Mudanças climáticas e serviços ecossistêmicos

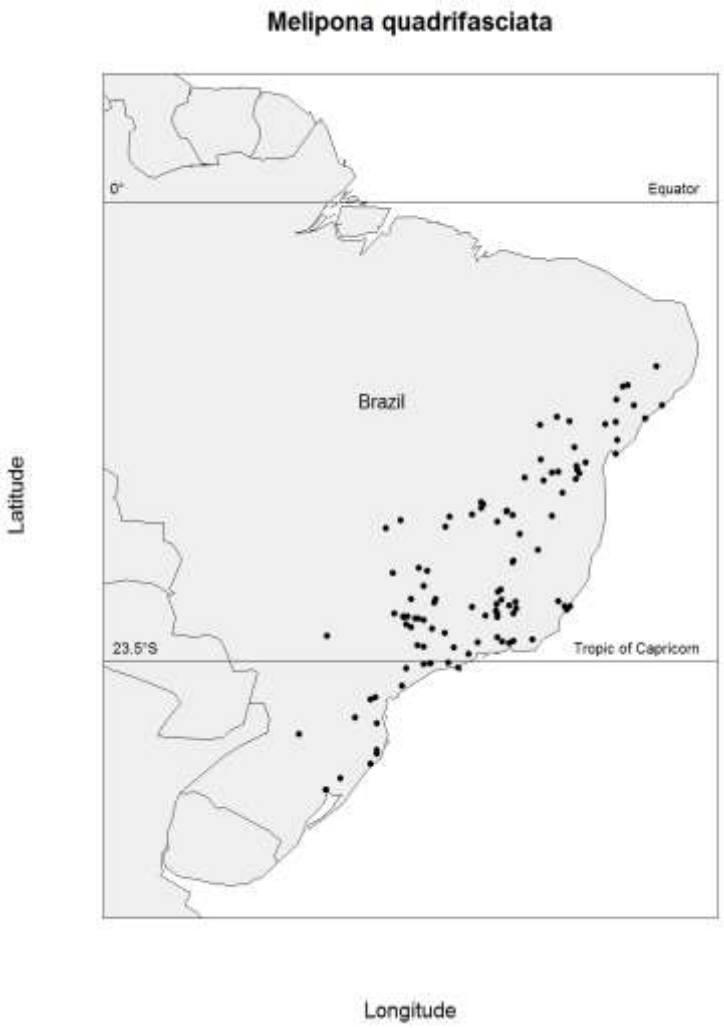
Jean Paul Metzger

Instituto de Biociências, USP

Plano

- Duas histórias
- Os serviços ecossistêmicos e o IPBES
- Cenários de mudanças climáticas e os serviços

Primeira história: a abelha Mandaçaia



ABELHA MANDAÇAIA

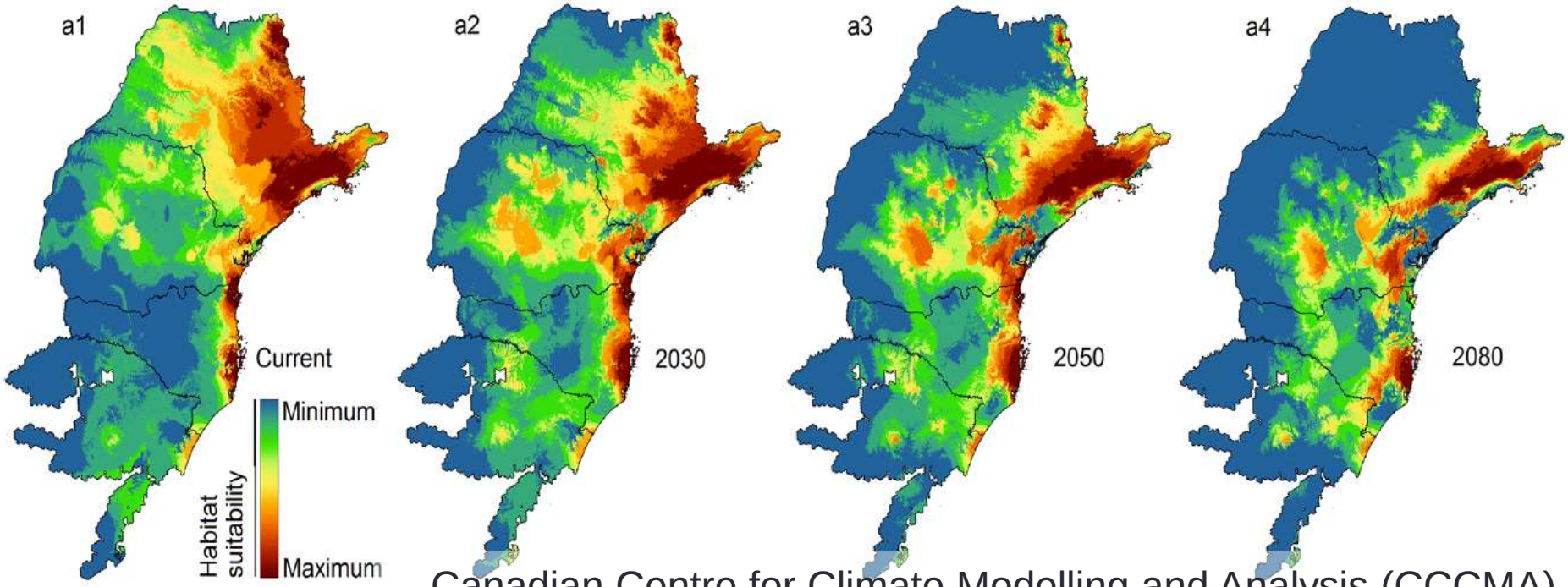
Melipona quadrifasciata

RESEARCH ARTICLE

Safeguarding Ecosystem Services: A Methodological Framework to Buffer the Joint Effect of Habitat Configuration and Climate Change

Tereza C. Giannini[1,2,3]*, Leandro R. Tambosi[1], André L. Acosta[1], Rodolfo Jaffé[1], Antonio M. Saraiva[2], Vera L. Imperatriz-Fonseca[1,3], Jean Paul Metzger[1]

PLOS ONE | DOI:10.1371/journal.pone.0129225 June 19, 2015

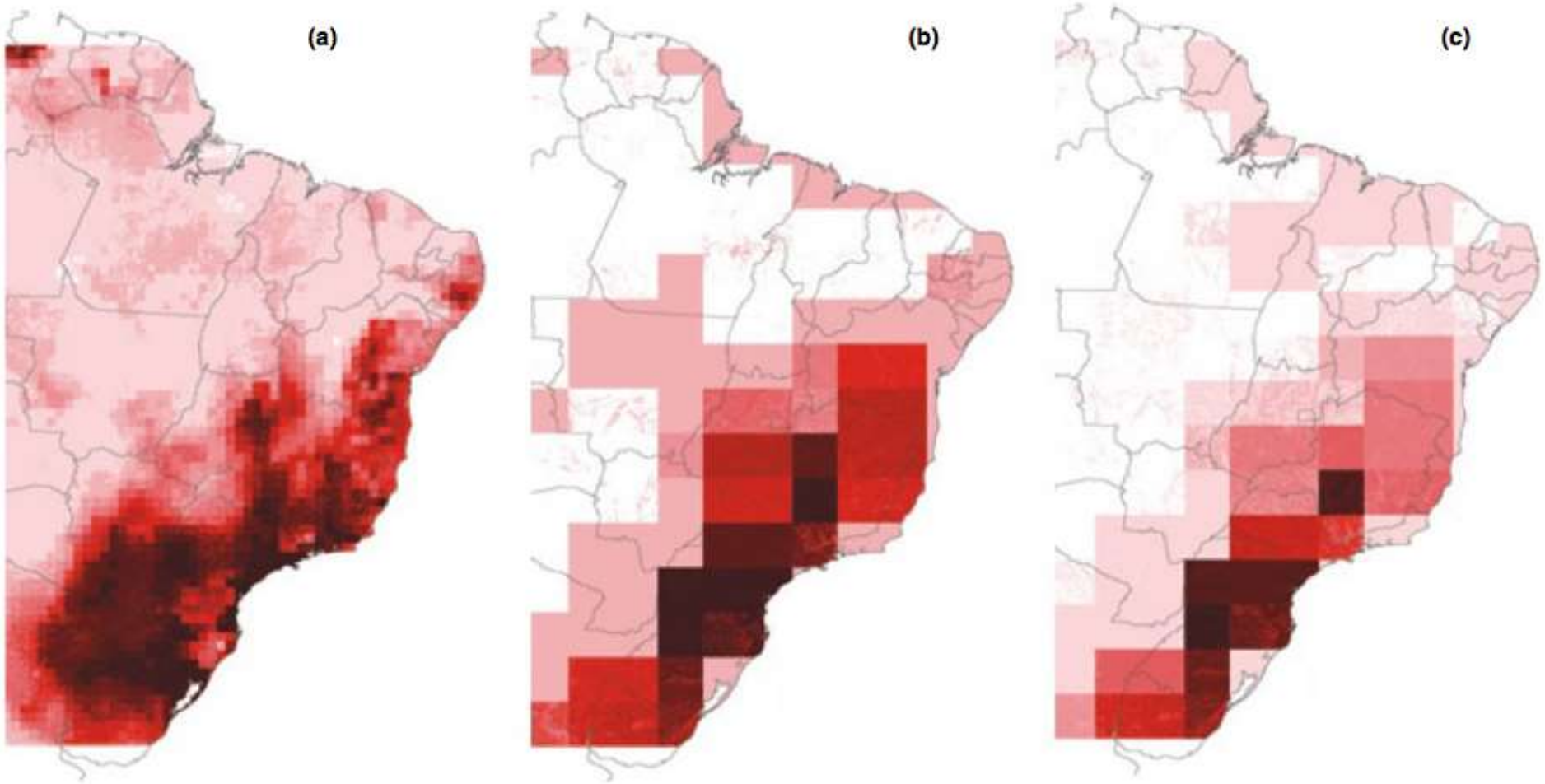


Canadian Centre for Climate Modelling and Analysis (CCCMA)

Cenário atual

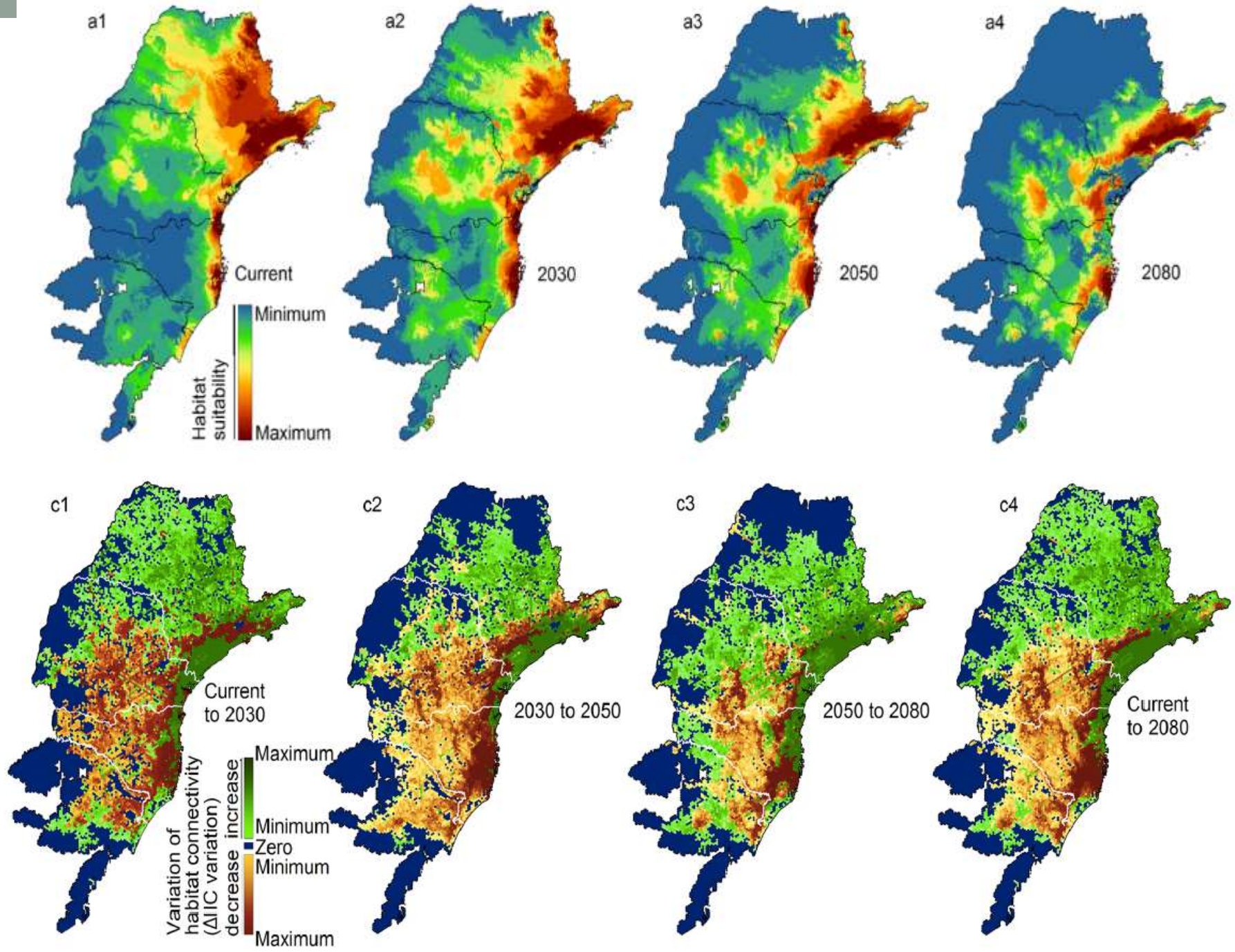
Cenário otimista (2060)

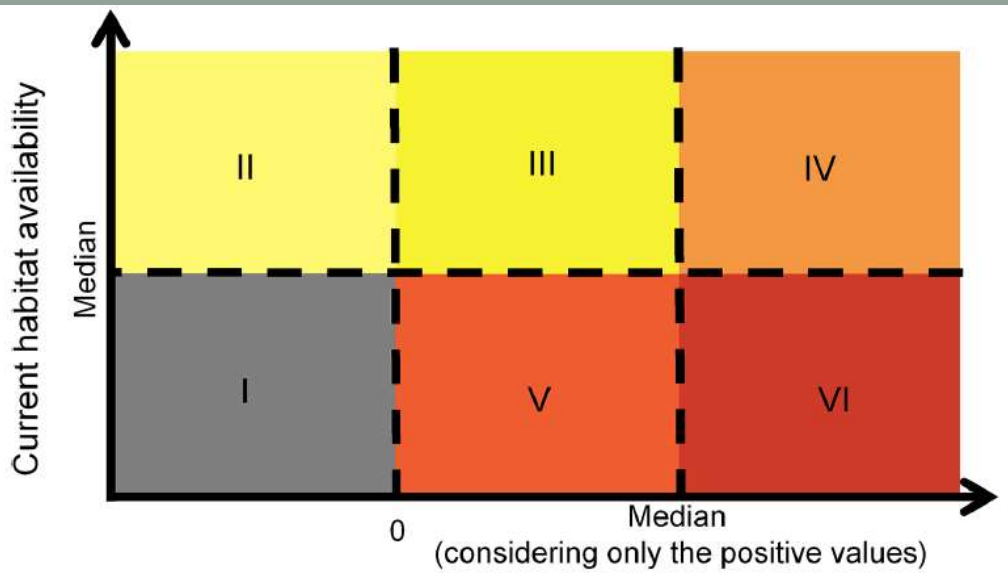
Cenário pessimista (2060)

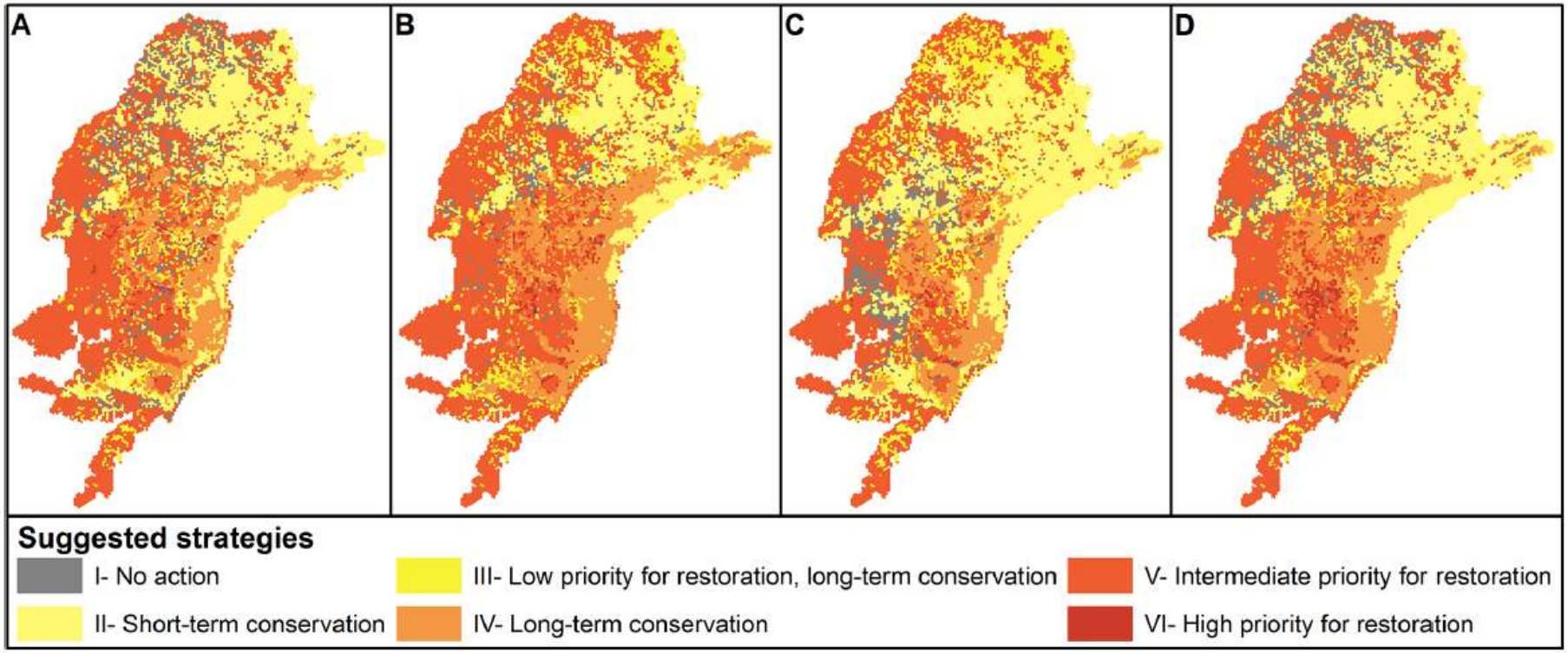


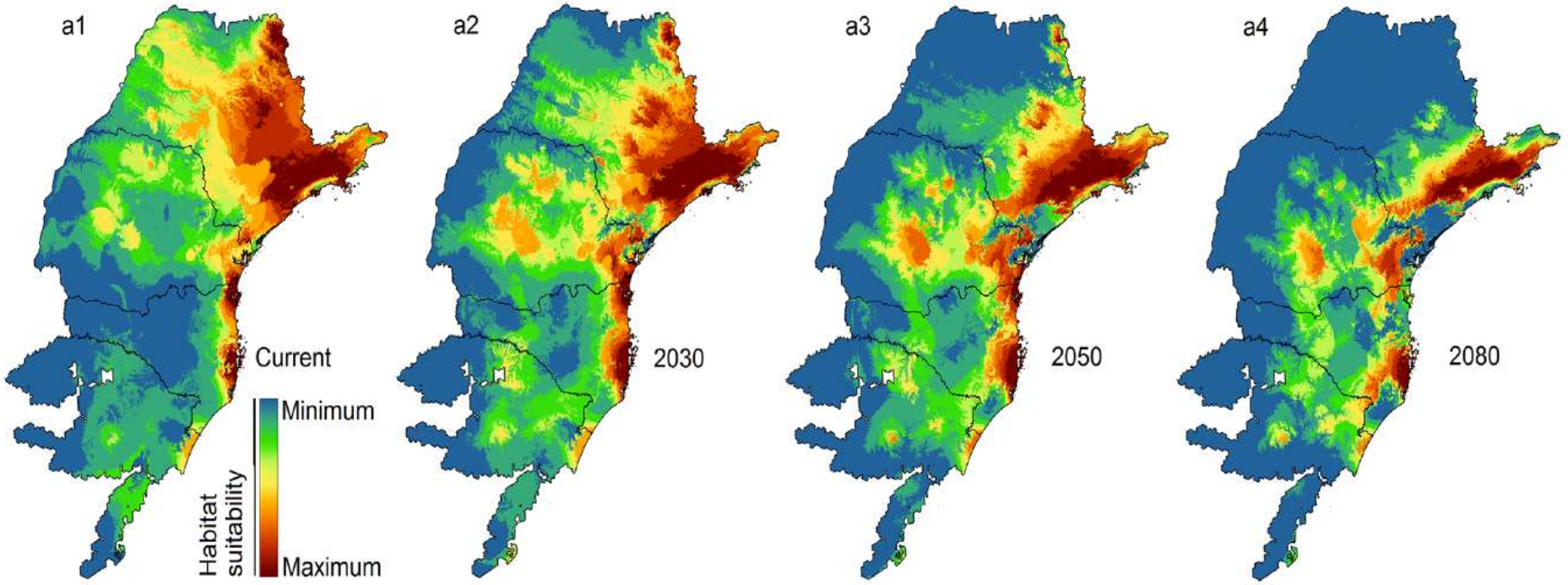
Área potencial de ocorrência de 38 espécies arbóreas da Mata Atlântica

(Colombo & Joly 2010; Joly et al. 2014)


a1
a2
a3
a4
Current
2030
2050
2080
Habitat suitability
Minimum
Maximum
c1
c2
c3
c4
Current to 2030
2030 to 2050
2050 to 2080
Current to 2080
Variation of habitat connectivity (ΔIC variation)
decrease
increase
Maximum
Minimum
Zero
Minimum
Maximum


II
III
IV
I
V
VI
Current habitat availability
Median
0
Median
(considering only the positive values)
Variation in ΔIIC from previous to future conditions


A
B
C
D
Suggested strategies
I- No action
II- Short-term conservation
III- Low priority for restoration, long-term conservation
IV- Long-term conservation
V- Intermediate priority for restoration
VI- High priority for restoration



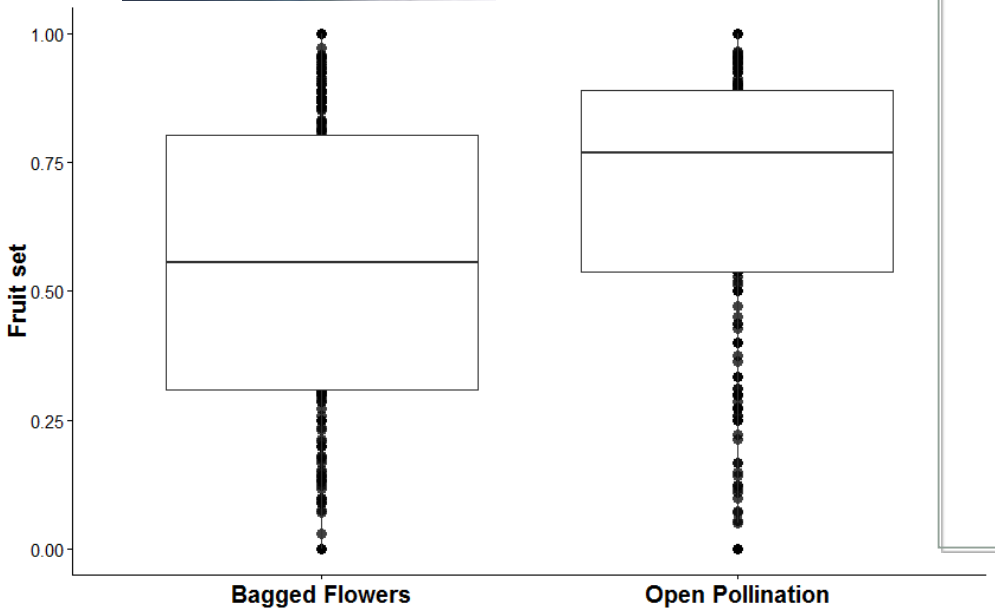
> 200 years of plantation

High production

Export: US$ 3 billion / year

Landscape structure influences bee community and coffee pollination at different spatial scales

Fernanda Teixeira Saturni[a*], Rodolfo Jaffé & Jean Paul Metzger[a]



Perda de US$ 540 millions

➔ Mean increase value is 28%

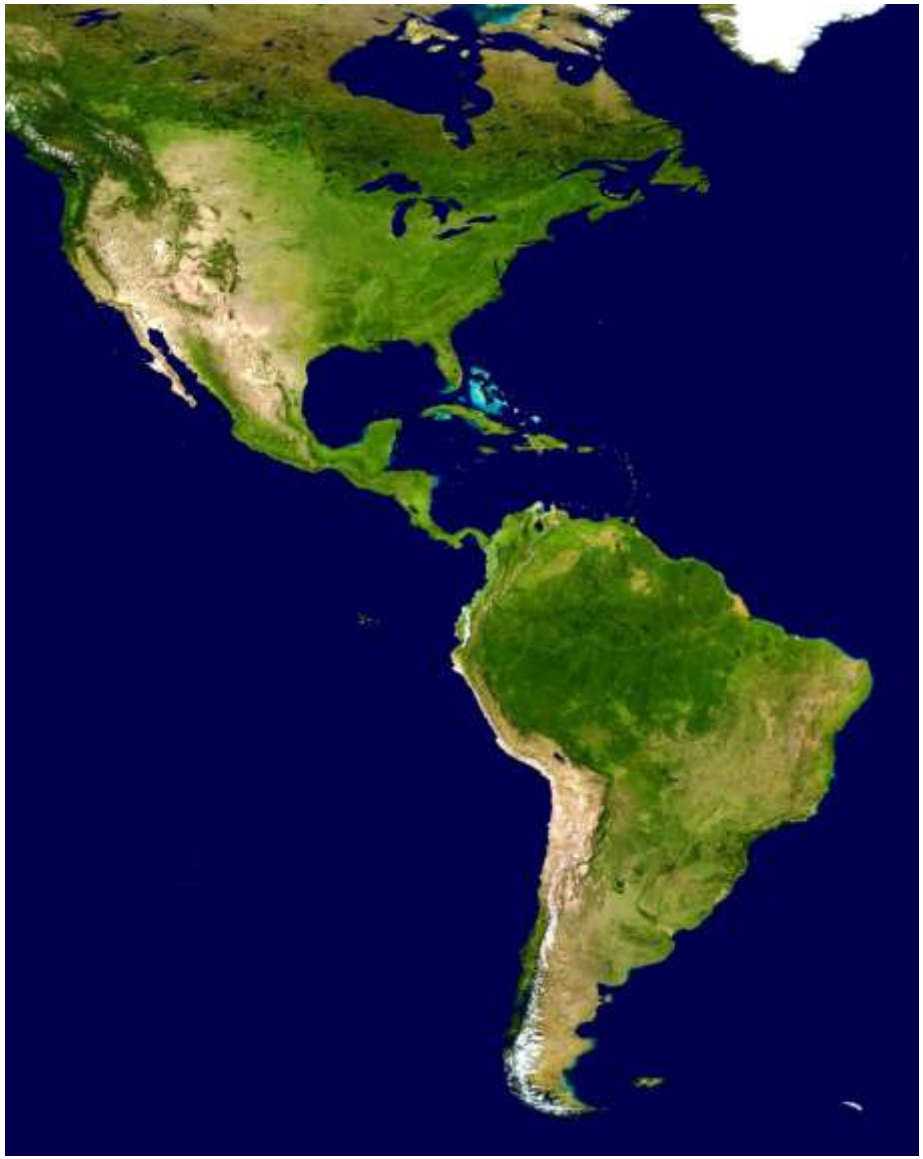
Segunda história: dois pequenos roedores

Necromys lasiurus

Oligoryzomys nigripes

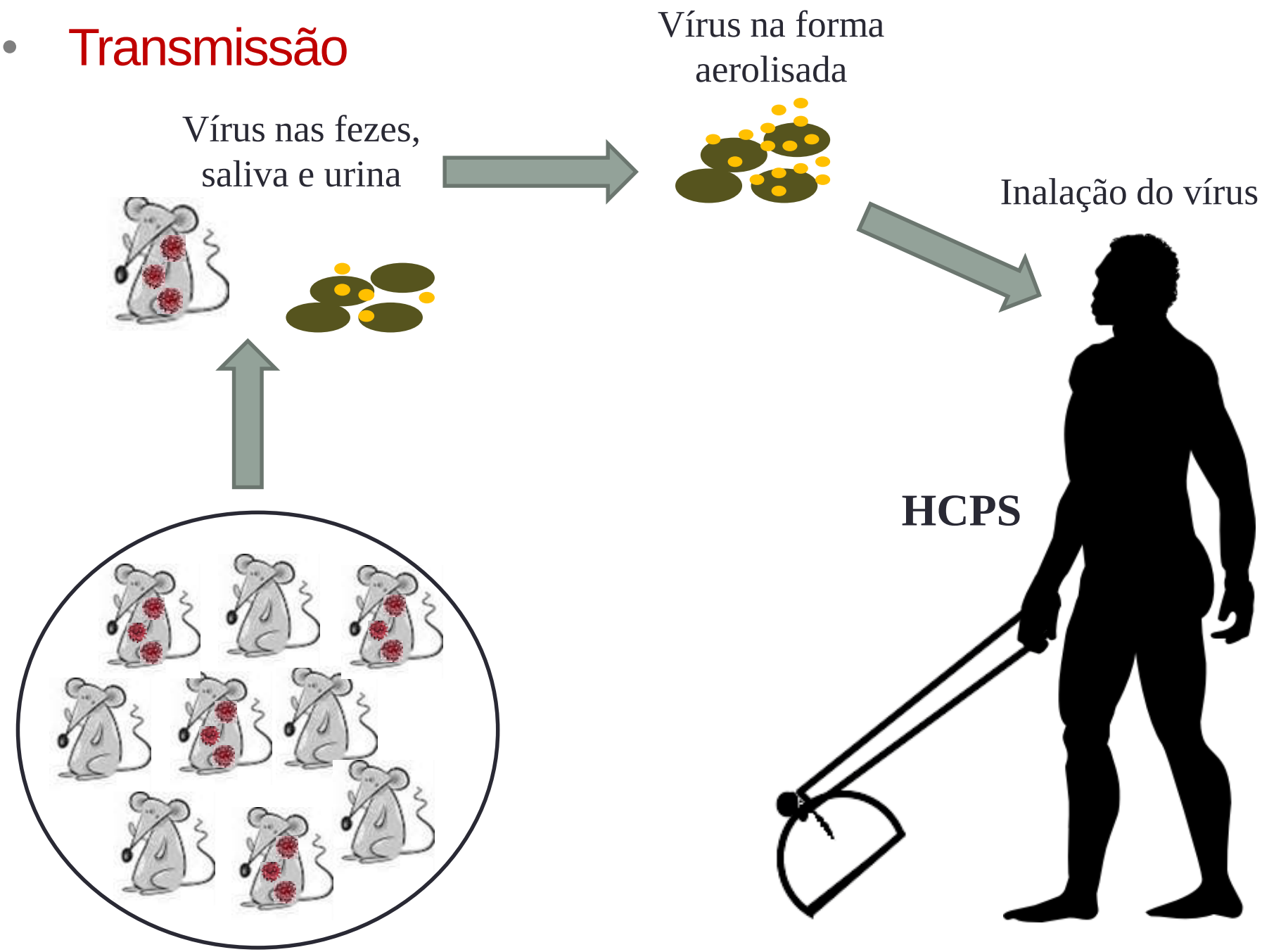
Fonte: Bonvicino *et al*., 2008

Hantavirose



- Síndrome Cardiopulmonar por Hantavírus (HCPS)
- Letalidade: 30% ~ 50%
- Doença rural, agrícola ou peri- urbana

- Transmissão



Perda e fragmentação de habitat

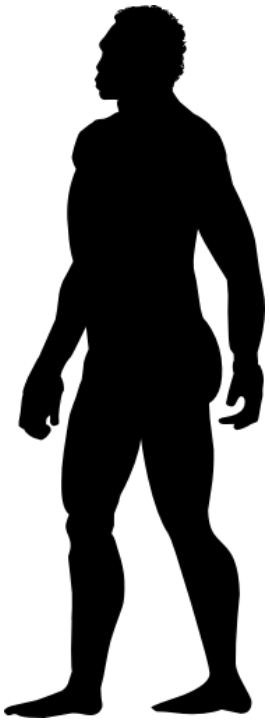
+

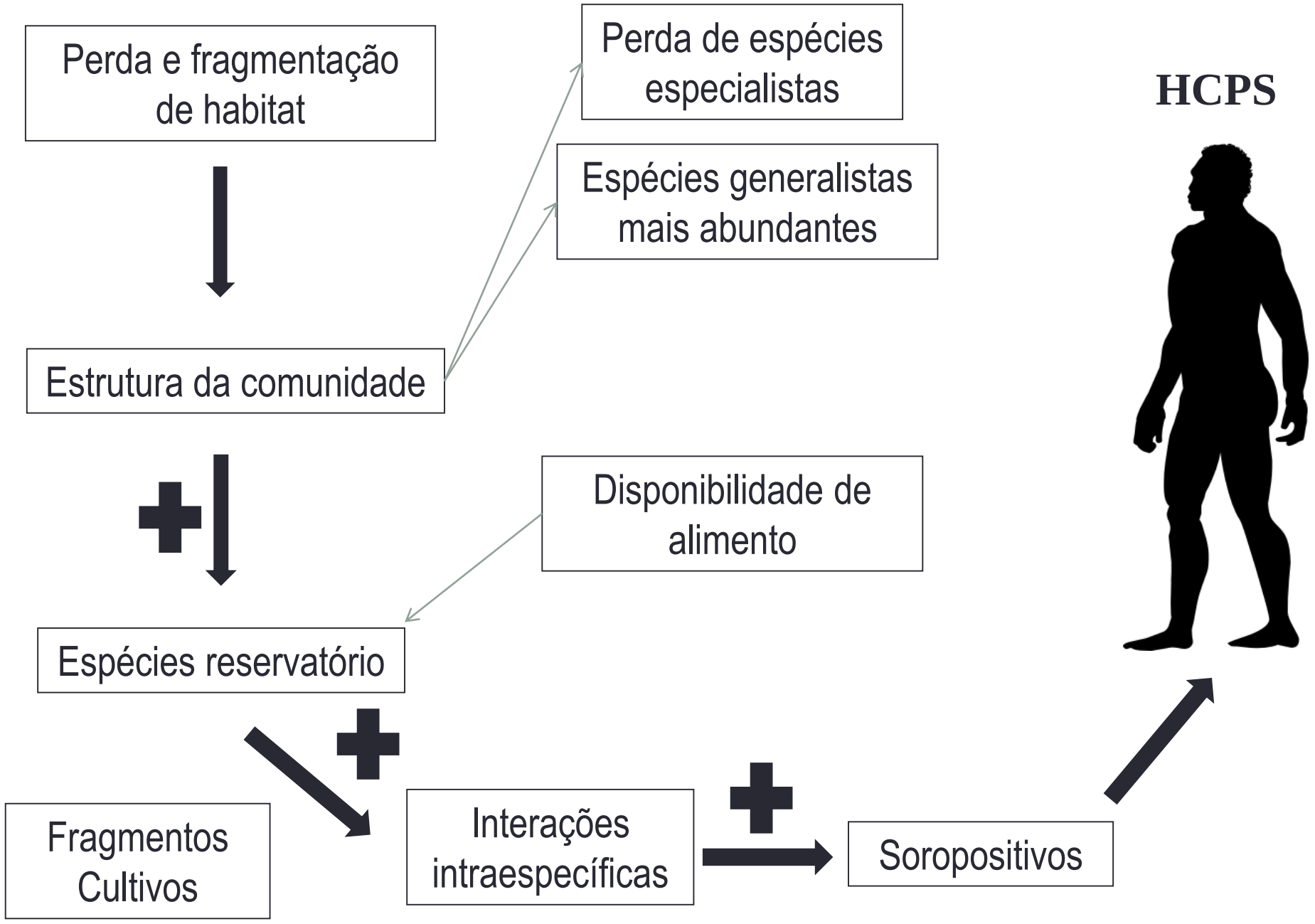
Espécies reservatório

+

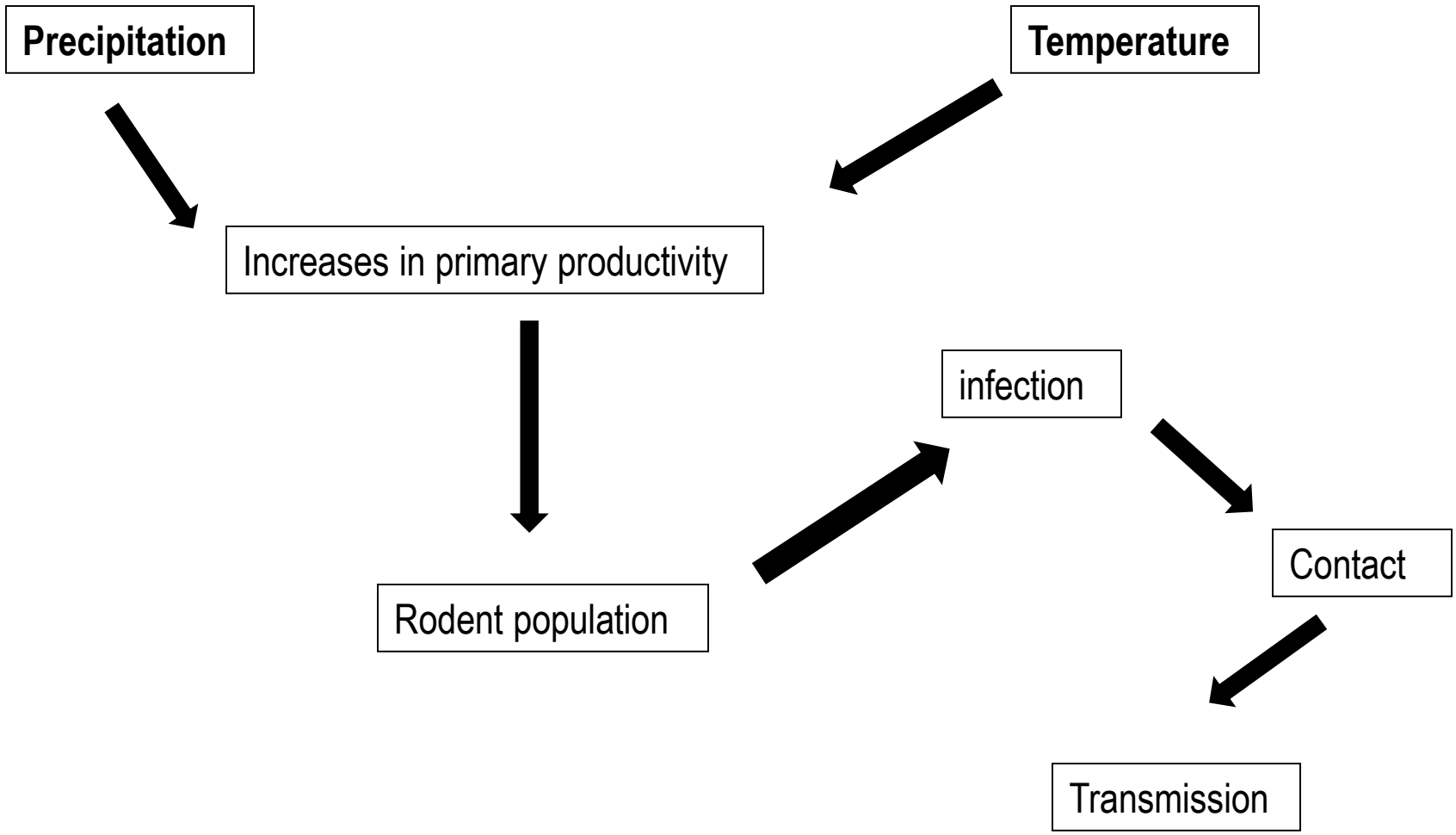
Soropositivos

HCPS




Perda e fragmentação de habitat
Perda de espécies especialistas
Espécies generalistas mais abundantes
HCPS
Estrutura da comunidade
Disponibilidade de alimento
Espécies reservatório
Fragmentos Cultivos
Interações intraespecíficas
Soropositivos

Climate effects



Climate effects

exposure to sunlight and high temperatures decrease the time the virus remains infectious

Infected dried feces, containing the virus, become airborne

Precipitation

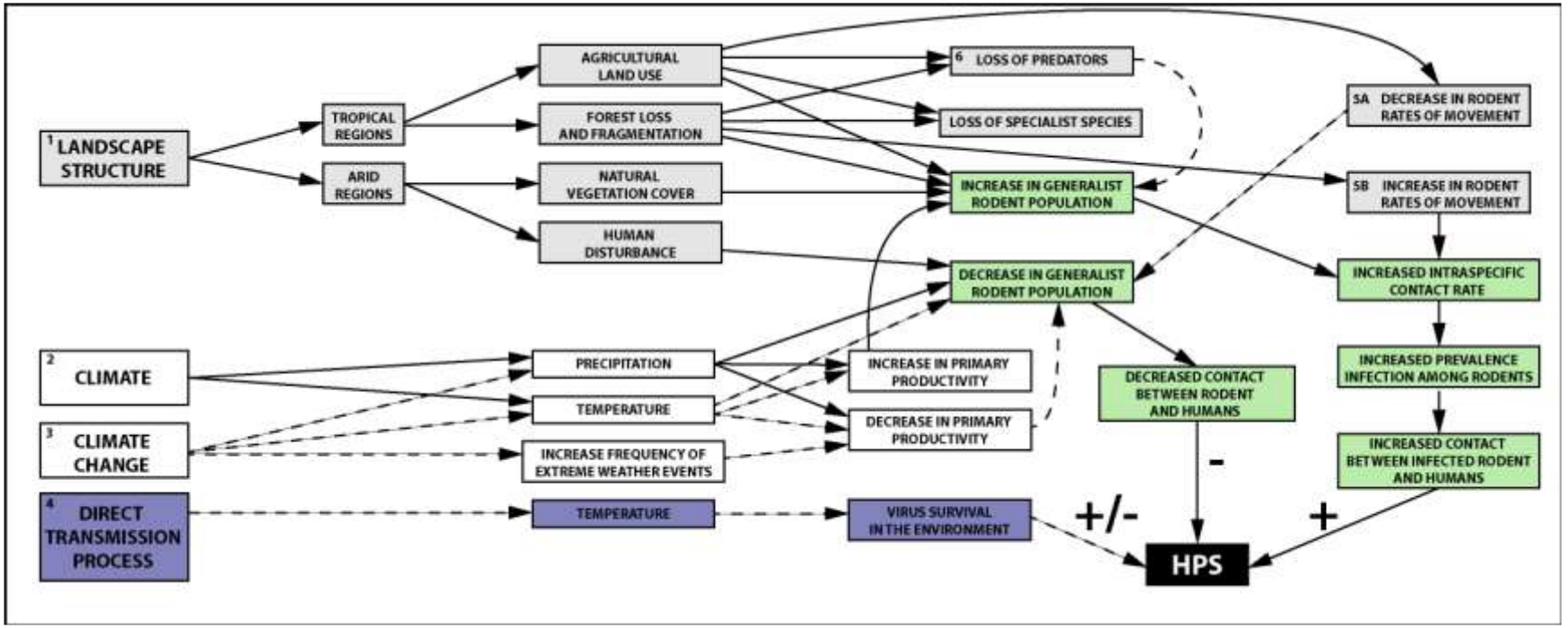
Temperature

Environmental conditions

Virus survival in the environment

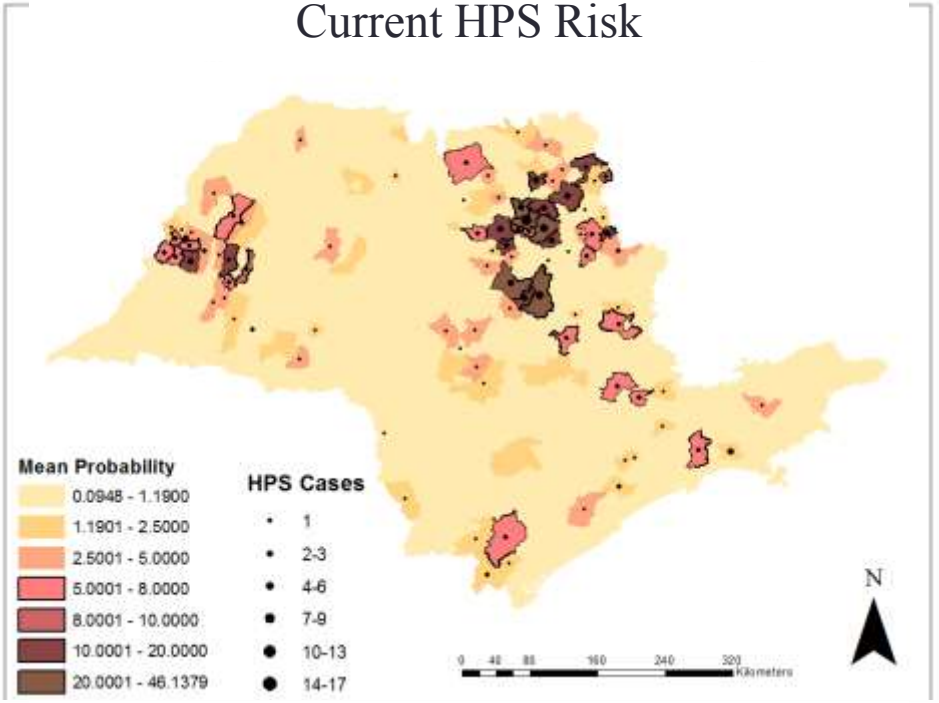
Infection risk

mouse excreta become dry- virus particles become airborne much more readily in these conditions

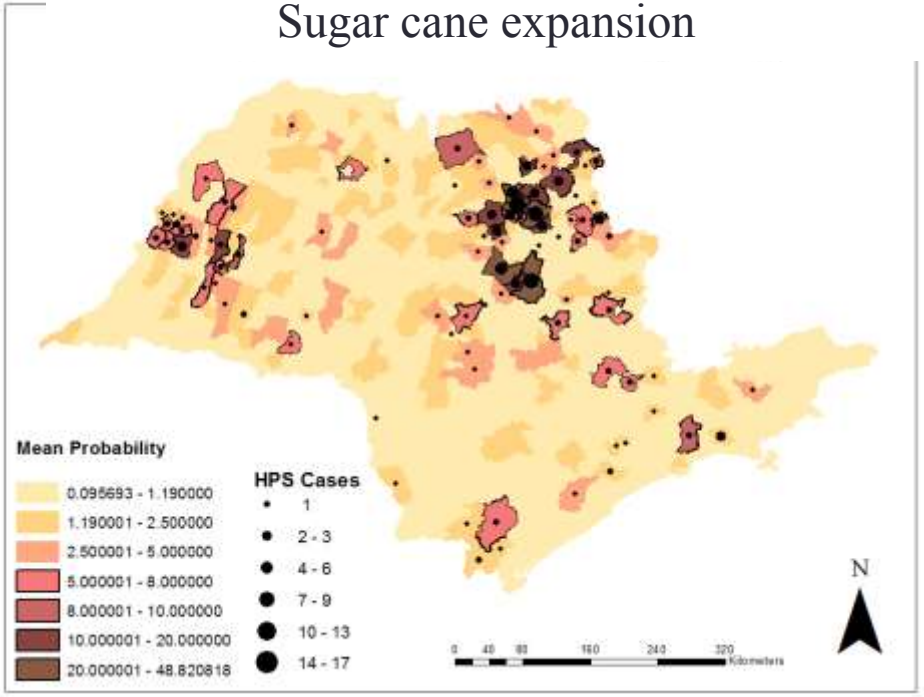


(Tese de doutorado de Paula Prist)

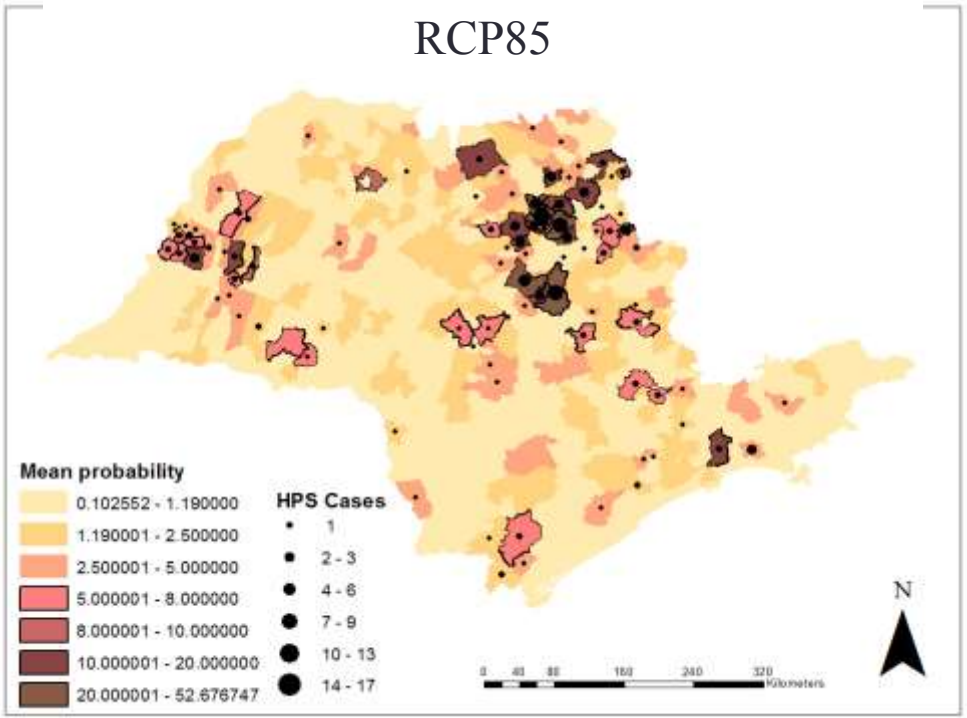
Current HPS Risk



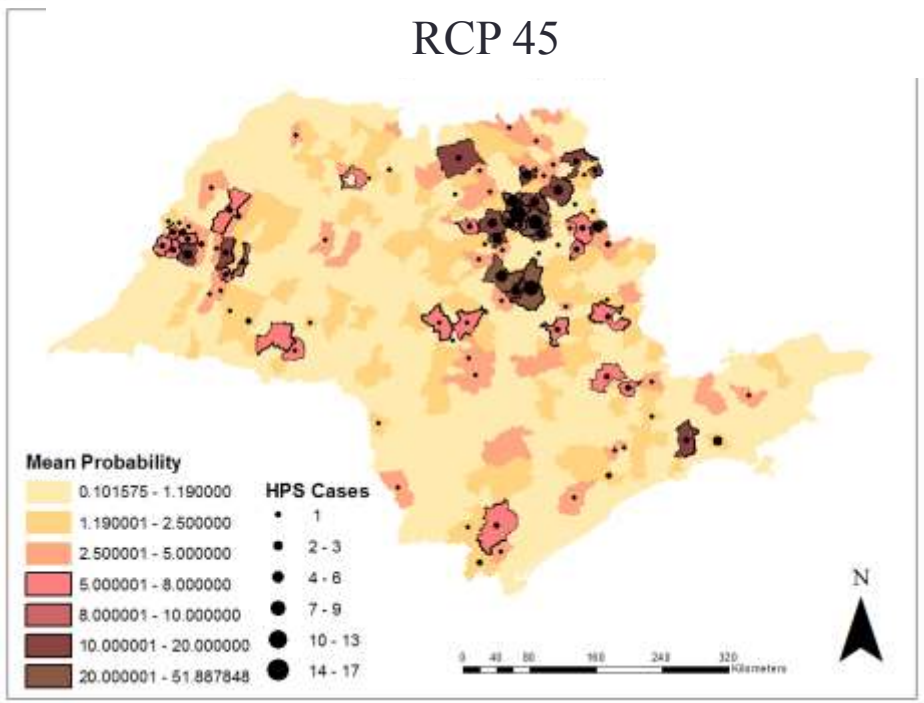
Sugar cane expansion



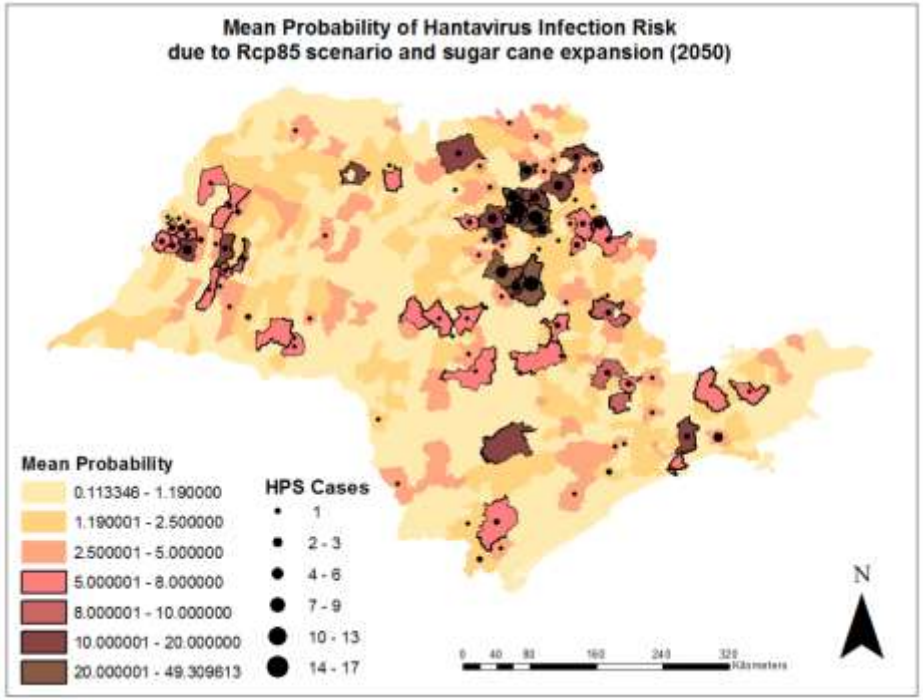
RCP85



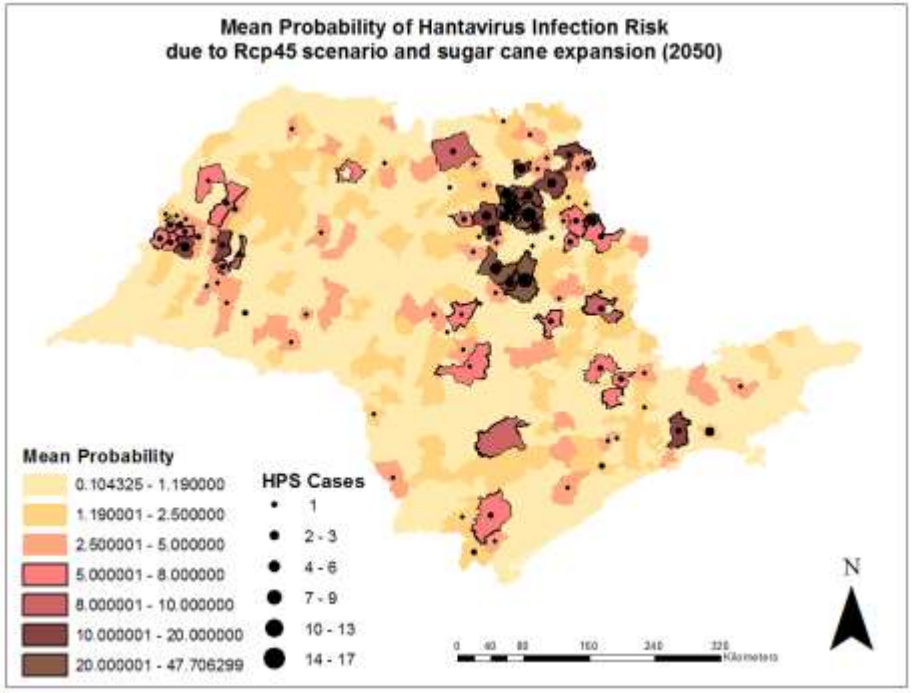
RCP 45



RCP85 and Sugar cane expansion



RCP45 and Sugar cane expansion



(Prist et al. in prep.)

Baseline model - **6%** of the State of São Paulo has medium to high risk for HPS = 39 municipalities

RCP4.5 and sugar cane expansion– **7.13%** of the state is classified as medium to high risk for HPS = 46 municipalities.

Andradina, Presidente Prudente, Monte Aprazível, Assis and Jaú.

RCP8.5 and sugar cane expansion– **8.7%** of the state is classified as medium to high risk for HPS = 56 municipalities.

Paraguaçu Paulista, Assis, Monte Aprazível, Pederneiras and Jaú

(Prist et al. in prep.)

- Mudanças climáticas levam não apenas a mudanças na distribuição das espécies mas também na provisão de serviços ecossistêmicos

"Ecosystem services are the direct and indirect contributions of ecosystems for human well-being" (TEEB 2010)

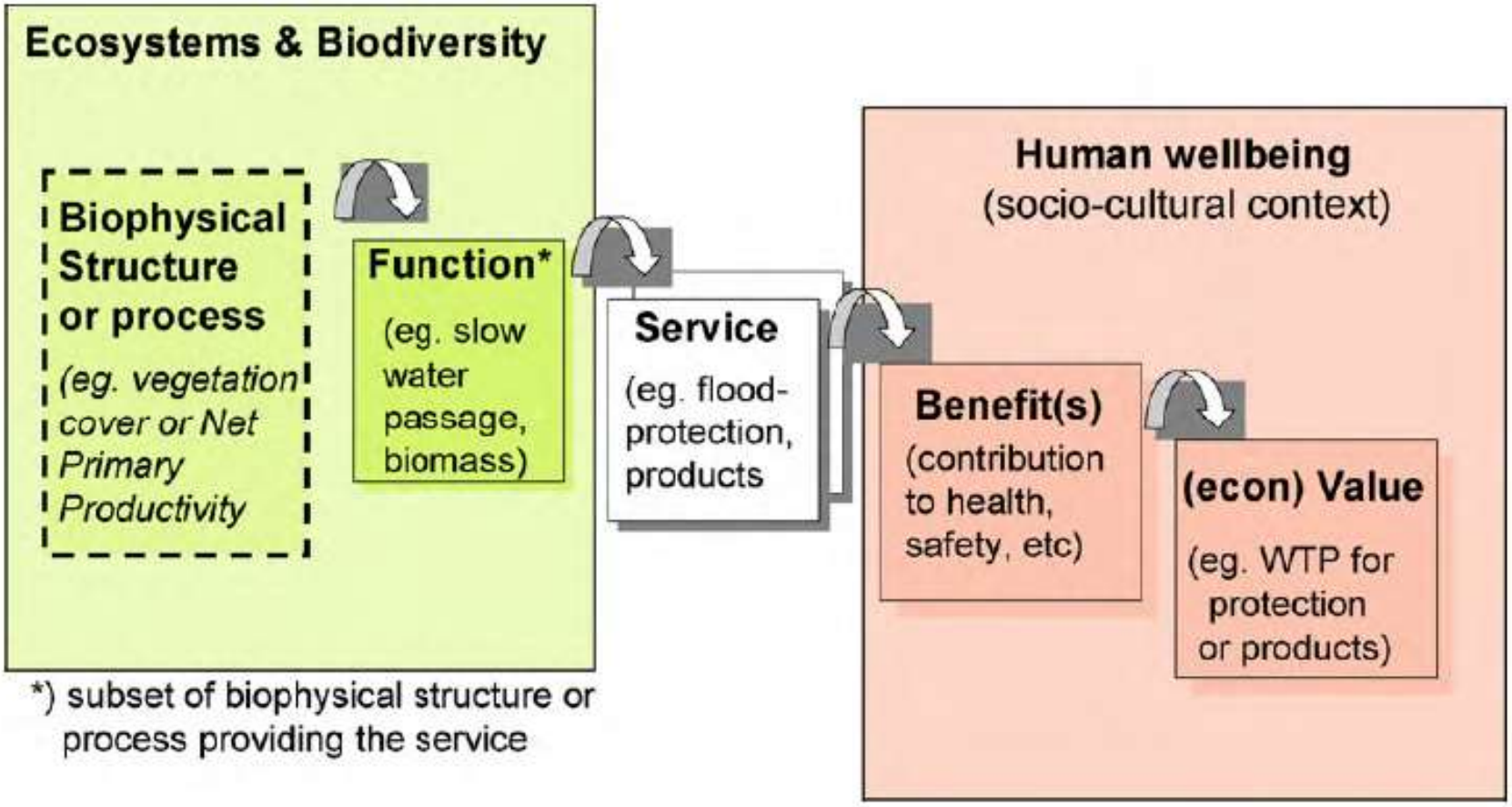
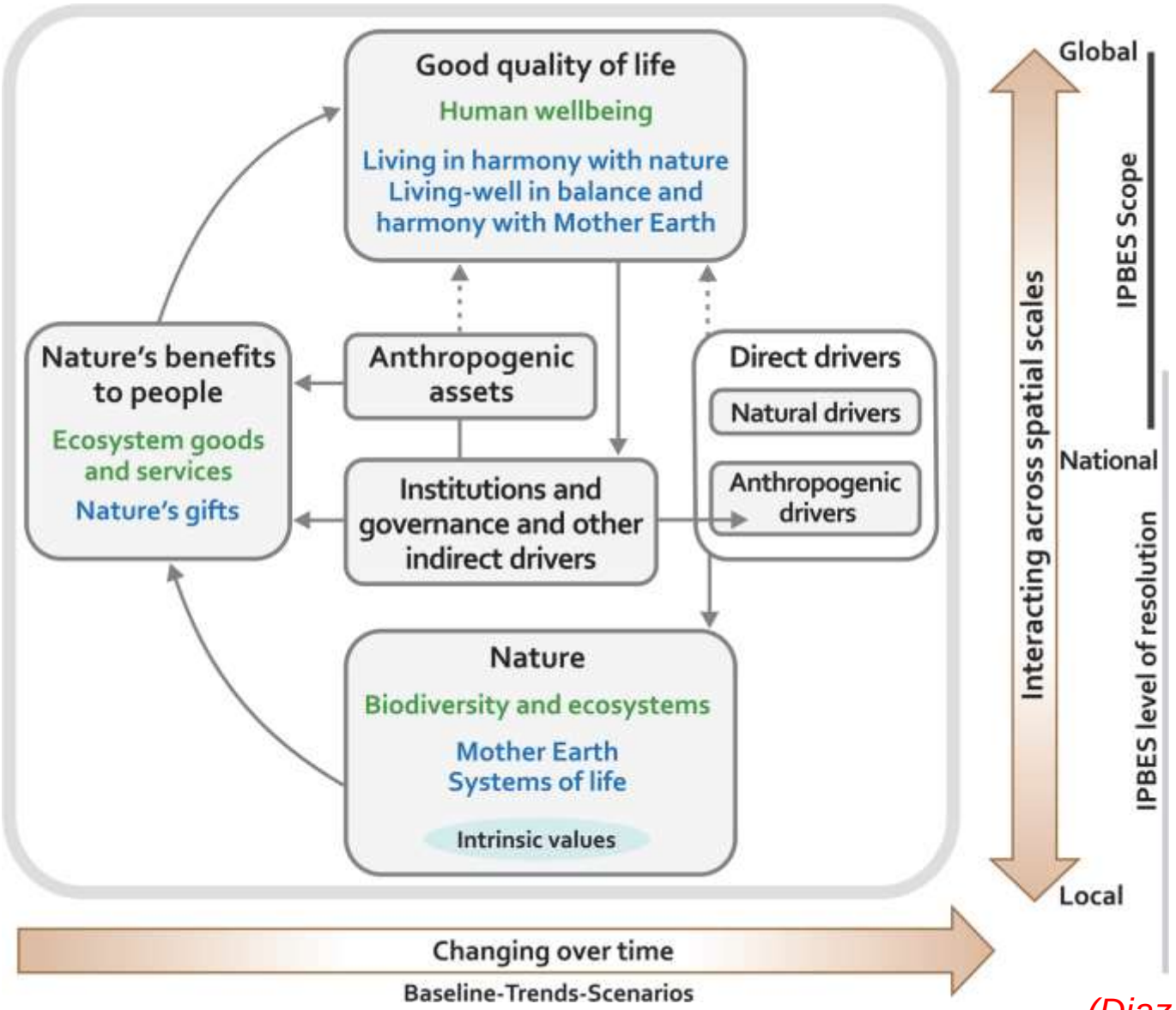


Fig. 2. Framework for linking ecosystems to human wellbeing (adapted from Haines-Young and Potschin, in press).

IPBES Conceptual Framework



(Diaz et al. 2015)

What is IPBES?

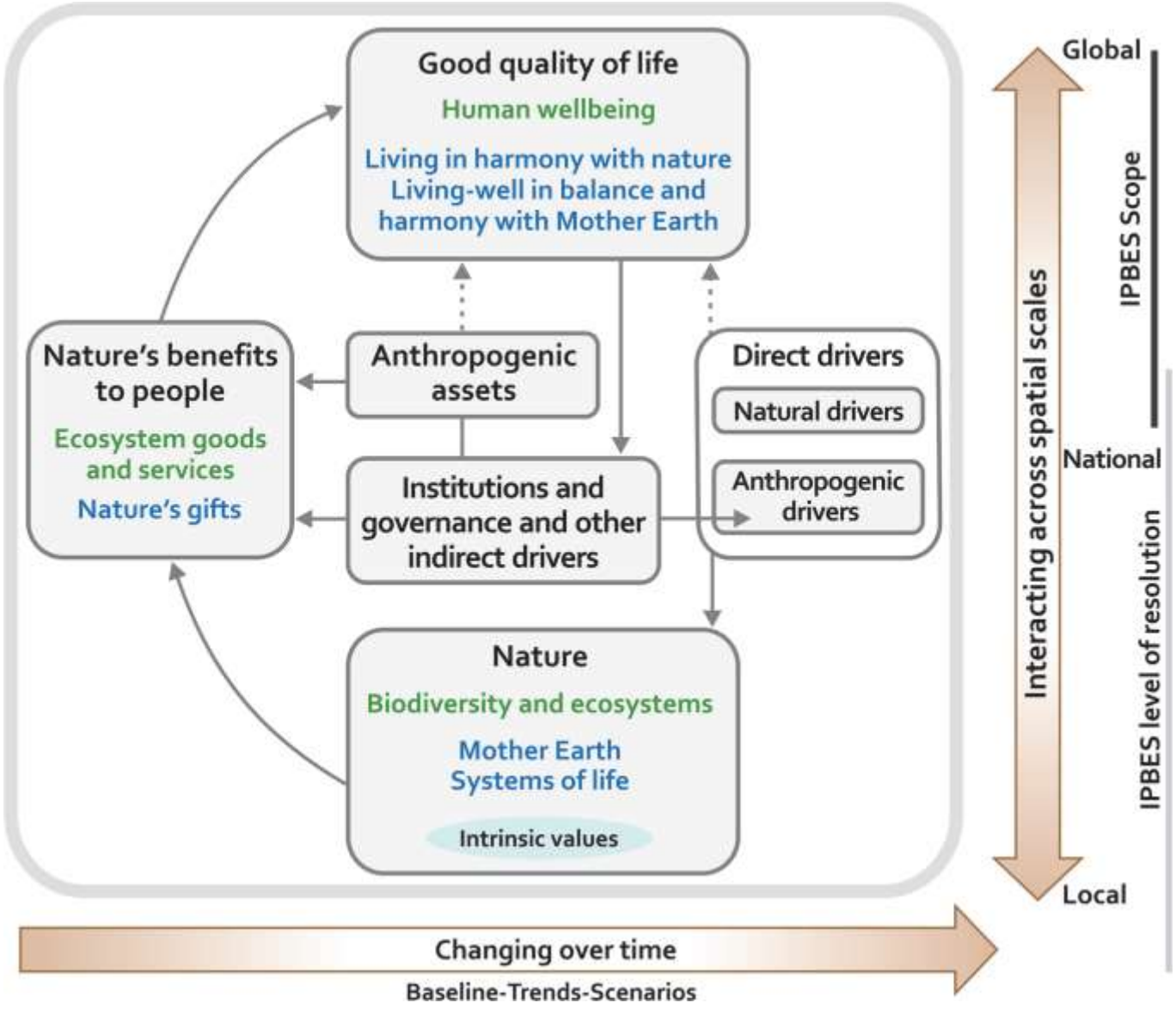
IPBES-3 (Jan 2015, Bonn)

IPBES-2 (Dec 2013, Antalya)

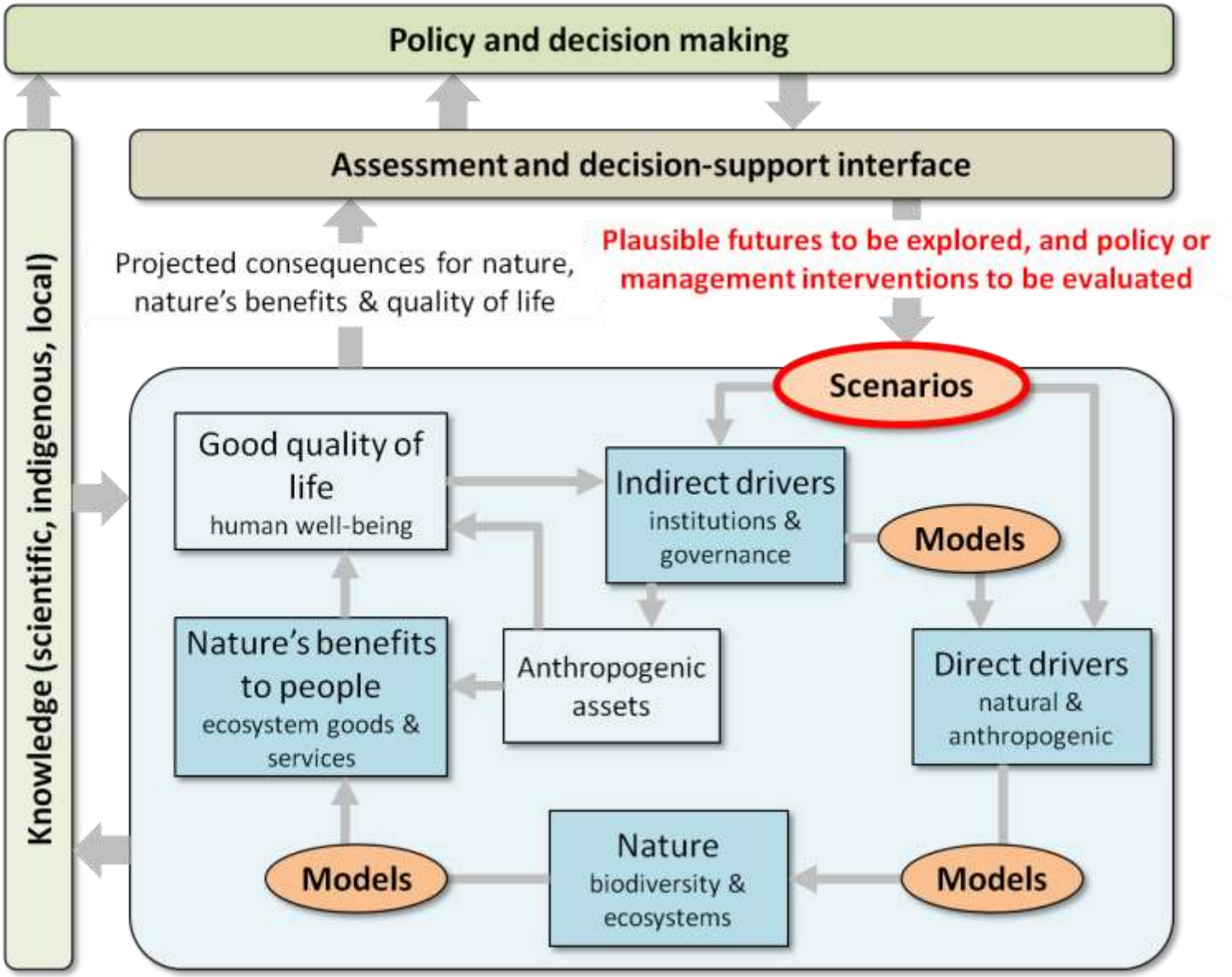
- **I**ntergovernmental science-policy **P**latform on **B**iodiversity and **E**cosystem **S**ervices
- **Overall objective:** To provide policy relevant knowledge on biodiversity and ecosystem services to inform decision making
- Established in April 2012, Panama
- 124 Members
- Secretariat hosted in Bonn

Context for the birth of IPBES

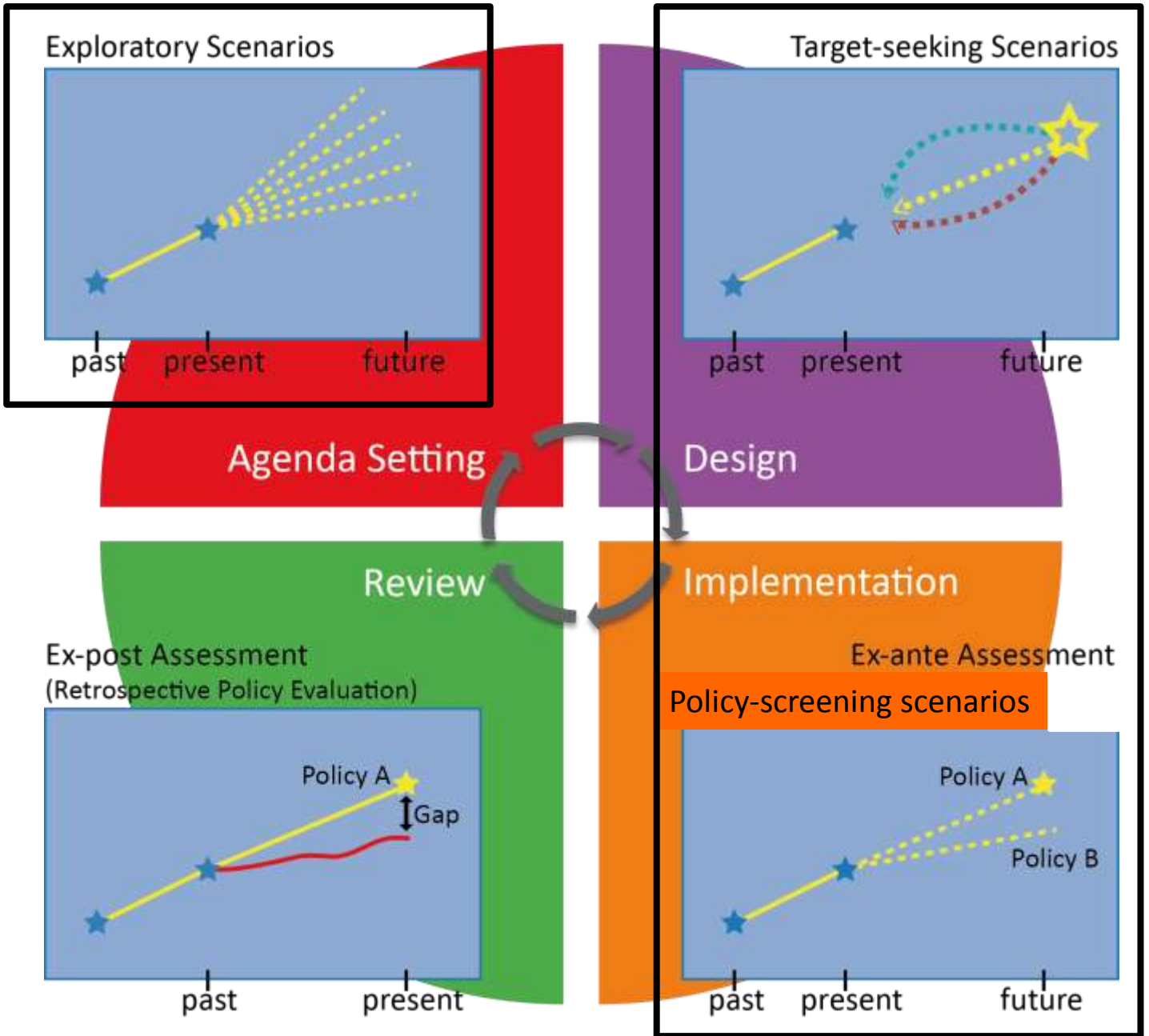
- Millennium Ecosystem Assessment (2005)
- No mechanism to:
  - repeat this exercise
  - to involve governments
- Call by French President for “an IPCC like mechanism for biodiversity”


Good quality of life
Human wellbeing
Living in harmony with nature
Living-well in balance and harmony with Mother Earth
Nature's benefits to people
Ecosystem goods and services
Nature's gifts
Anthropogenic assets
Direct drivers
Natural drivers
Anthropogenic drivers
Institutions and governance and other indirect drivers
Nature
Biodiversity and ecosystems
Mother Earth
Systems of life
Intrinsic values
Global
National
Local
Interacting across spatial scales
IPBES Scope
IPBES level of resolution
Changing over time
Baseline-Trends-Scenarios

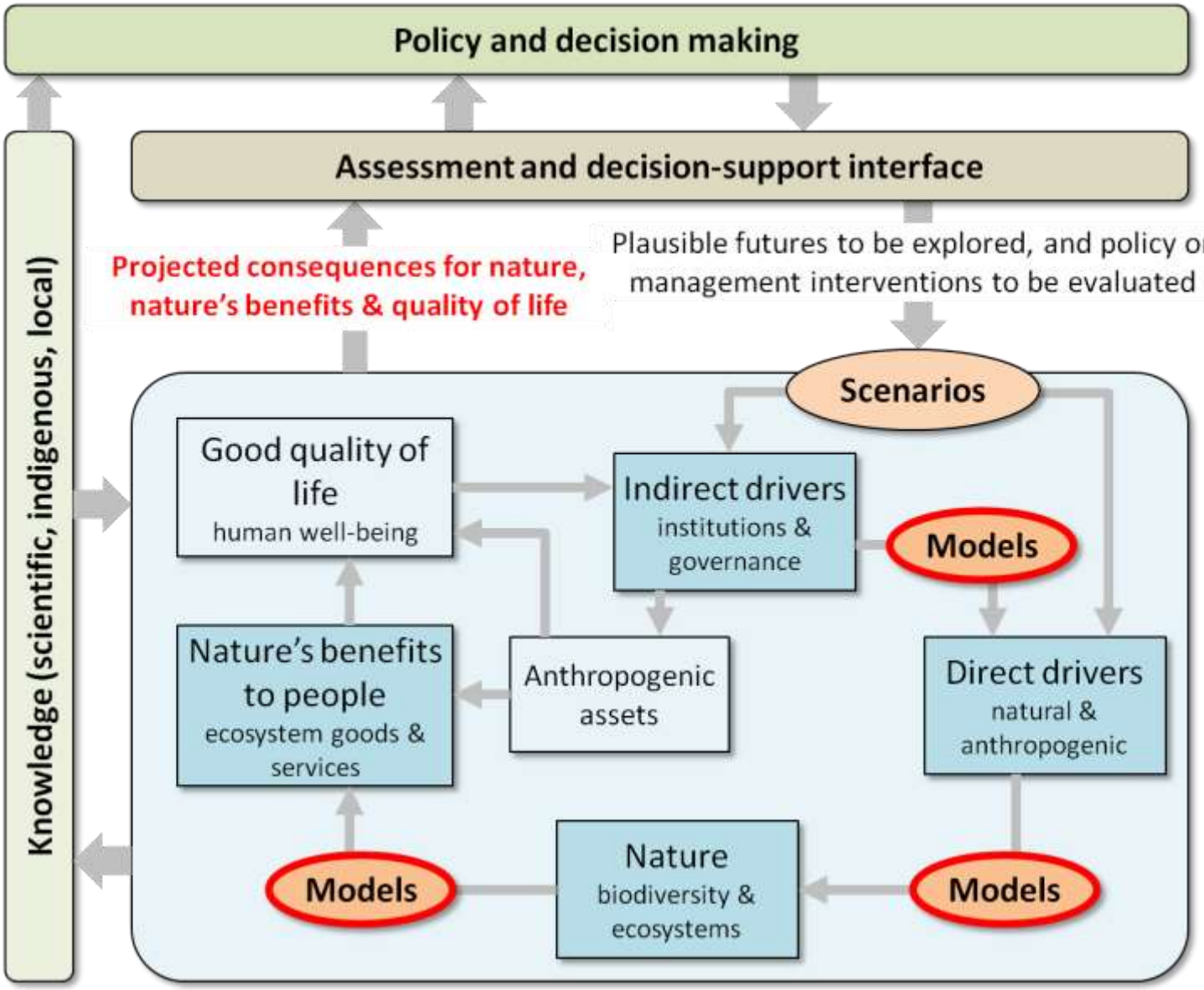
Scenarios: plausible representations of possible futures for one or more components of a system, and/or alternative policy or management options intended to alter the future state of these components



Types of scenarios aligned with phases of the policy cycle



Models: qualitative or quantitative representations of key components of a system and of relationships between these components



Ecosystem Service Supply and Vulnerability to Global Change in Europe

Dagmar Schröter,[1,2*] Wolfgang Cramer,[1] Rik Leemans,[3] I. Colin Prentice,[4] Miguel B. Araújo,[5,6] Nigel W. Arnell,[7] Alberte Bondeau,[1] Harald Bugmann,[8] Timothy R. Carter,[9] Carlos A. Gracia,[10] Anne C. de la Vega-Leinert,[1] Markus Erhard,[11] Frank Ewert,[3] Margaret Glendining,[12] Joanna I. House,[4] Susanna Kankaanpää,[9] Richard J. T. Klein,[1] Sandra Lavorel,[13,14] Marcus Lindner,[15] Marc J. Metzger,[3] Jeannette Meyer,[15] Timothy D. Mitchell,[16] Isabelle Reginster,[17] Mark Rounsevell,[17] Santi Sabaté,[10] Stephen Sitch,[1] Ben Smith,[18] Jo Smith,[19] Pete Smith,[19] Martin T. Sykes,[18] Kirsten Thonicke,[4] Wilfried Thuiller,[20] Gill Tuck,[12] Sönke Zaehle,[1] Bärbel Zierl[8]

www.sciencemag.org SCIENCE VOL 310 25 NOVEMBER 2005

Scenarios by 2080	Climate model			
	HadCM3	NCAR-PCM	CGCM2	CSIRO2
	Storyline B1			
Population (10^6)	376	376	376	376
CO_2 concentration (ppm)	518	518	518	518
Δ Temperature (°C)	3.1	–	–	–
Δ Precipitation (%)				
Europe	4.8	–	–	–
Iberian Peninsula JJA	–17	–	–	–
Iberian Peninsula DJF	7	–	–	–
	Storyline B2			
Population (10^6)	346	346	346	346
CO_2 concentration (ppm)	567	567	567	567
Δ Temperature (°C)	2.1	–	–	–
Δ Precipitation (%)				
Europe	2.7	–	–	–
Iberian Peninsula JJA	–14	–	–	–
Iberian Peninsula DJF	7	–	–	–
	Storyline A1FI			
Population (10^6)	376	376	376	376
CO_2 concentration (ppm)	779	779	779	779
Δ Temperature (°C)	4.4	–	–	–
Δ Precipitation (%)				
Europe	–0.5	–	–	–
Iberian Peninsula JJA	–27	–	–	–
Iberian Peninsula DJF	2	–	–	–
	Storyline A2			
Population (10^6)	419	419	419	419
CO_2 concentration (ppm)	709	709	709	709
Δ Temperature (°C)	2.8	2.7	3.4	2.7
Δ Precipitation (%)				
Europe	0.5	2.3	0.0	–0.6
Iberian Peninsula JJA	–22	–18	–26	–19
Iberian Peninsula DJF	10	0	1	–3

(Schröter et al. 2005)

Mudanças no stress hídrico em função de mudanças climáticas e populacionais

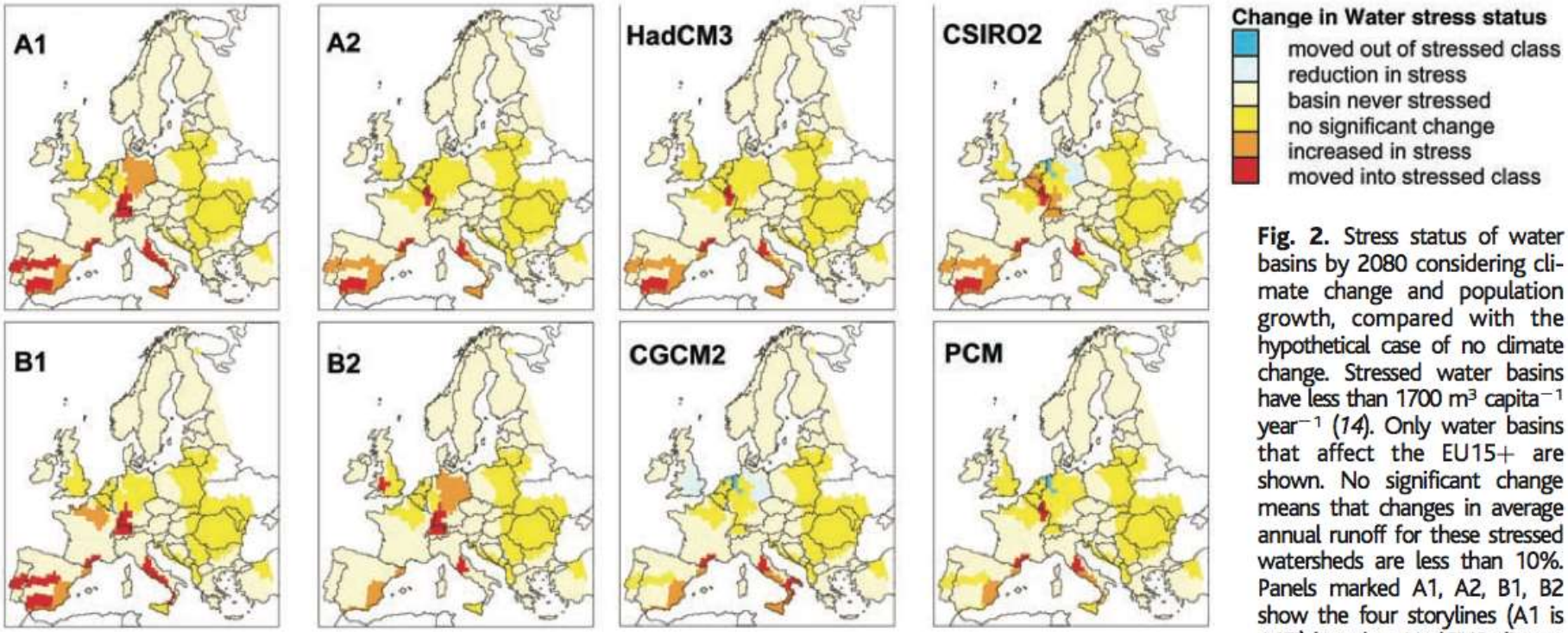


Fig. 2. Stress status of water basins by 2080 considering climate change and population growth, compared with the hypothetical case of no climate change. Stressed water basins have less than 1700 m^3 $capita^{-1}$ $year^{-1}$ (*14*). Only water basins that affect the EU15+ are shown. No significant change means that changes in average annual runoff for these stressed watersheds are less than 10%. Panels marked A1, A2, B1, B2 show the four storylines (A1 is A1FI) based on HadCM3 climate (2051 to 2080) and respective population sizes. Panels marked HadCM3, CSIRO2, CGCM2, and PCM show the four GCMs (2051 to 2080; PCM is NCAR-PCM) and A2 population size.

(Schröter et al. 2005)

- Há uma lacuna enorme de conhecimento sobre as implicações de diferentes cenários de mudanças climáticas sobre as funções e os serviços ecossistêmicos


Obrigado
Dept. of Ecology – University of São Paulo
jpm@ib.usp.br
http://ecologia.ib.usp.br/projetointerface/