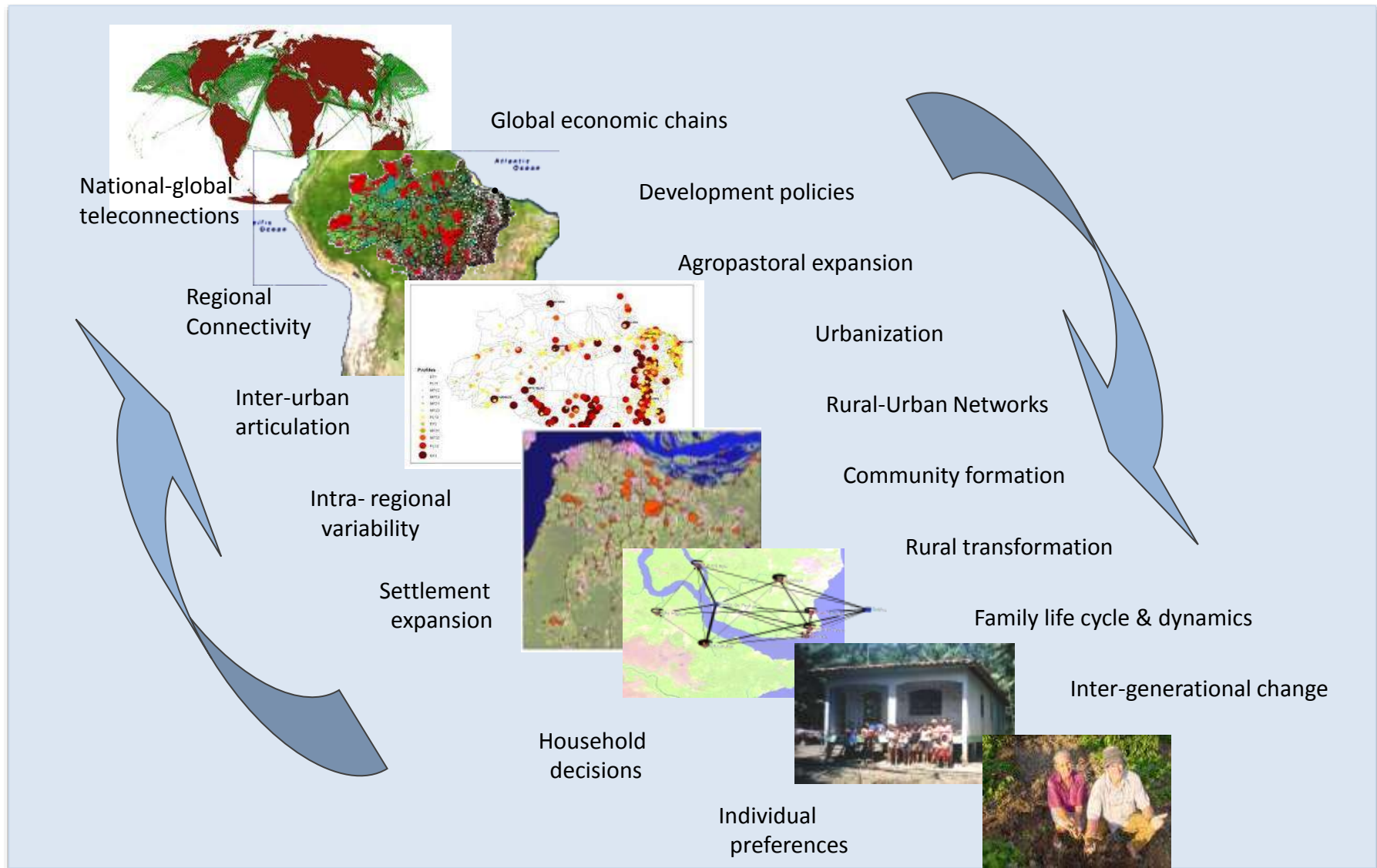
## Co-evolution of urban networks, agropastoral areas, reserves



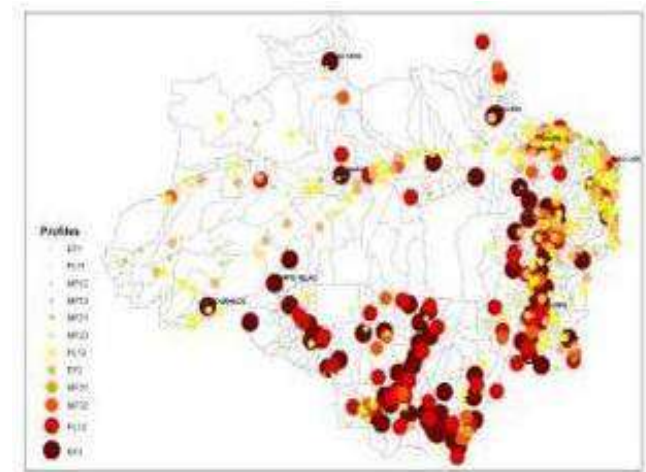
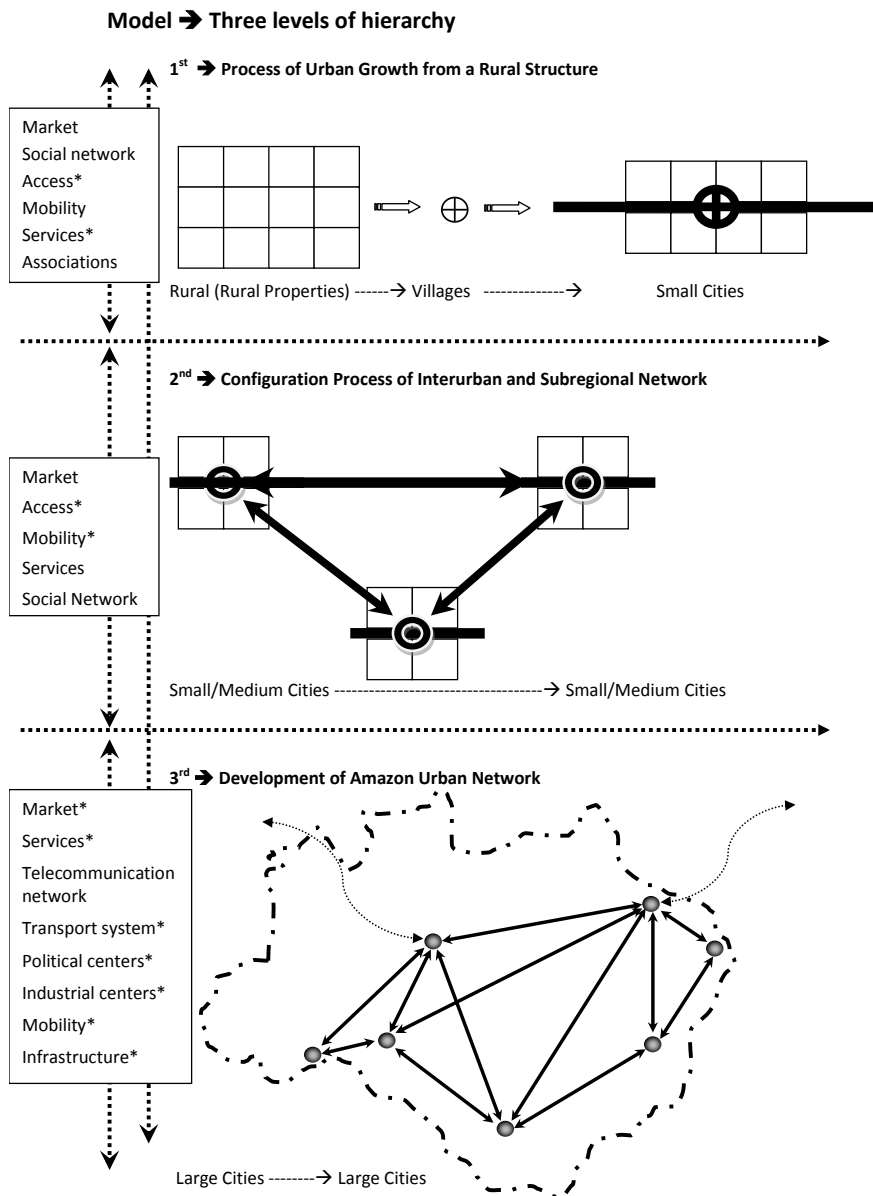
# Connectivity and emergent regional complexity



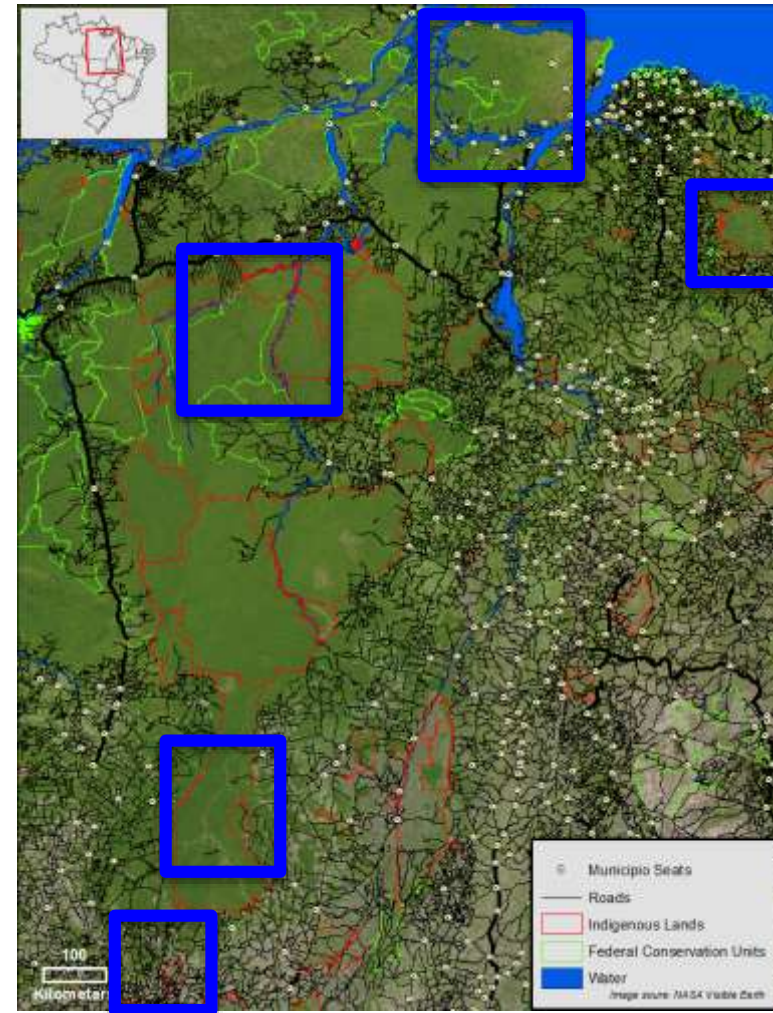
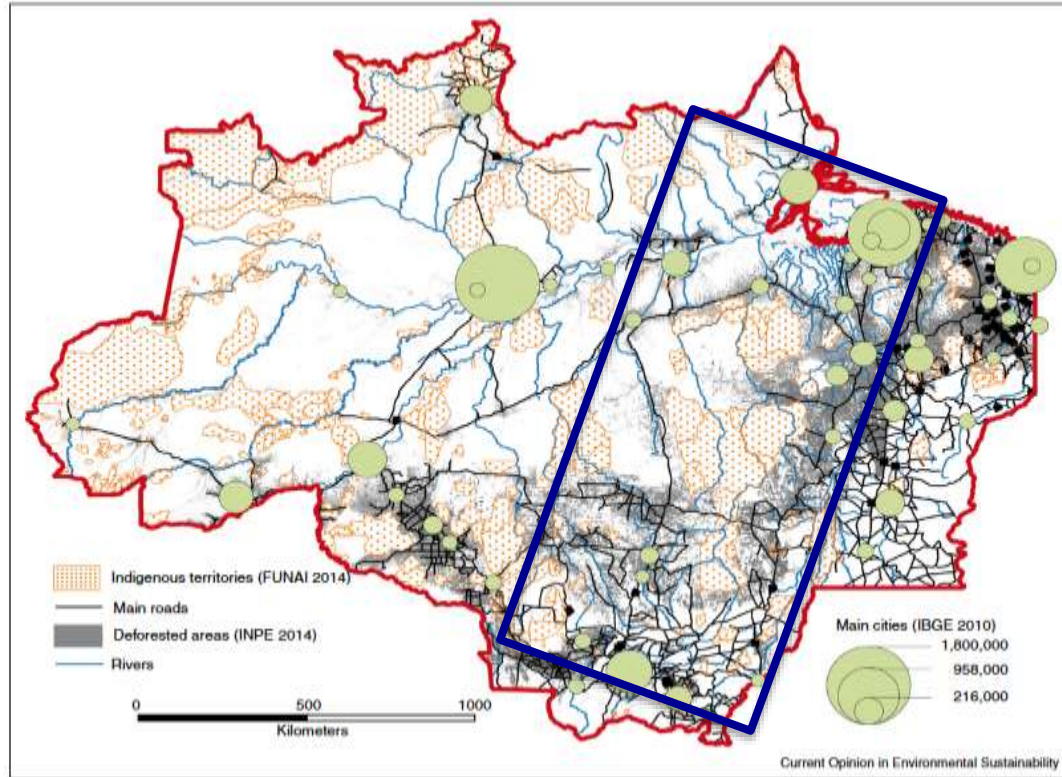
# Building blocks of interactions and regional transformation(s)



# The Formation of Inter-regional urban networks



# Levels of Analysis



Regional

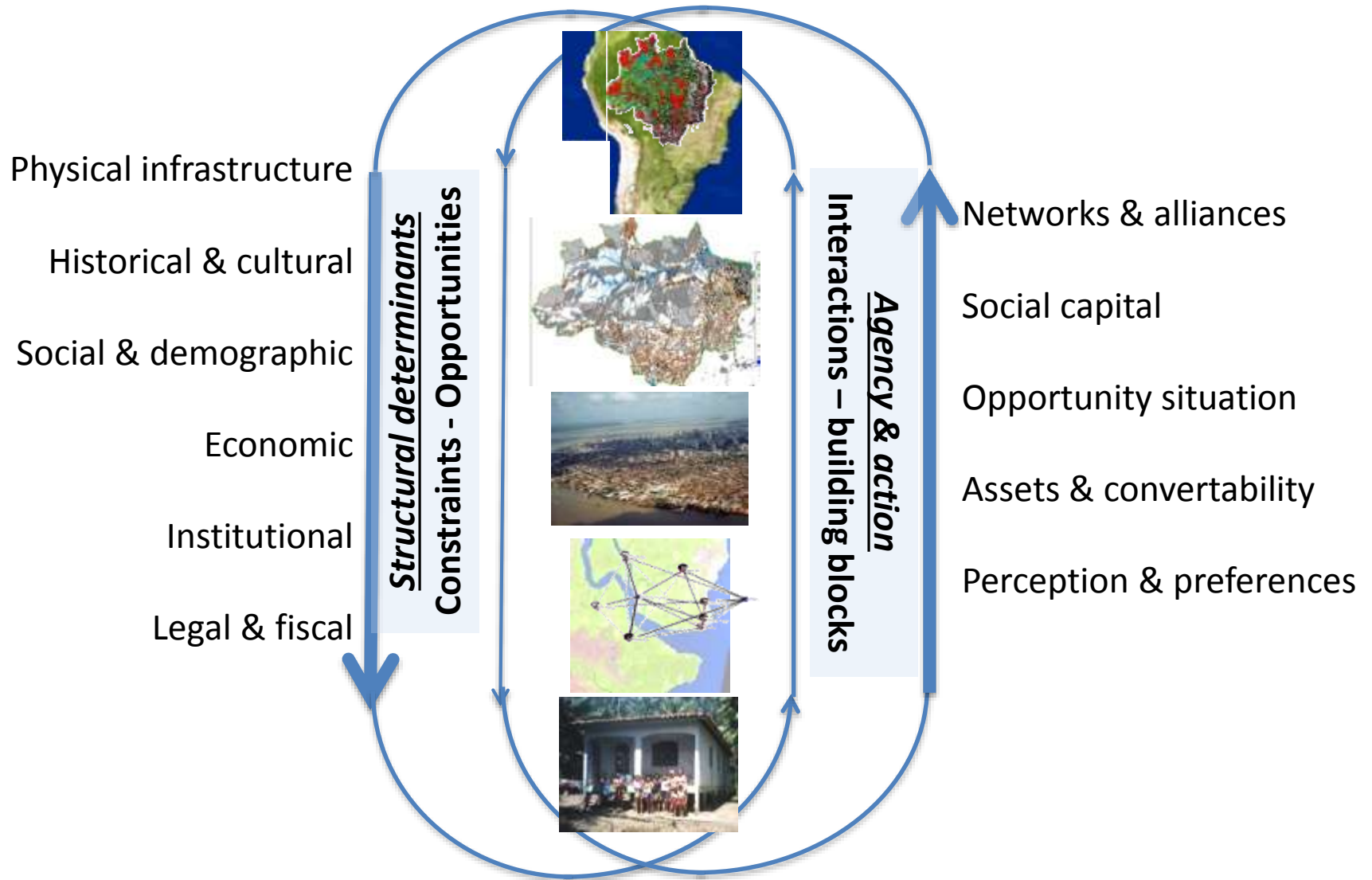


BR 163 – BR 152

Xingu Basin – Delta

Focal Areas

# A complex system perspective



# Final Remarks

**Co-evolution** of inter-urban networks, agrarian expansion, and territorial conservation will shape Amazonian landscapes in the coming 20 years

**Bridging Institutions** as social capital in complex landscapes

**Persisting extractivist frame of development** from commodities to carbon

**Structural** limitations of insolvent local economies.

**Complex Systems** thinking for understanding and inform



**Thank You!**