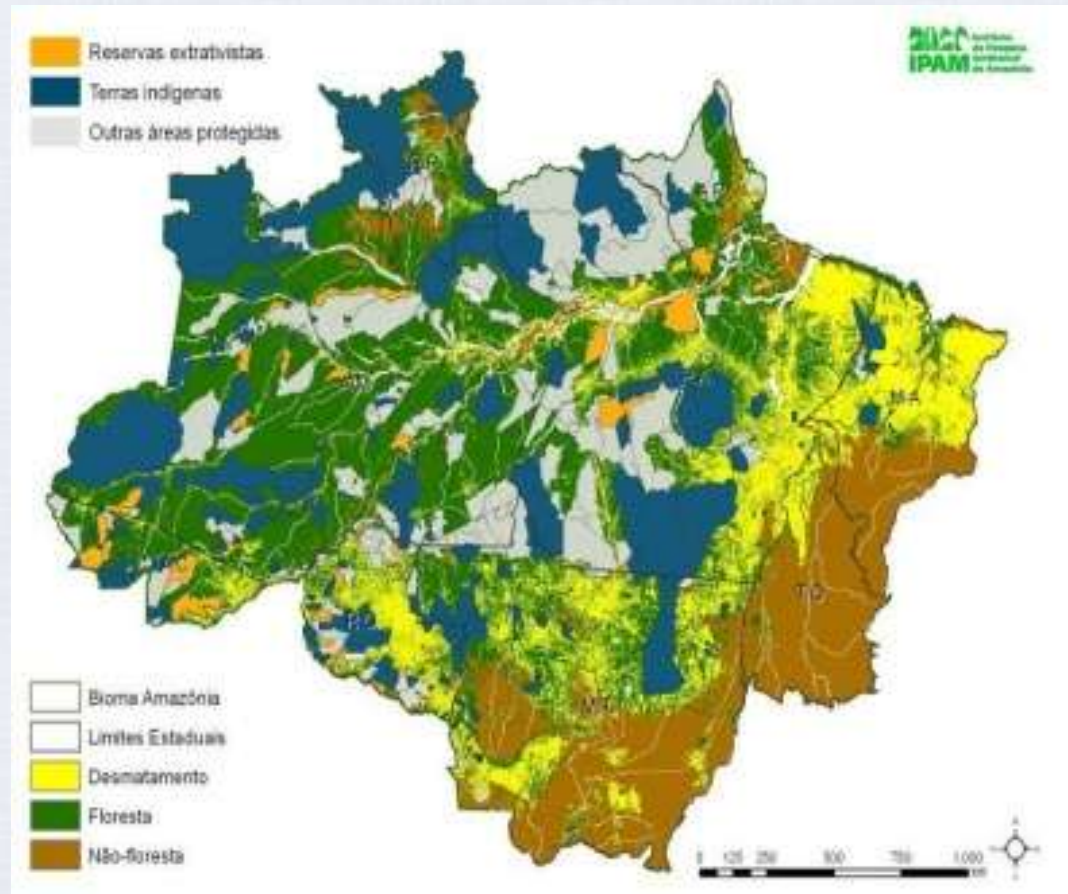
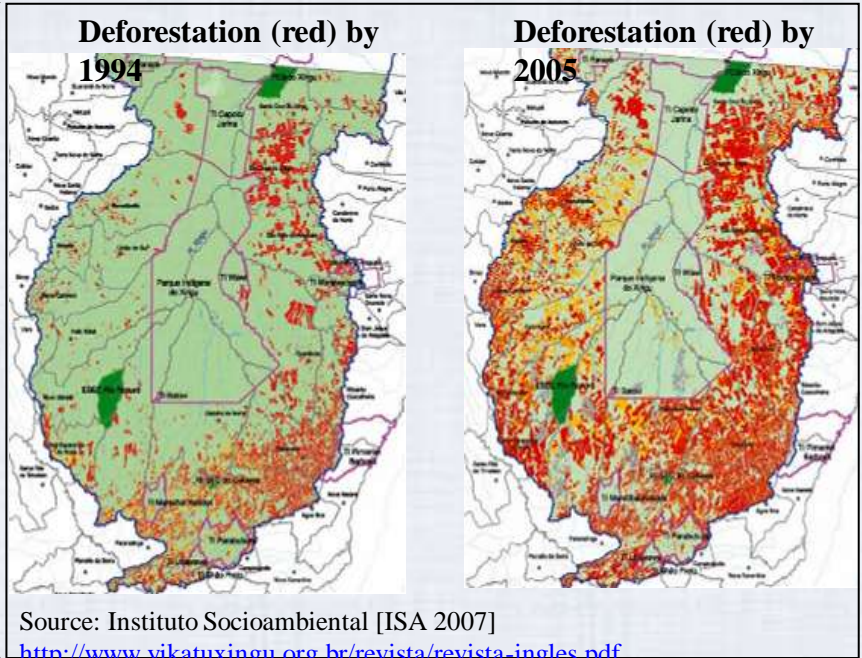


An evolving complex sociocultural and institutional landscapes:



Functional Inter-dependence: Social, physical, institutional connectivity within watersheds



The Xingu Indigenous Park within the larger watershed



Governance challenges created by cross-level interactions

a. Fit: level of (mis)matches between environmental and institutional boundaries;

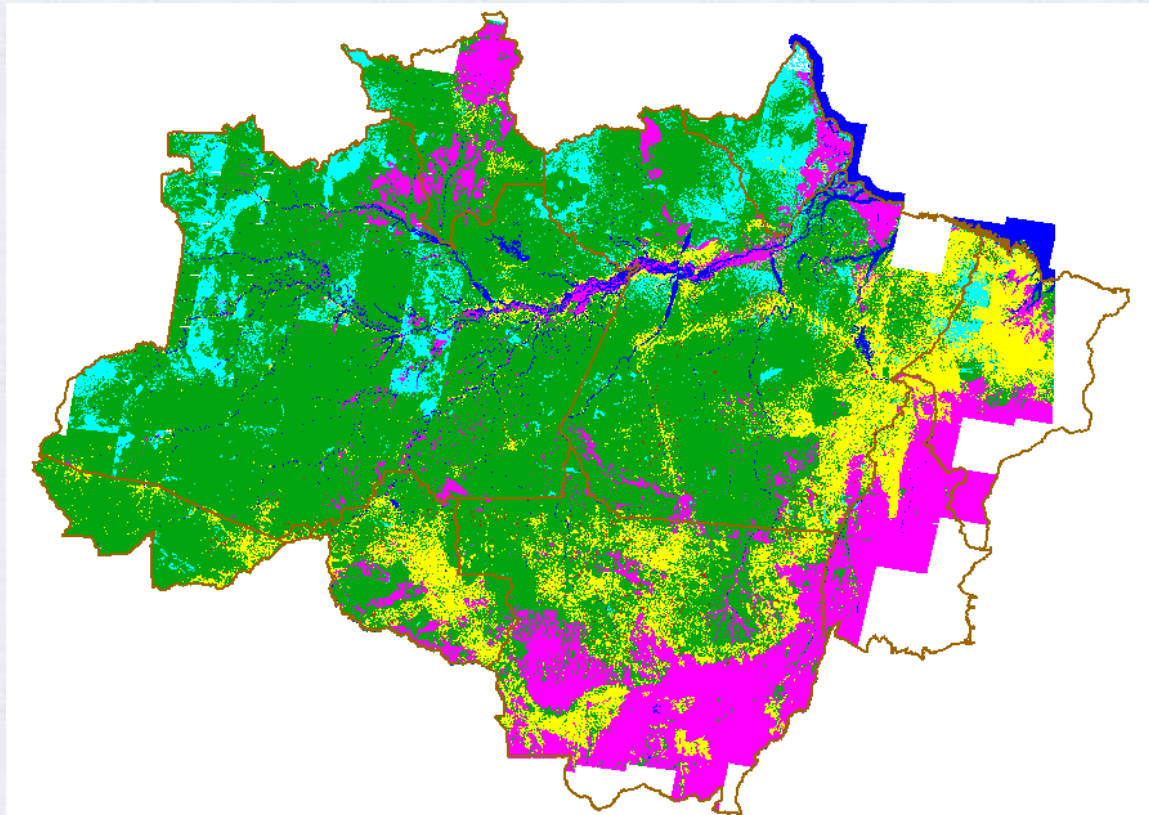
b. Boundaries: competing rules of subtractability and exclusion operating in different parts of the same ecosystem;

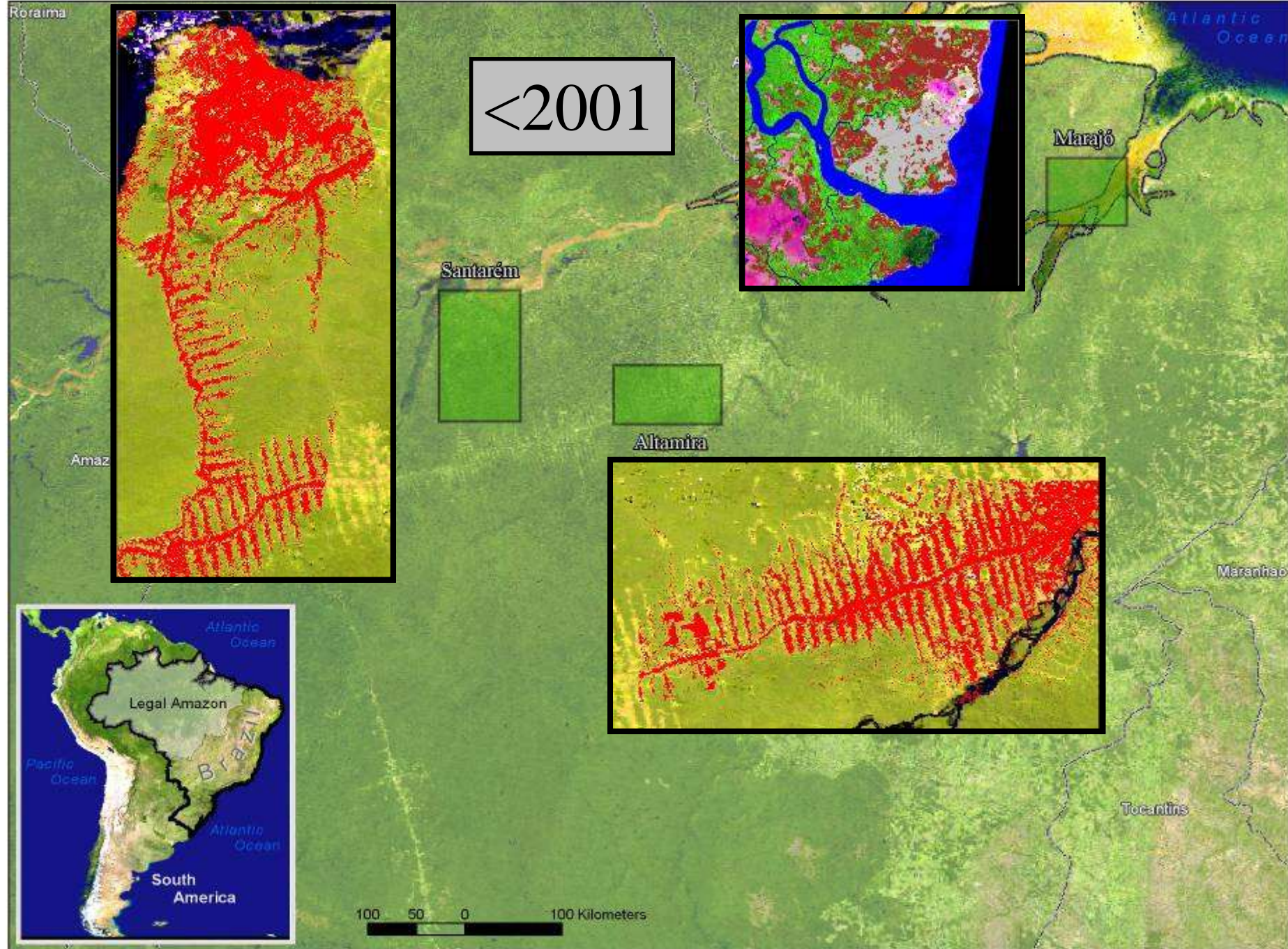
c. Authority: shifts in jurisdiction and authority over resources, including overlaps, at different levels;

d. Sanctions: inverted correlation between compliance with rules and scale (i.e., level of compliance decreases as you move from local to international levels);

e. Knowledge and information: problems of credibility, saliency, and legitimacy resulting from differences in knowledge systems and access to information at different levels and by different groups.

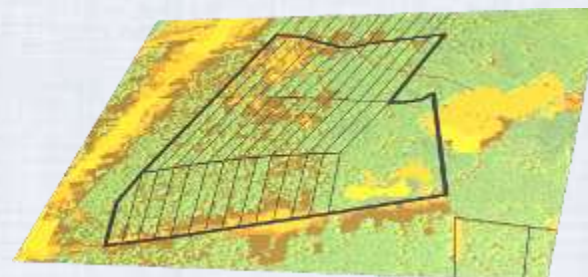
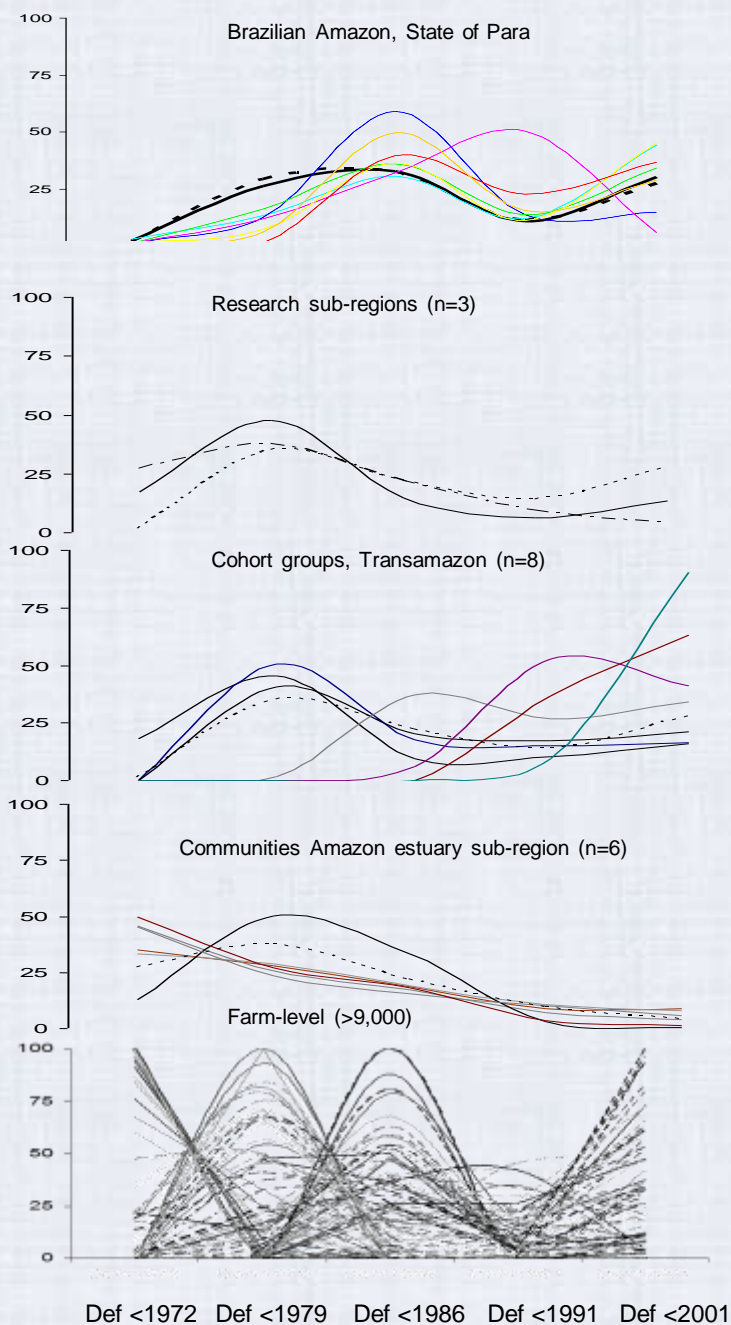
Untangling factors underlying trajectories of deforestation and LUCC change as level-dependent





Multi-Level Deforestation Trajectories 1972-2001

(a) Regional
(b) Sub-regions
(c) Farm cohorts and Communities
(d) Farm Lots



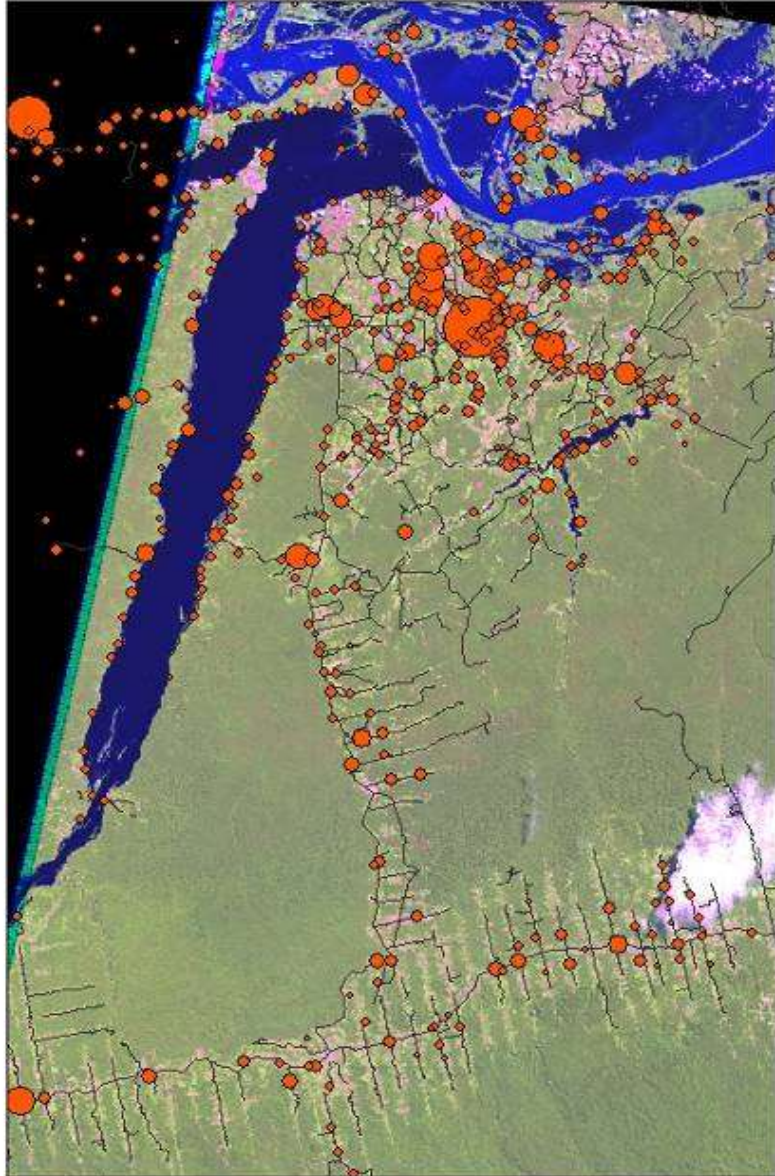
From: Brondizio, E. and E. Moran (under review) Level-dependent deforestation trajectories in the Amazon, 1970-2001, Population and Environment.

3. Implications for sustainability

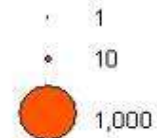
- Not complexity for the sake of complexity: It matters to policy
 - Functional inter-dependence and linkages between levels and different institutional arrangements and economic systems
 - Evolving rural-urban network systems defining future regional landscapes
- From 'panacea' to 'mesoscopic' approaches to policy
 - Account for intra-regional variability and underlying persisting structural problems
 - Limitations of level specific policy approaches → 'Policentrism'
 - Link regional models of climate change to local level needs
- Towards a transformative economy
 - Limitations of compensation mechanisms to deal with regional complexity
 - Aggregating resource value and generating employment at the local and regional levels
 - Overcome disconnection of municipalities from regional resource economy
 - Locally developed solutions for environment management and agropastoral intensification

THANK YOU!

Rural community formation, Santarem region



Households



Growing pressure on urban infrastructure, employment

Table 2 - Distribution of Urban Infrastructure of Households (%) in Municipalities (%) of the Legal Brazilian Amazon, from IBGE Micro Data of the 2000 Census (IBGE 2000)

Percentage of households	Electric Energy	Public Electric Light	Pavement	Water system	Pipe Water System in at least one room	Sewage system	Waste - City collection
0 - 10%	0.8	4.0	47.7	15.1	15.3	96.1	32.3
10 - 20%	4.2	8.6	24.6	12.1	25.7	2.1	17.3
20 - 30%	12.6	15.0	14.6	15.5	19.3	0.8	12.5
30 - 40%	17.0	16.6	7.8	16.5	14.1	0.4	10.6
40 - 50%	18.1	16.3	2.8	13.5	9.5	0.4	9.1
50 - 60%	15.9	15.5	1.7	10.8	5.1	0.1	6.4
60 - 70%	11.7	10.7	0.4	7.8	6.2	0.0	5.2
70 - 80%	10.8	8.0	0.4	5.2	3.2	0.0	3.8
80 - 90%	5.8	4.6	0.0	2.8	1.7	0.0	2.7
90 - 100%	3.2	0.7	0.0	0.7	0.0	0.0	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Derived from Brazilian Demographic Census - microdata (IBGE, 2000)

Table 3: Employment sectors (%) in 2005 for 8 Amazonian states according to RAIS (Annual Report of Social Information)

IBGE ECONOMIC SECTORS	RONDÔNIA	ACRE	AMAZONAS	RORAIMA	PARÁ	AMAPÁ	TOCANTINS	MATO GROSSO
Mineral extractive	0.3	0.1	0.2	0.1	0.6	0.9	0.3	0.3
Industrial sector	9.2	4.9	25.6	4.1	10.9	3.4	4.1	11.9
Public services	1.2	1.5	0.9	3.0	0.7	1.3	1.6	0.9
Construction	2.3	5.1	3.2	4.7	4.4	3.7	3.9	3.1
Commerce	19.2	16.9	12.9	22.8	17.7	19.2	12.8	21.3
Services	19.8	16.8	25.9	27.7	24.9	24.9	13.2	23.2
Public administration	45.4	51.9	30.9	36.0	37.7	46.1	58.9	29.4
Agropastoral, extractivism, hunting and fishing	2.7	2.8	0.5	1.7	3.2	0.5	5.1	9.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

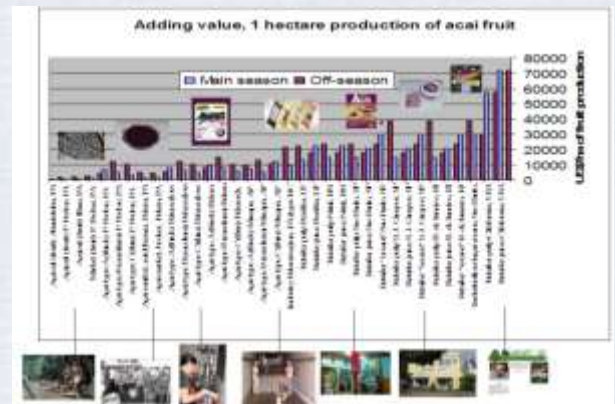
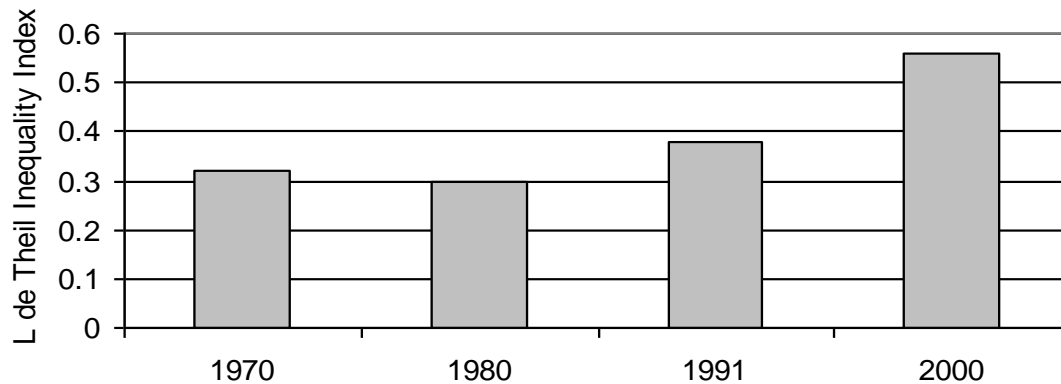
Source: RAIS / MTE, Brasil.

Vicious cycle:

- Increase urban population and demand for services
- Lack of ability to provide urban infrastructure and public goods
- Persistent unemployment

Concentration of Wealth in the Amazon estuary

Inequality in Income Distribution (L de Theil index)
IPEA data
Ponta de Pedras 1970-2000



Forest-based economy

Lack of transformative industries

Value added away from the region

Competitive disadvantage for producers

- Municipalities disconnected from resource economies

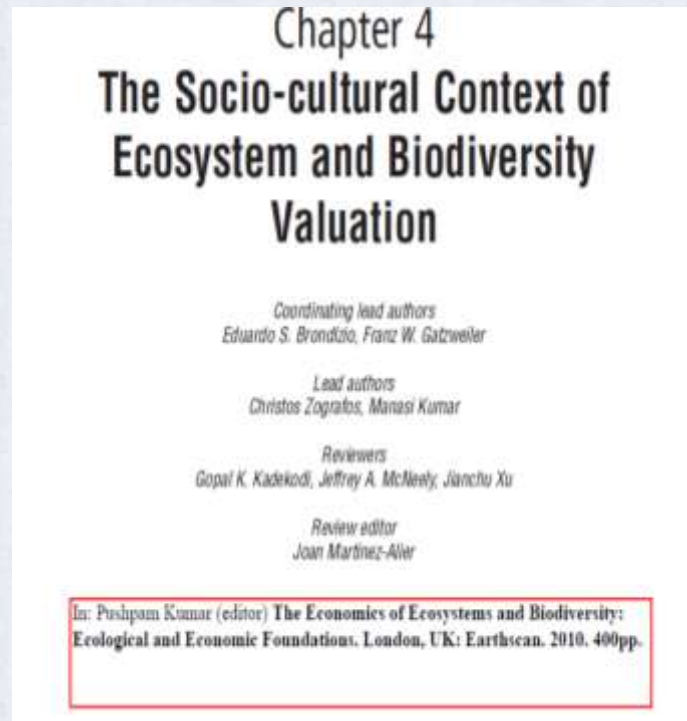
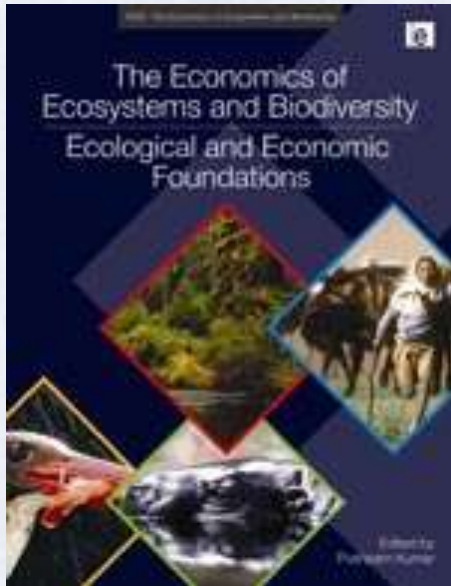
Small Farmers, Food Production, and Security

IBGE Agropastoral Census 2006

- Properties <10ha=2.4% area —————→ 75% of rural employment
- Properties >1000ha=44% area
- Properties > 2000ha > 80% deforested area
- Small farmers: 24% agropastoral area (% national prod):
 - -87% Manioc -38% Coffee -21% Wheat
 - -70% Beans -34% Rice -16% Soybean
 - -46% Corn -58% Milk



Limitations of Ecosystem Services Valuation



- Contrasting cultural perspectives to nature
- Long-term implications of commodifying nature as property
- Resource value aggregated outside the region
- Local efforts undermined by regional changes