Brazilian Atlantic Rainforest: integrating biodiversity, history and socioeconomic aspects

Prof. CARLOS ALFREDO JOLY

State University of Campinas/UNICAMP

BIOTA FAPESP
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Transformative Research: Interactions Between Social Sciences, Humanities and Environmental Science
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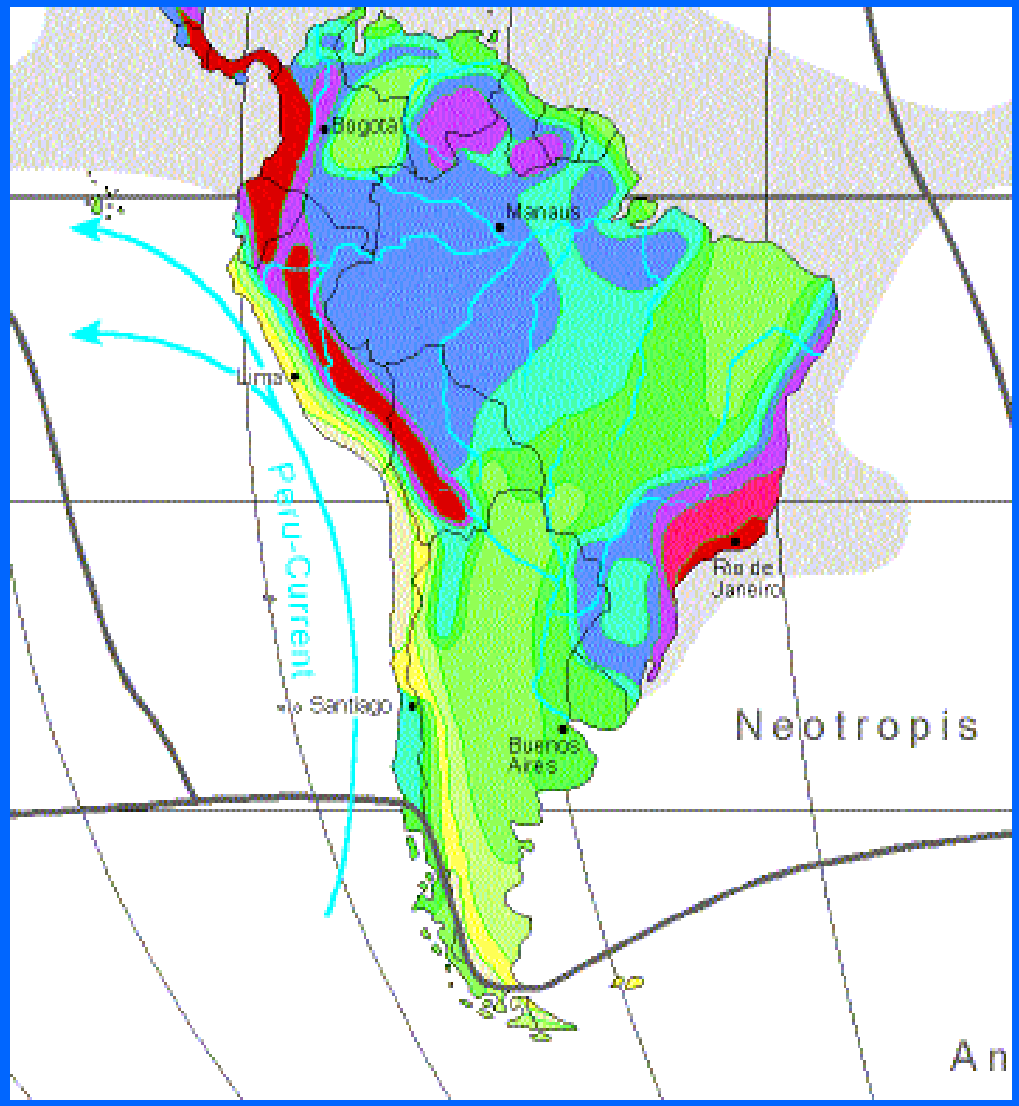
Original Cover :
1.306.421 km²

15% of Brazilian territory



Diversity Zones (DZ): Number of species per 10.000km^2

- DZ 1 (<100)
- DZ 2 (100 - 200)
- DZ 3 (200 - 500)
- DZ 4 (500 - 1000)
- DZ 5 (1000 - 1500)
- DZ 6 (1500 - 2000)
- DZ 7 (2000 - 3000)
- DZ 8 (3000 - 4000)
- DZ 9 (4000 - 5000)
- DZ 10 (≥5000)

The origin of the subparallel mountain systems which compose the coastal Serra do Mar and the inland Serra da Mantiqueira is related to the Cretaceous-Tertiary boundary (K/T)., about 65 million years ago.

Present high biodiversity of the Atlantic Forest of Brazil originated and has been shaped by complex interactions between ancient geological events and more recent evolutionary processes.

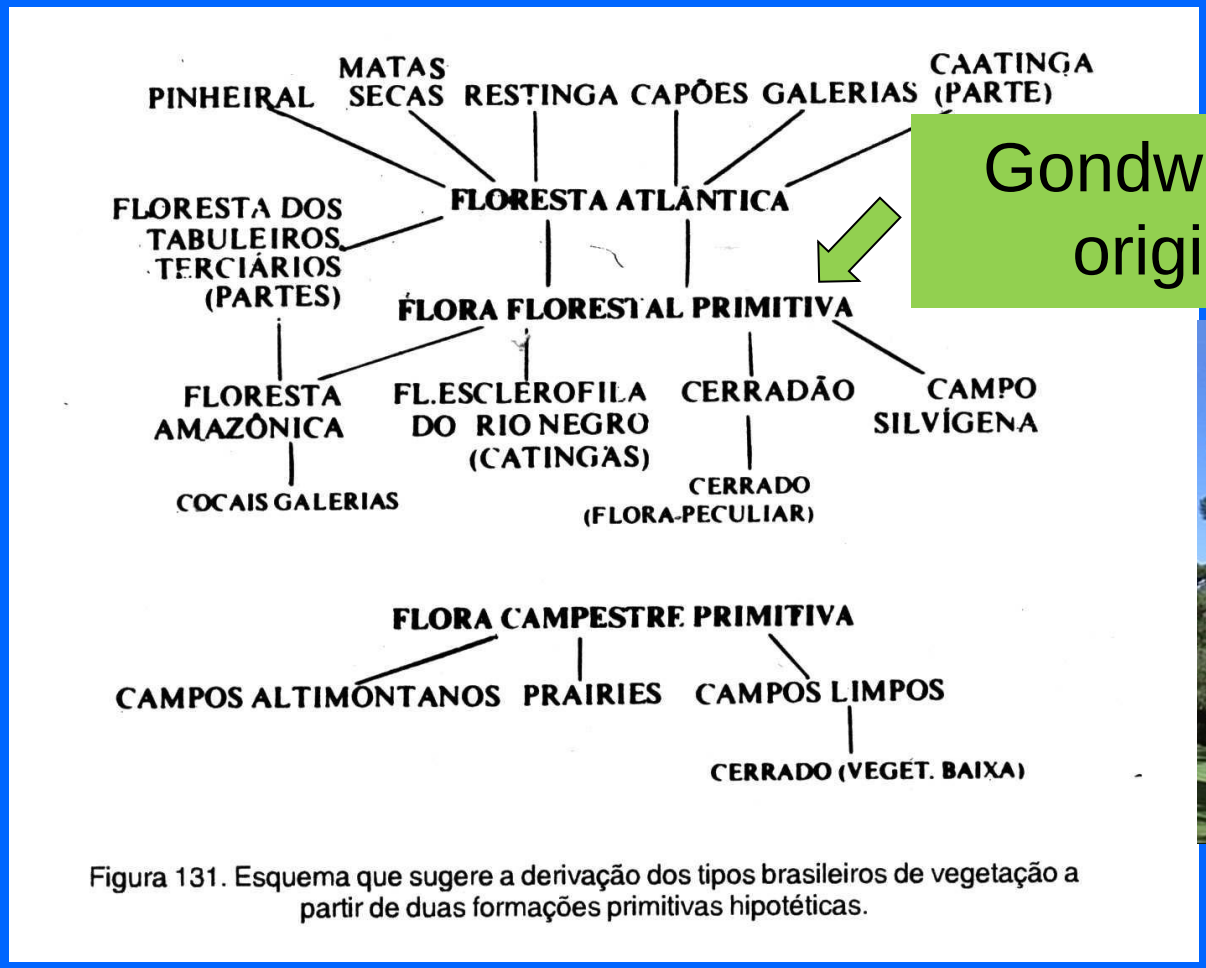


Figura 131. Esquema que sugere a derivação dos tipos brasileiros de vegetação a partir de duas formações primitivas hipotéticas.

Gondwanic origin

ATLANTIC FOREST ENDEMIC FAUNA

	TOTAL	ENDEMIC
Mammals	270	**51**
Birds	850	**160**
Reptiles	200	**143**
Amphibians	370	**163**
Fish	350	**133**
Invertebrate	unknown	**unknown**

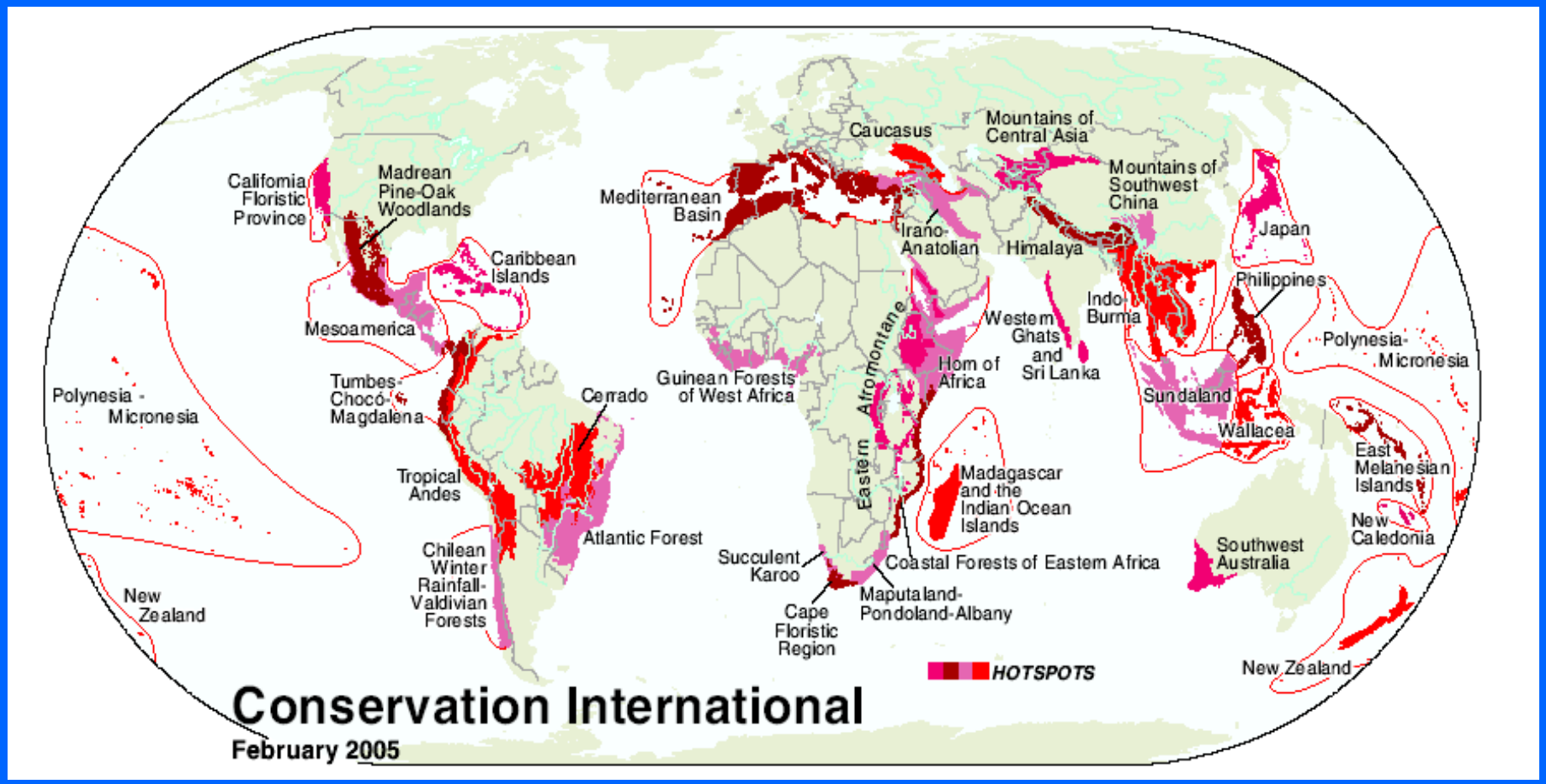
ATLANTIC FOREST ENDEMIC PLANTS

≈ 5.000 endemic species




BROMELIAD	74%
PALMS	64%
BAMBOOS (Taquaras)	75%
TREES	53%

Biodiversity hotspots

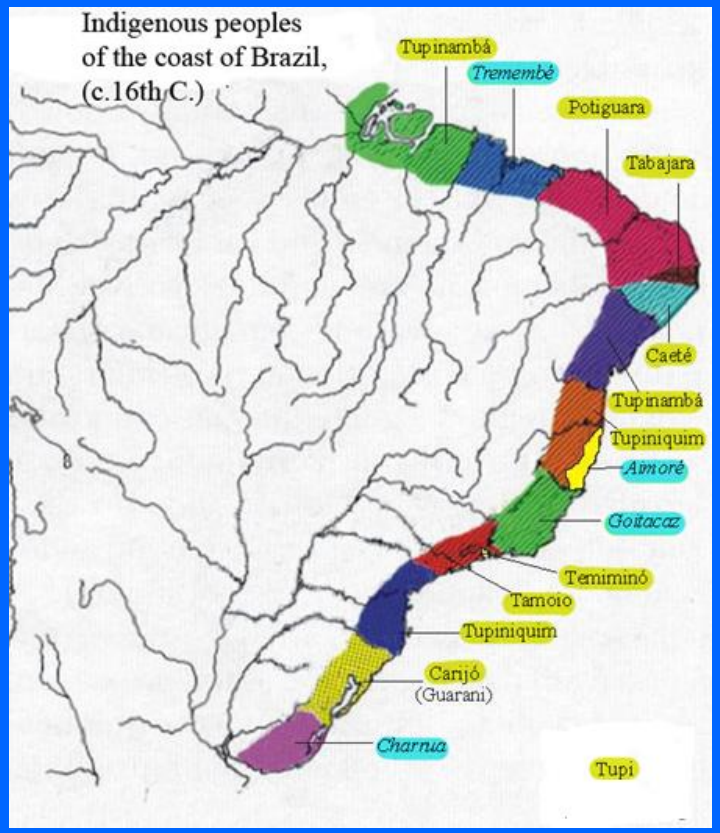


To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must meet two strict criteria: it must contain at least 0.5% or 1,500 species of vascular plants as endemics, and it has to have lost at least 70% of its primary vegetation. Around the world, 35 areas qualify under this definition, and these sites support nearly 60% of the world's plant, bird, mammal, reptile, and amphibian species, with a very high share of endemic species.

Sambaquis ≈ 8.000

Sambaquis are the first archaeological sites considered as such in Brazilian historiography, and long ago have been identified as remnants of various indigenous activities, such as fishing stations, mollusks collection, burial and rituals. Researchers believe that they have started to be built by an ancient culture of fisher-gatherer maybe since the beginning of Holocene. It should be noted that the **shellmounds** of North and Northeast regions of the Country correspond to other archaeological culture and should be considered apart.

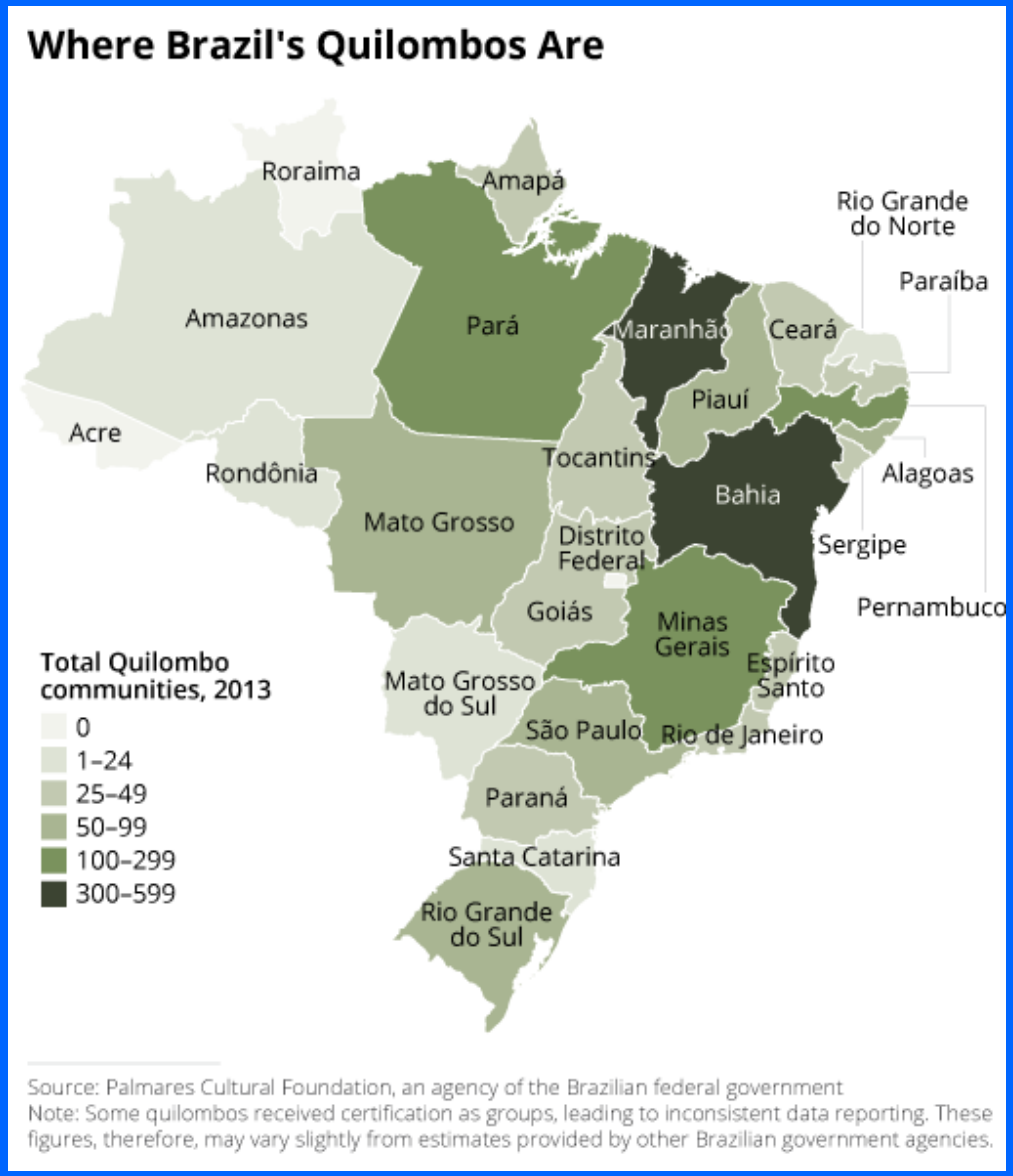
The **Tupí people** inhabited almost all of Brazil's coast when the Portuguese first arrived there. They were divided into tribes, each tribe numbering from 300 to 2,000 people. Some examples of these tribes are: **Tupiniquim**, **Tupinambá** (that together in the early 1500 formed the **Tamoios Confederation**), **Potiguara**, **Tabajara** and **Caetés**.



The **Tupí** utilized **agriculture** growing cassava, corn, sweet potatoes, beans, peanuts, tobacco, squash, cotton and many others. There was not a unified Tupí identity despite the fact that they were a single ethnic group that spoke a common language.

Major Brazilian economic cycles

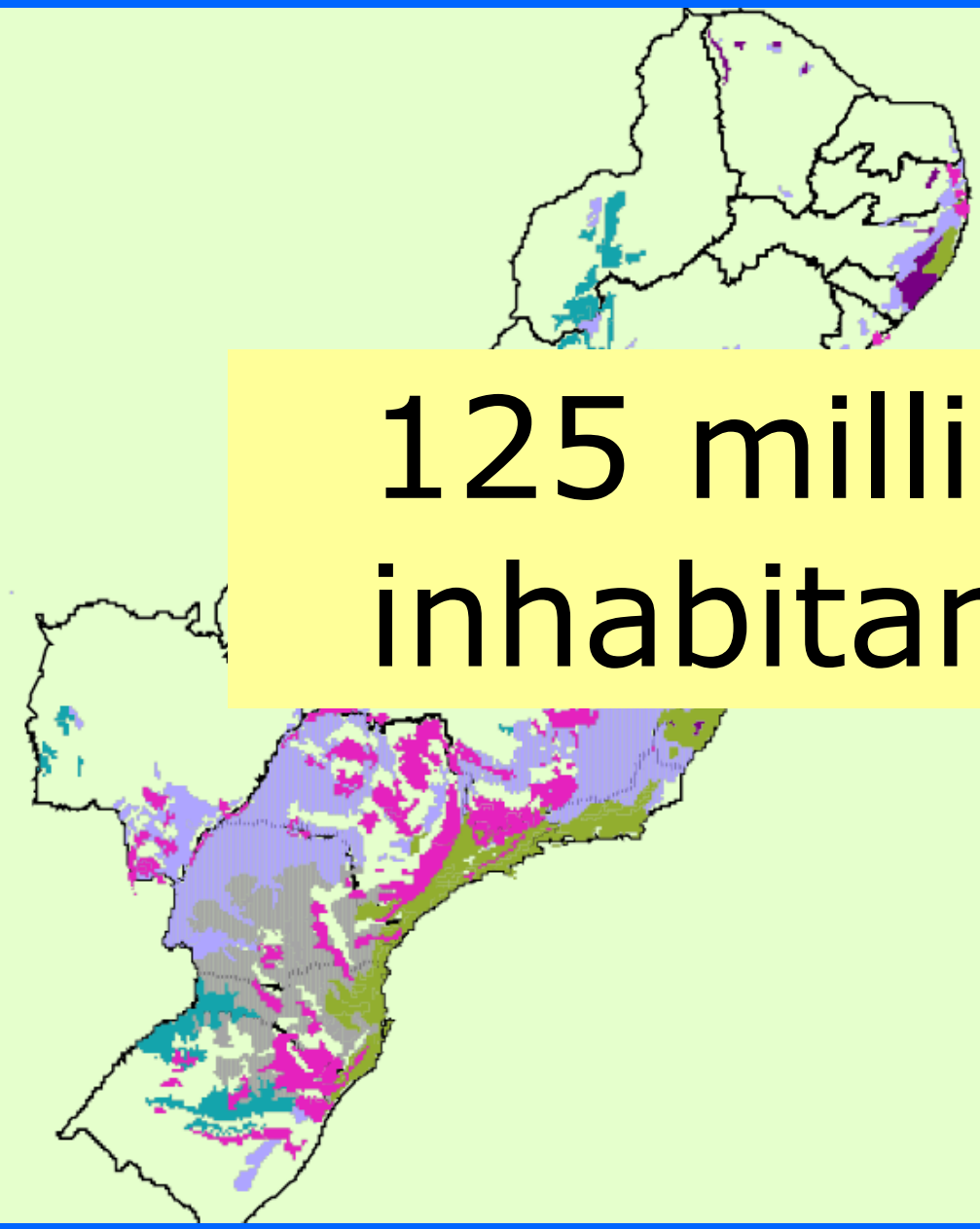
- Brazilwood extraction ≈ 1500
- Sugar cane ≈ 1530 – max 1650
- Gold & diamond ≈ 1600 max 1750
- Coffee ≈ 1800 – max 1929
- Urban expansion ≈ 1920 – ongoing
- New sugar cane cycle ≈ 1973 – ongoing
- Paper & cellulose cycle ≈ 1990 ongoing



In Colonial Brazil, the African slaves that managed to escape from their owners started to constitute hidden communities in the woods, known as **quilombos**.

While quilombos have existed for hundreds of years, only in recent decades have they intensified their efforts to gain title to their lands.

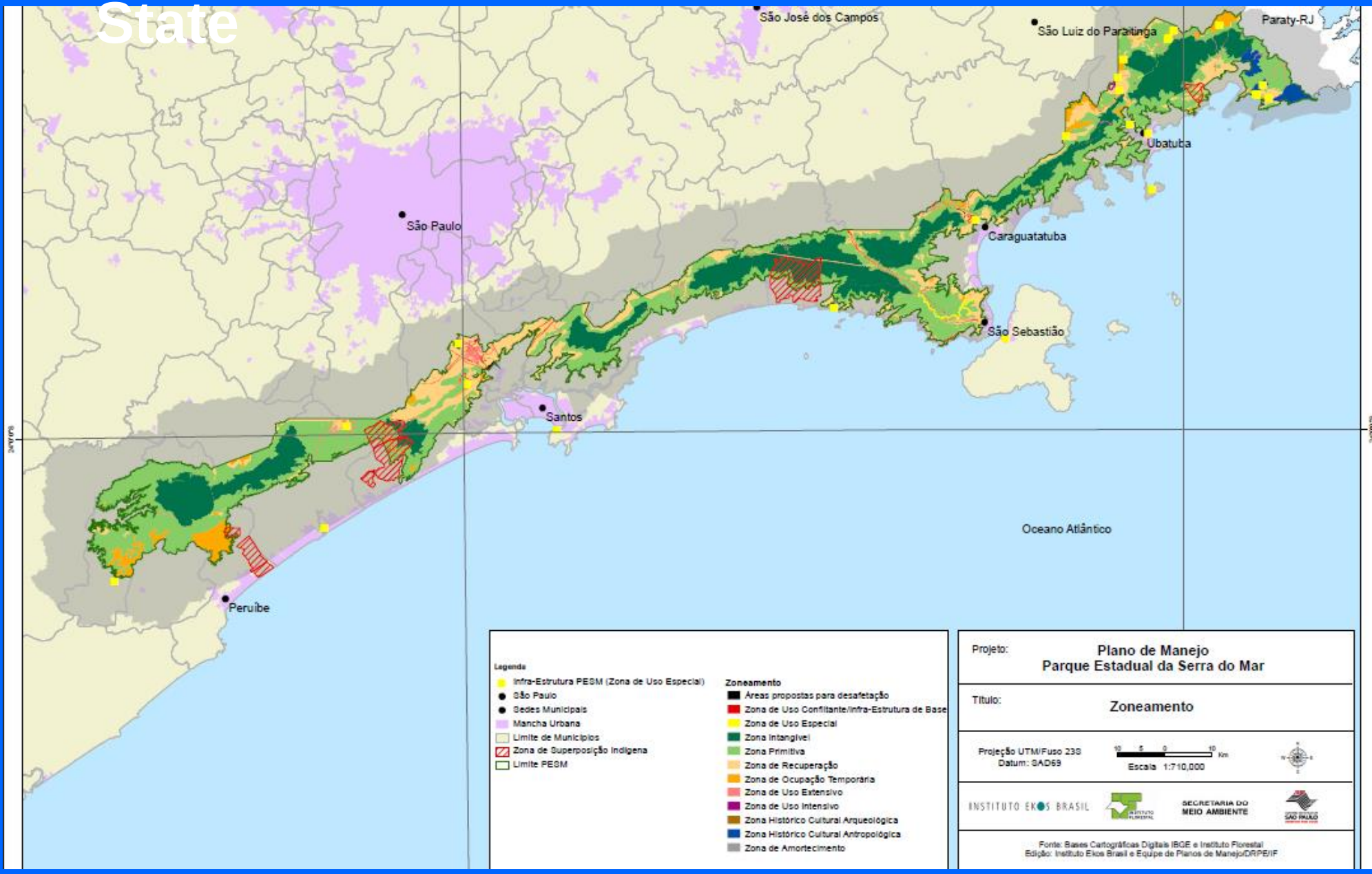
The definition of quilombos lies at the core of debates over the application of laws granting land rights to these communities. While quilombo representatives and advocates continue to seek an expansive definition that accommodates the historical diversity of quilombos, those groups with interests in conflict with the rights of quilombo communities seek to restrict the understanding of what constitutes a quilombo.



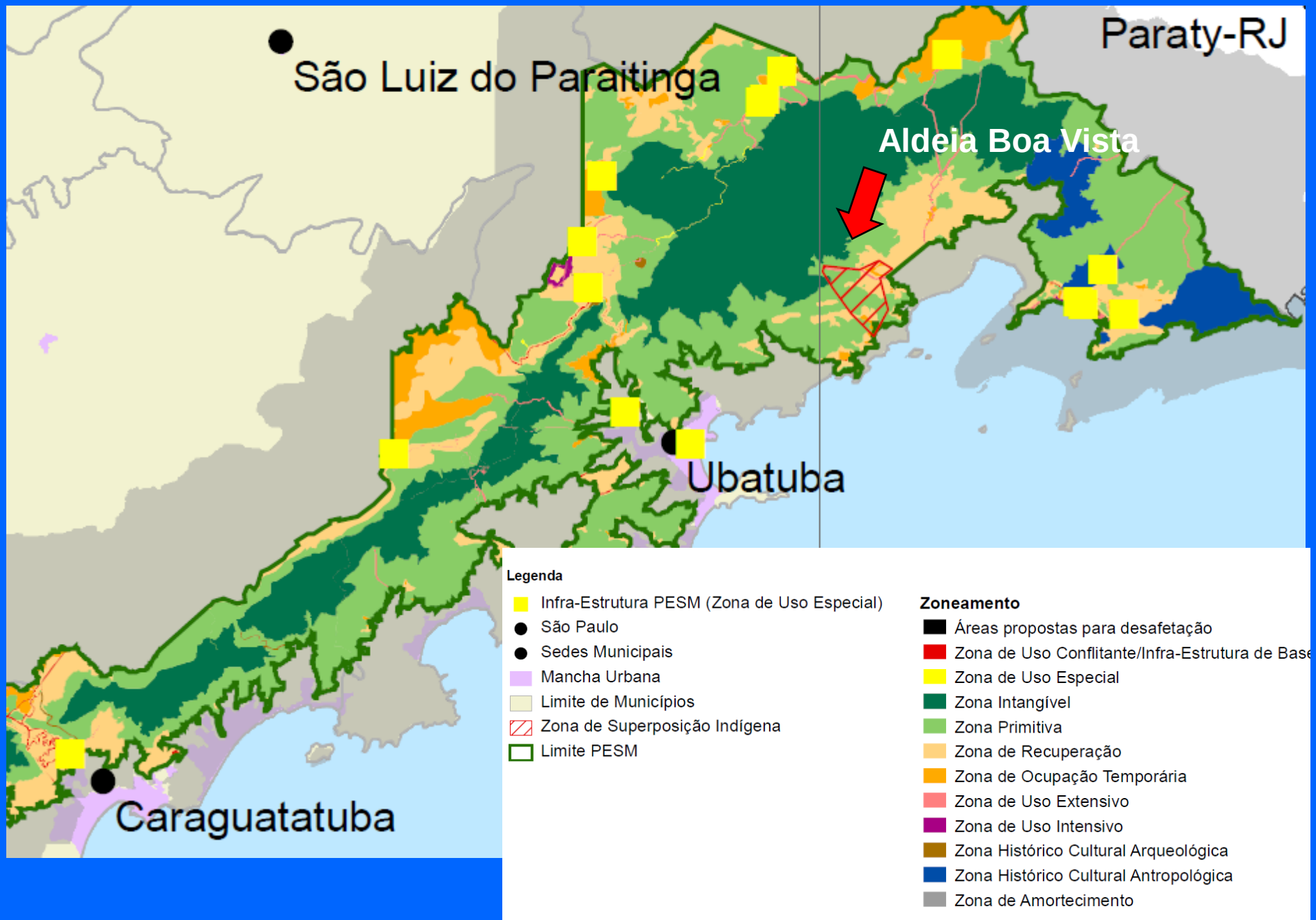
125 million inhabitants

Phytophysiognomy	km²
Ombrófila Mista	168.916
Ombrófila Aberta	18.746
nsa	218.790
cid.	486.500
al	149.052
Form. Florestais	1.041.998
Tensão Ecológica	157.747
Form. Pioneiras	41.105
DMA	1.306.421

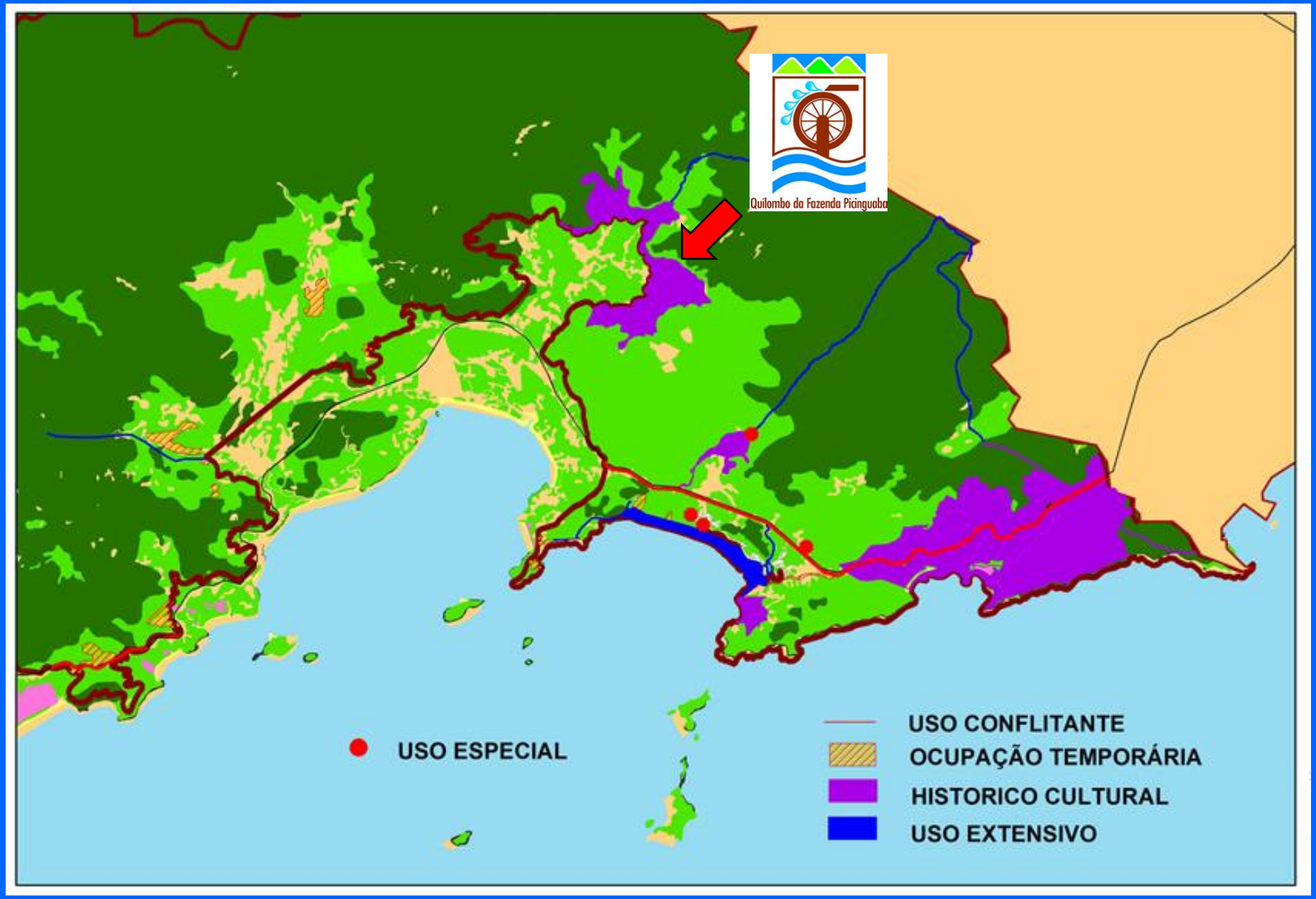
Serra do Mar State Park/PESM, São Paulo State



Nucleus Caraguatatuba, Picinguaba and Santa Virginia/PESM



Nucleus Picinguaba/PESM



Caraguatatuba Demographic growth

TABELA 1
População urbana e taxas de crescimento da população urbana
Municípios do litoral norte paulista– 1970-2010

Municípios	População urbana					Taxas de crescimento (% a.a.)			
	1970	1980	1991	2000	2010	1970/ 1980	1980/ 1991	1991/ 2000	2000/ 2010
Ubatuba	9.083	24.673	46.333	65.195	76.907	10,51	5,90	3,87	1,67
Caraguatatuba	13.121	33.215	52.729	75.251	96.673	9,73	4,29	4,03	2,62
Ilhabela	5.434	7.571	13.286	20.589	28.002	3,37	5,25	4,99	3,12
São Sebastião	11.259	18.598	33.702	57.452	73.109	5,15	5,55	6,11	2,42
Litoral norte	**38.897**	**84.057**	**146.050**	**218.487**	**274.691**	**8,01**	**5,15**	**4,58**	**2,34**

Fonte: IBGE. Sistema IBGE de Recuperação Automática – Sidra. Dados atualizados em 02/2011.

Caraguatatuba Urban sprawl

O crescimento da mancha urbana de Caraguatatuba seguiu, basicamente, dois vetores: um longitudinal, ao longo da rodovia SP-55, em paralelo à orla marítima, e outro vetor transversal, da orla marítima em direção à Serra do Mar. Esse padrão é verificado em outros municípios do litoral paulista cuja urbanização se encaixa nas planícies localizadas entre o mar e as montanhas.

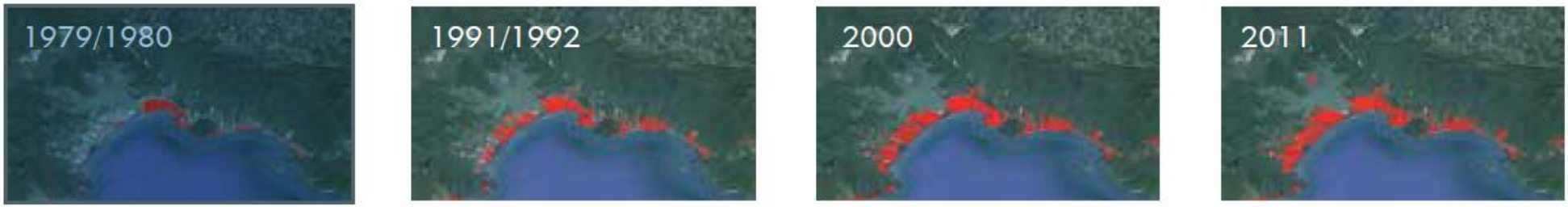
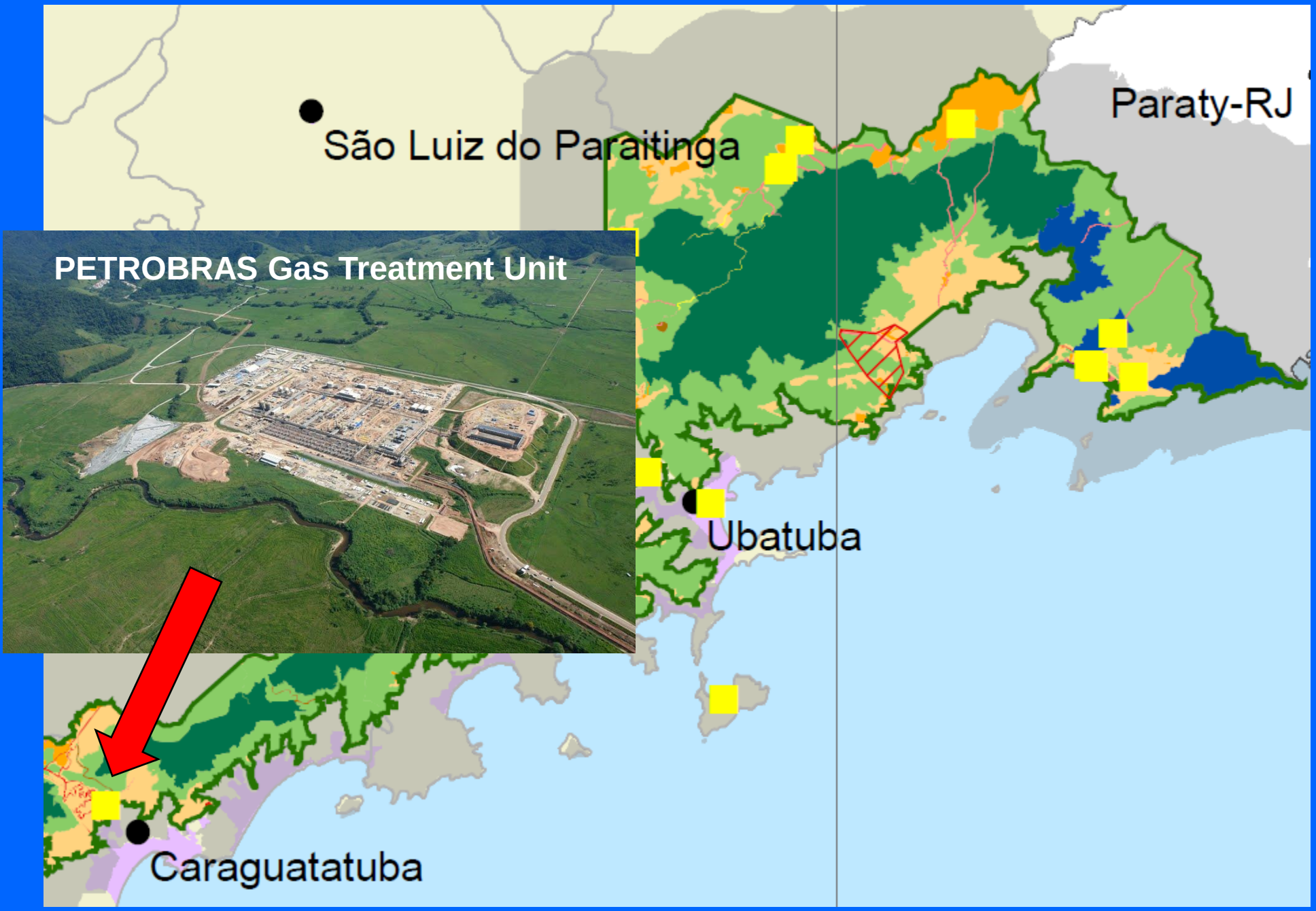
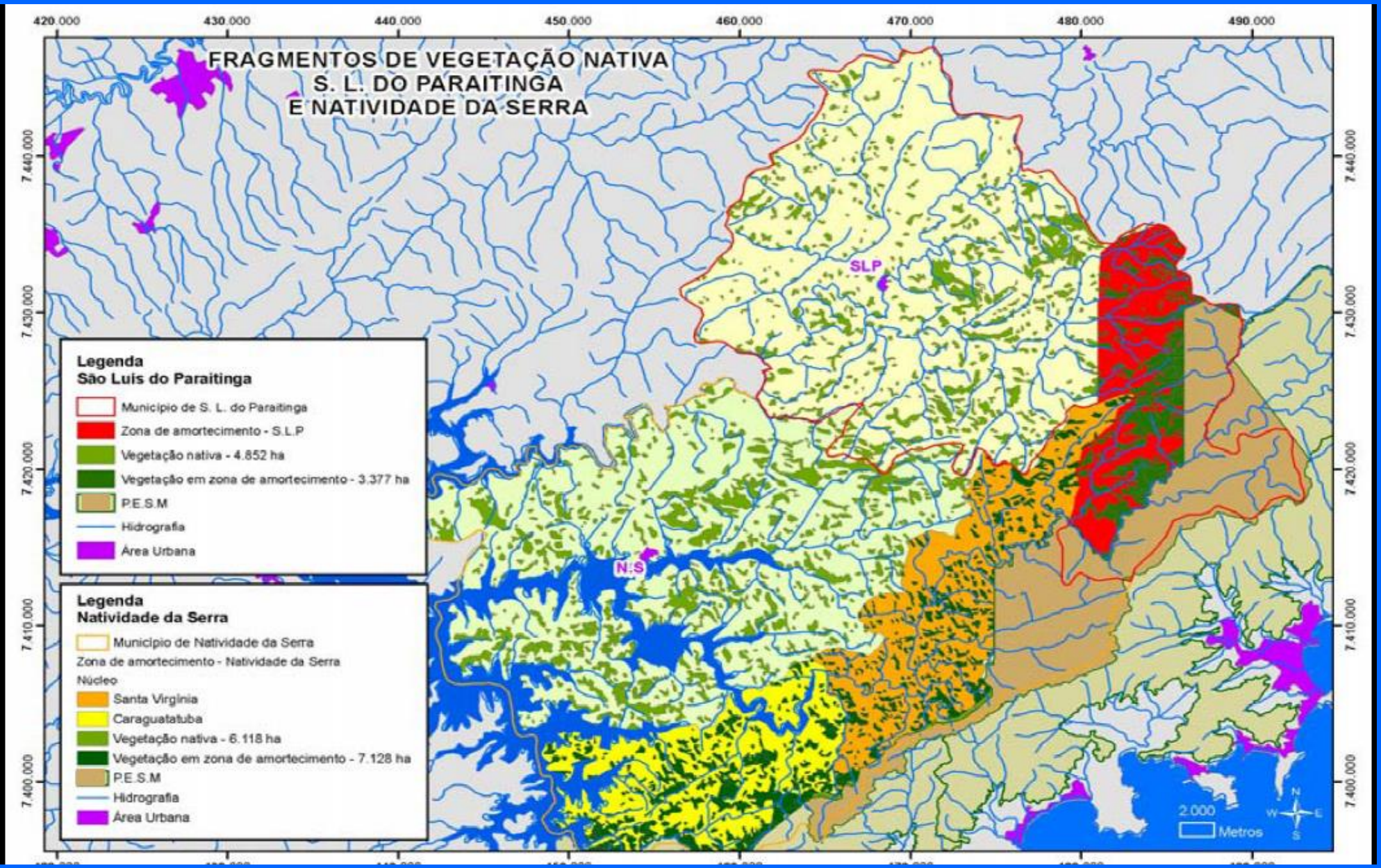


FIGURA 1
Fonte: Imagens Landsat 1979/1980, 1981/1982, 2000, Google earth, 2011. Elaboração: Instituto Pólis

Nucleus Caraguatatuba/PESM



Nucleus Santa Virginia/PESM



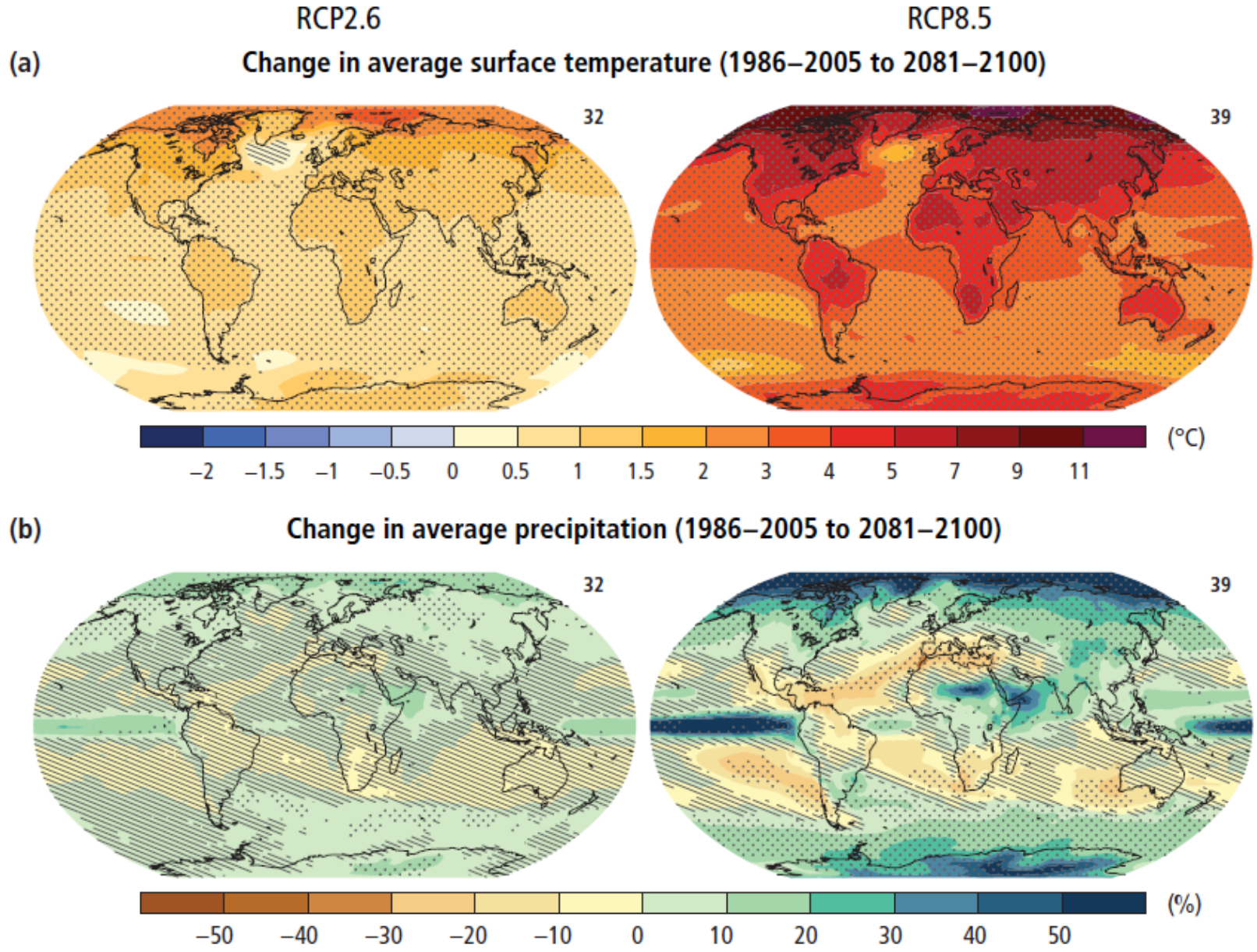
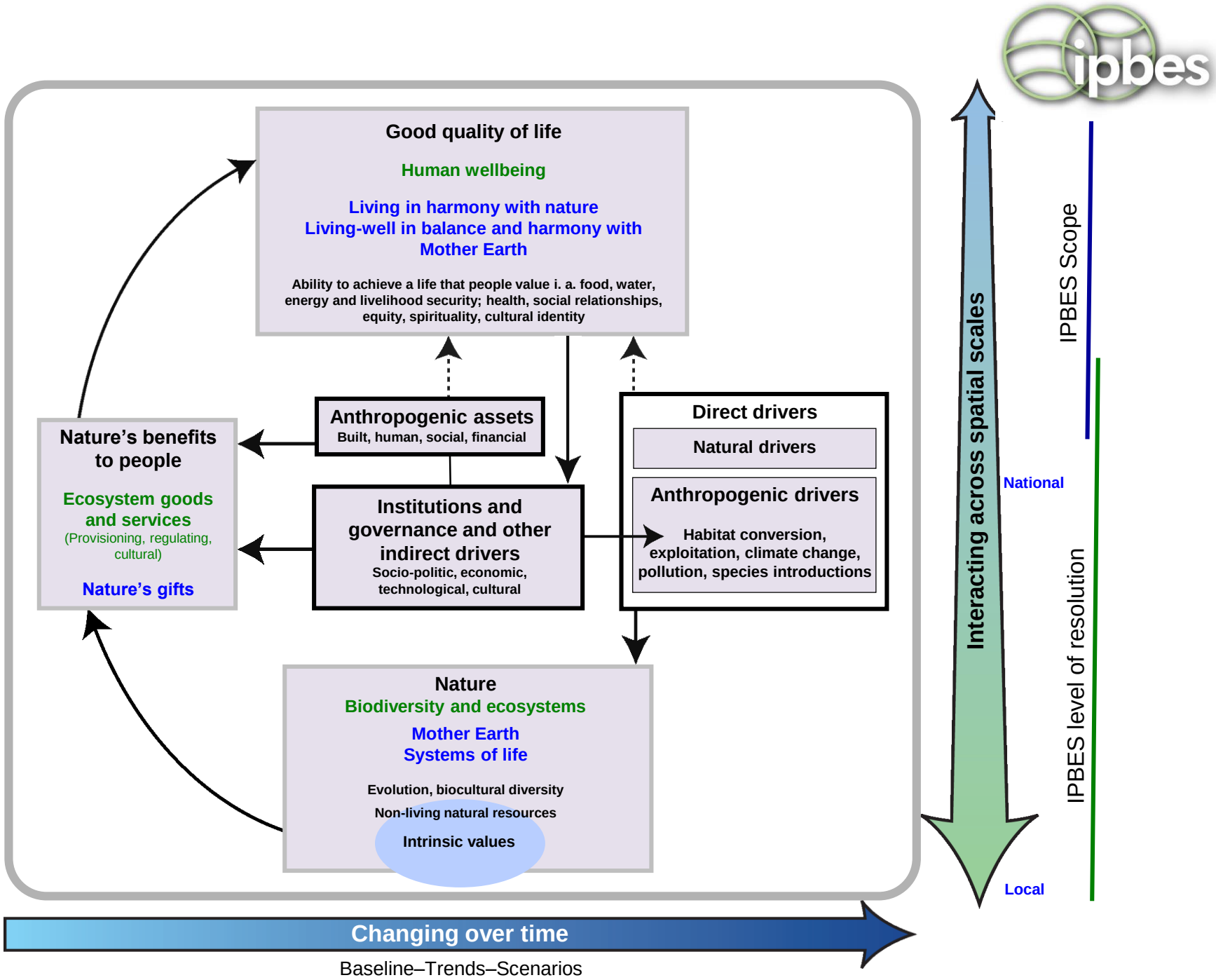


Figure SPM.7 | Change in average surface temperature **(a)** and change in average precipitation **(b)** based on multi-model mean projections for 2081–2100 relative to 1986–2005 under the RCP2.6 (left) and RCP8.5 (right) scenarios. The number of models used to calculate the multi-model mean is indicated in the upper right corner of each panel. Stippling (i.e., dots) shows regions where the projected change is large compared to natural internal variability and where at least 90% of models agree on the sign of change. Hatching (i.e., diagonal lines) shows regions where the projected change is less than one standard deviation of the natural internal variability.

So, in this region, to carry out police relevant research in biodiversity conservation you need to integrate all these information, understanding the synergies and the antagonisms among them.

A good example is the **Conceptual Framework** of the **Intergovernmental Platform on Biodiversity and Ecosystem Services/IPBES, a powerful tool not only for share working understanding across different disciplines, but also across different knowledge systems.**


Good quality of life
Human wellbeing
Living in harmony with nature
Living-well in balance and harmony with Mother Earth
Ability to achieve a life that people value i. a. food, water, energy and livelihood security; health, social relationships, equity, spirituality, cultural identity
Nature's benefits to people
Ecosystem goods and services
(Provisioning, regulating, cultural)
Nature's gifts
Anthropogenic assets
Built, human, social, financial
Institutions and governance and other indirect drivers
Socio-politic, economic, technological, cultural
Direct drivers
Natural drivers
Anthropogenic drivers
Habitat conversion, exploitation, climate change, pollution, species introductions
Nature
Biodiversity and ecosystems
Mother Earth
Systems of life
Evolution, biocultural diversity
Non-living natural resources
Intrinsic values
Interacting across spatial scales
National
Local
IPBES Scope
IPBES level of resolution
Changing over time
Baseline–Trends–Scenarios

In IPBES Conceptual Framework, **labels in green denote the categories of science**, **labels in blue denote equivalent, or similar categories according to other knowledge systems.** The **blue** and **green** labels are illustrative, there could be more examples. **The headlines in black are the inclusive, trans-cultural categories that embrace them and are used in multilateral agreements**, and that should resonate with all stakeholders involved in IPBES.

“Nature” in the context of IPBES refers to the natural world with an emphasis on biodiversity.

Within the context of **science**, it includes categories such as **Biodiversity, Ecosystems, evolution, the biosphere, humankind’s shared evolutionary heritage and biocultural diversity**.

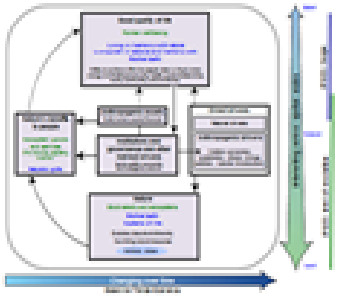
Within the context of **other knowledge** systems, **“nature”** includes different categories for indigenous peoples around the world, such as **Mother Earth** and **Systems of Life**, shared by the indigenous people of the South American Andes, and holistic concepts from the South Pacific islands, which include non-human living organisms, living people, ancestors and holy beings.

The **green** and **blue** categories listed here are **only 2 examples**, there could be more. **But all these categories are included in the broad category of “nature”.**

Science and other knowledge systems

Science-policy interface on biodiversity and ecosystems services

Analytical conceptual framework



IPBES processes, functions, and deliverables

Development and Implementation of the work program

- Knowledge generation
- Assessments
- Policy tools and methodologies
- Capacity building

Deliverables to advise and support policy for decision making

Policy and Decision making

In my view there are five major barriers for interdisciplinary research between natural and social scientists: (a) **trust;** (b) **different value judgement**; (c) **differences in epistemology**; (d) **look at the same phenomenon based in different theories and models**; (e) **willingness to work outside the comfort zone.**


Thank you !