SERVIÇOS ECOSSISTÊMICOS

CONBIO – 2019

Prof. Jean Paul Metzger

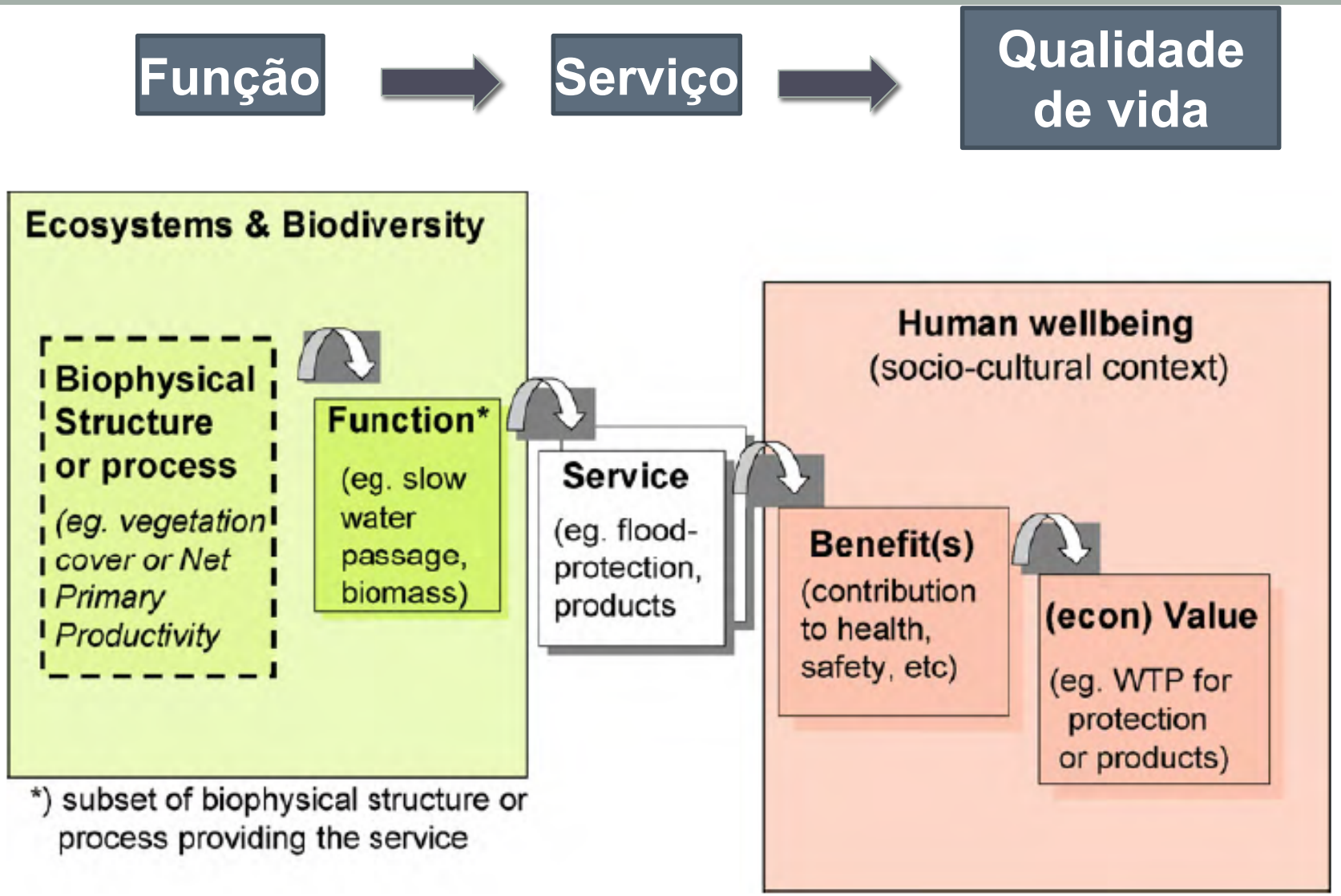
O QUE É SERVIÇO ECOSSISTÊMICO

Ecosystem services are the benefits people obtain from ecosystems, including those benefits that people perceive and those they do not perceive

Rough timeline	Framing of conservation	Key ideas	Science underpinning
1960–1970	 Nature for itself	Species Wilderness Protected areas	Species, habitats and wildlife ecology
1980–1990	 Nature despite people	Extinction, threats and threatened species Habitat loss Pollution Overexploitation	Population biology, natural resource management
2000–2005	 Nature for people	Ecosystems Ecosystem approach Ecosystem services Economic values	Ecosystem functions, environmental economics
2010	 People and nature	Environmental change Resilience Adaptability Socioecological systems	Interdisciplinary, social and ecological sciences

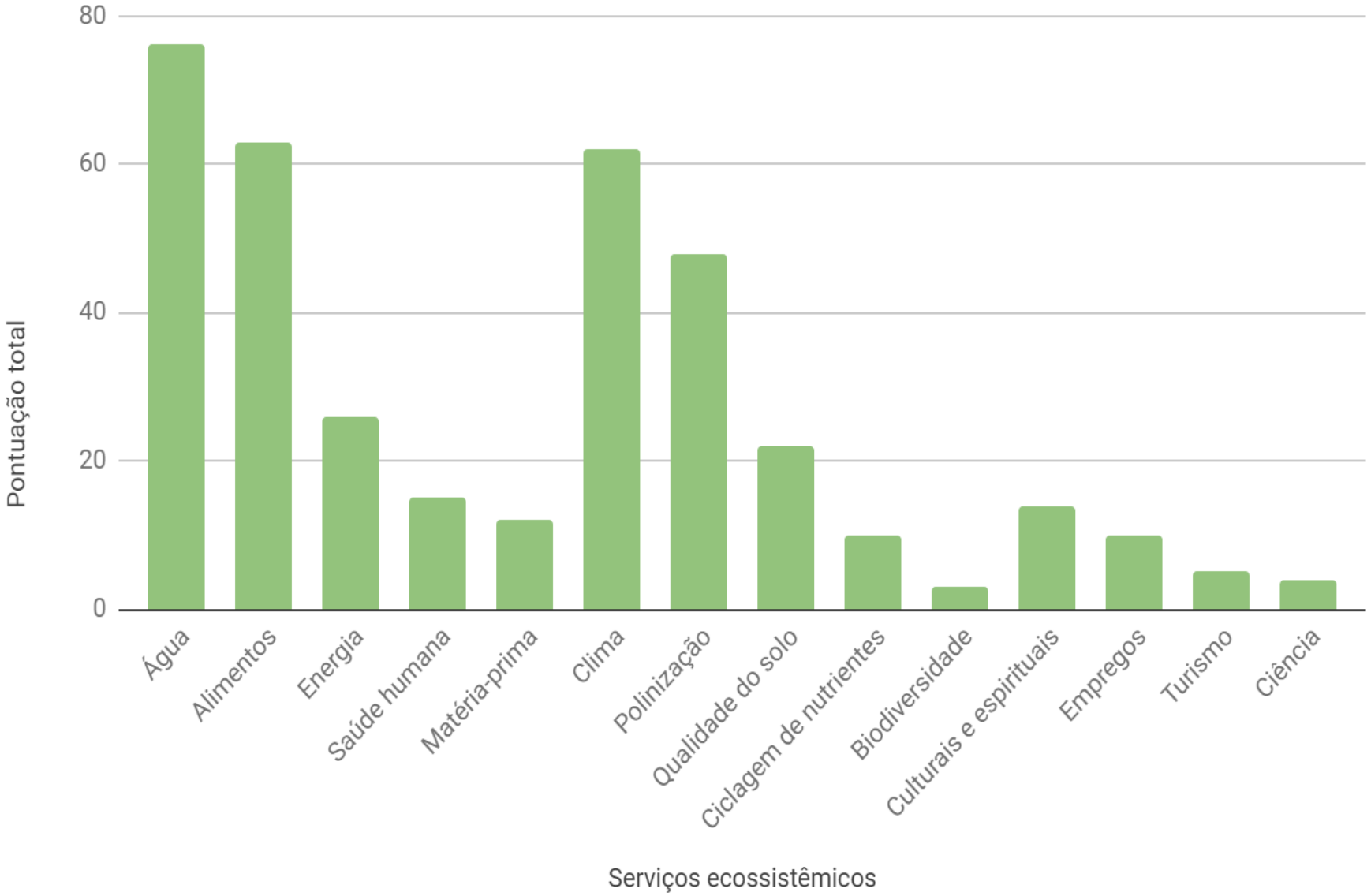
(Mace, Science 2014)

Como a vegetação nativa consegue prover serviço hídrico ou de regulação climática?

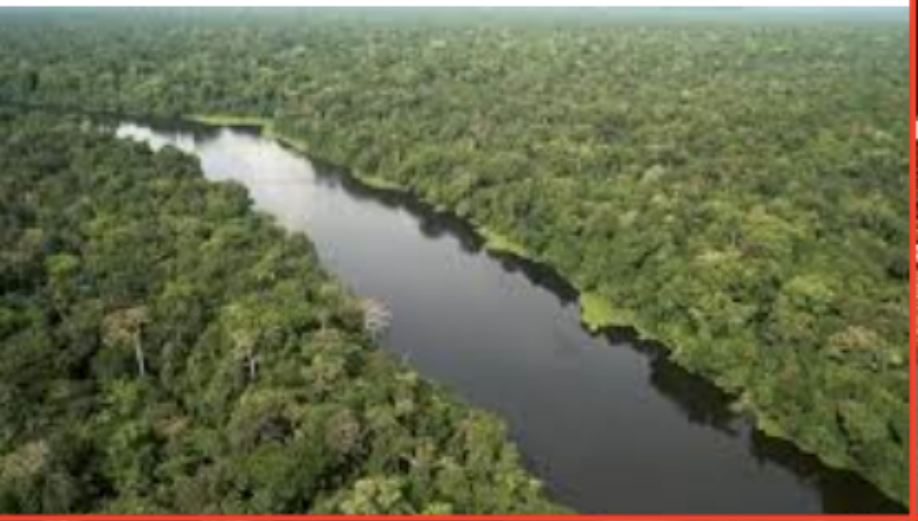


(De Groot et al. 2010)

- Os serviços ecossistêmicos são entendidos como os benefícios que as pessoas obtêm dos ecossistemas. Após ler o Sumário Executivo para Tomadores de Decisão referente ao primeiro “Diagnóstico Brasileiro de Biodiversidade e Serviços Ecossistêmicos”, liste, em ordem de importância (do mais ao menos importante), os cinco principais serviços ecossistêmicos que beneficiam a população brasileira


80
60
40
20
0
Pontuação total
Água
Alimentos
Energia
Saúde humana
Matéria-prima
Clima
Polinização
Qualidade do solo
Ciclagem de nutrientes
Biodiversidade
Culturais e espirituais
Empregos
Turismo
Ciência
Serviços ecossistêmicos

Serviços Ecossistêmicos



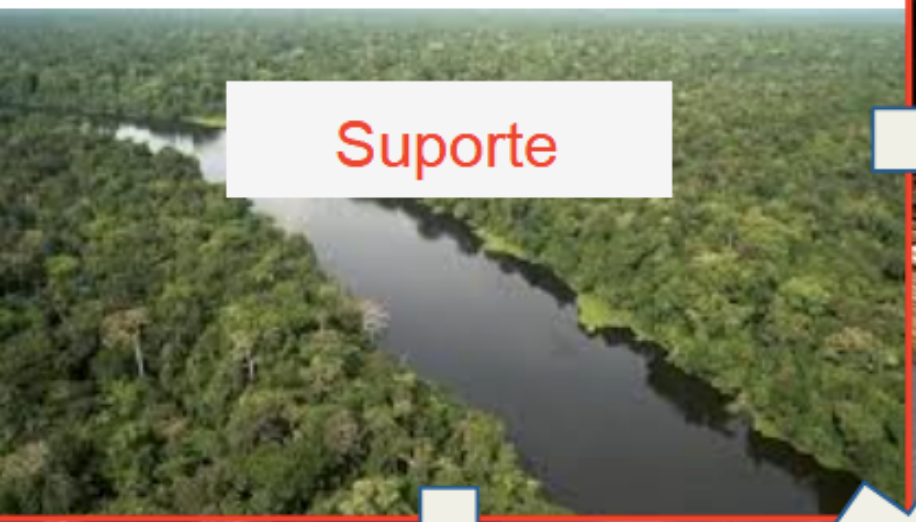
Serviços Ecossistêmicos

Suporte

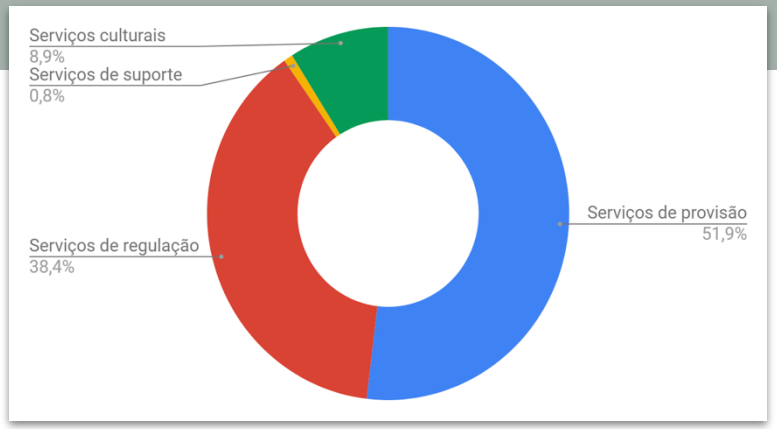
Serviços Ecossistêmicos

Serviços Ecossistêmicos

Serviços Ecossistêmicos

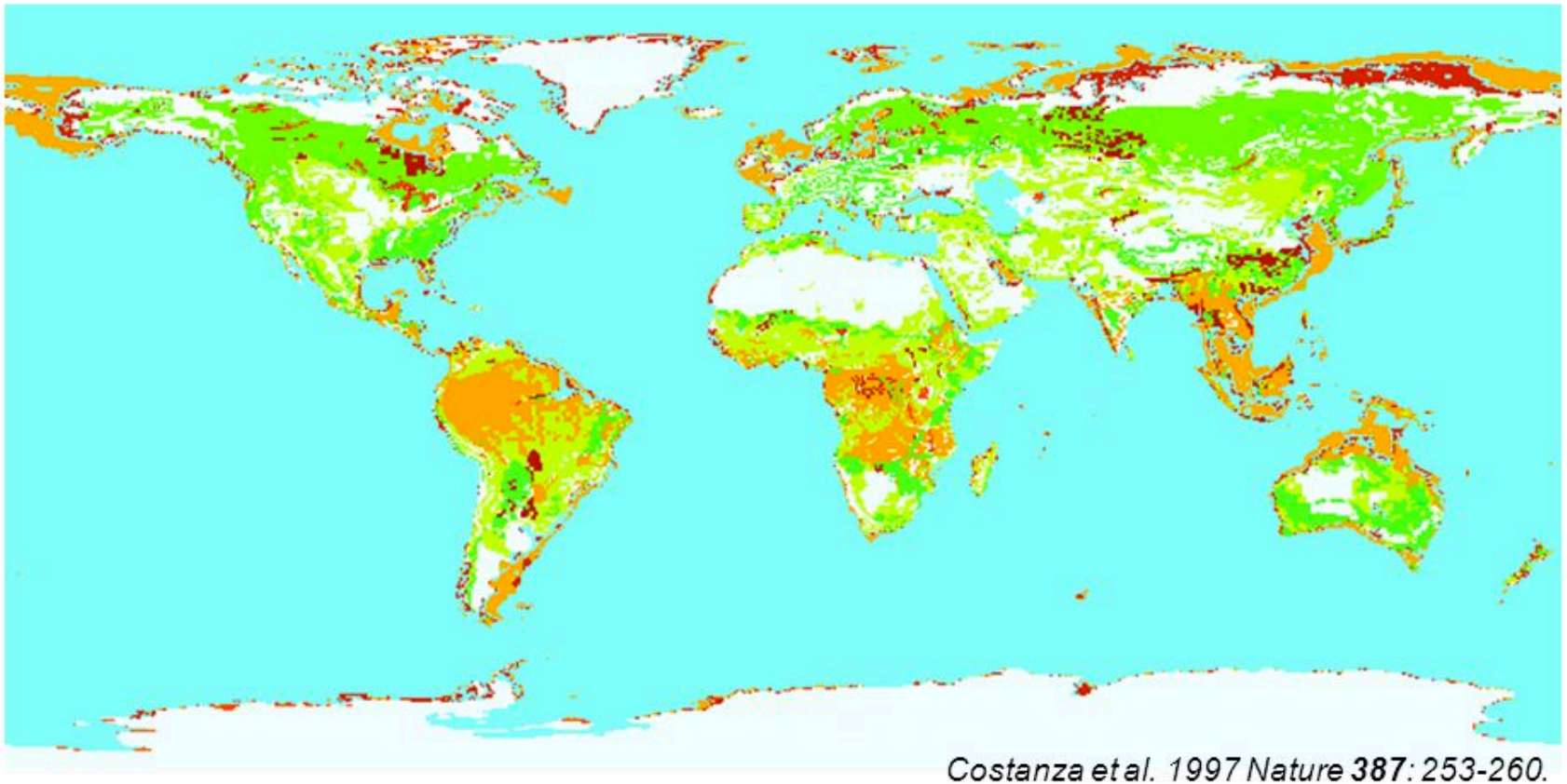


WHAT DO WE GET FROM **ECOSYSTEMS**?

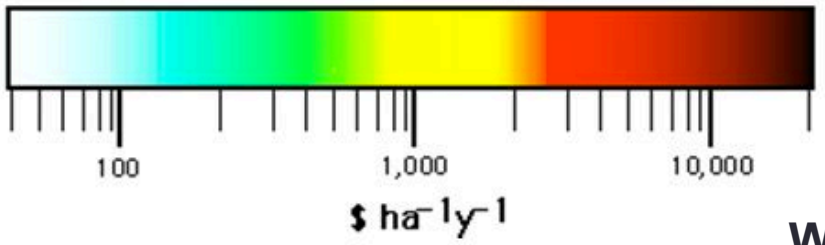


	Serviços ecossistêmicos citados	Pontuação	
Serviços de provisão	Segurança hídrica / fornecimento de recursos hídricos	76	192 pontos
	Segurança alimentar / fornecimento de alimentos	63	
	Segurança energética / produção de energia	26	
	Saúde humana / fornecimento de fármacos	15	
	Fornecimento de matéria-prima	12	
Serviços de regulação	Segurança climática / regulação do clima e qualidade do ar	62	142 pontos
	Polinização	48	
	Regulação da qualidade e estabilidade do solo	22	
	Ciclagem de nutrientes	10	
Serviços de suporte	Manutenção da biodiversidade	3	
Serviços culturais	Culturais e espirituais	14	33 pontos
	Geração de empregos e desenvolvimento econômico	10	
	Turismo	5	
	Desenvolvimento científico	4	

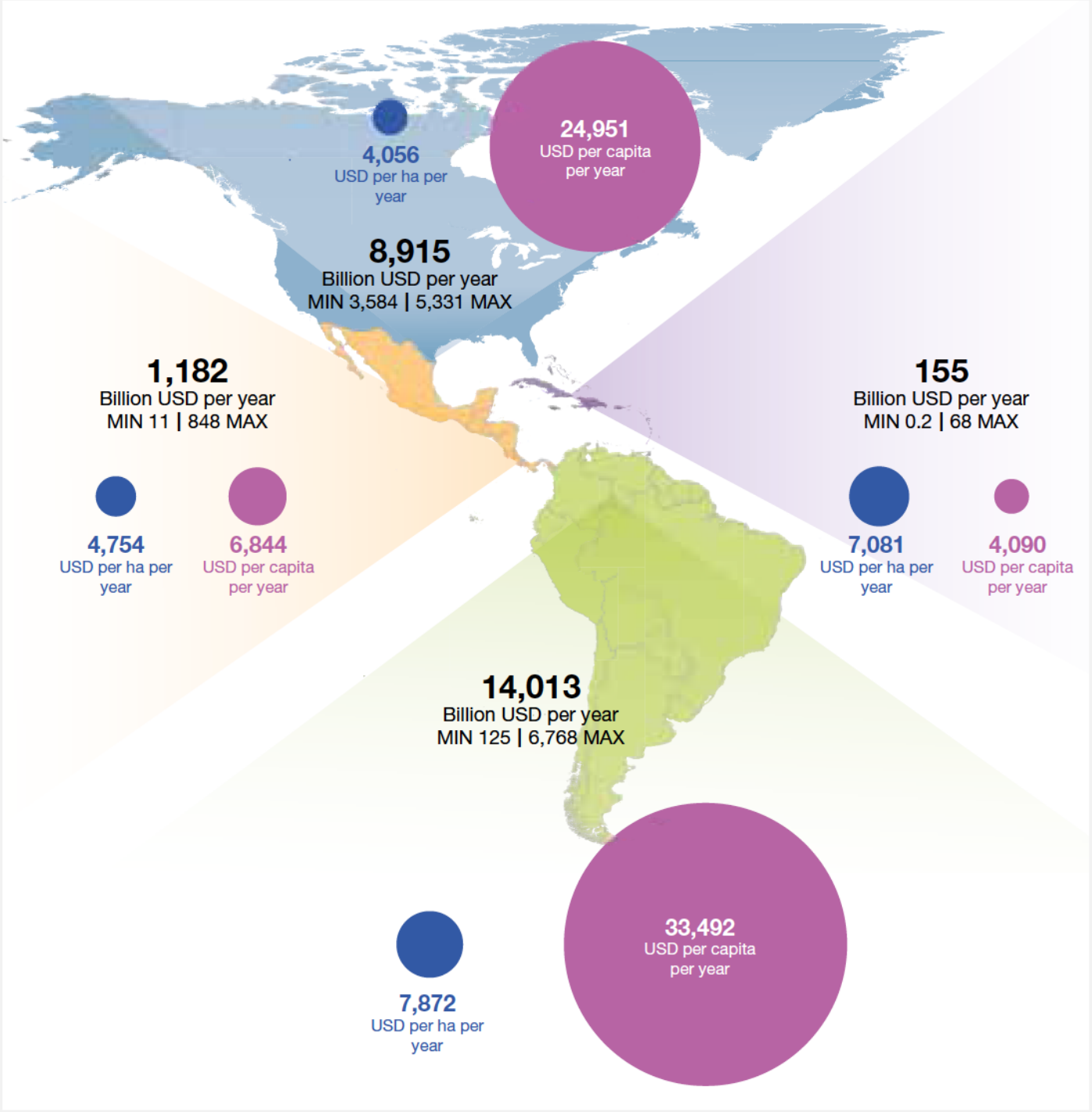
The value of the world's ecosystem services: $33 trillion



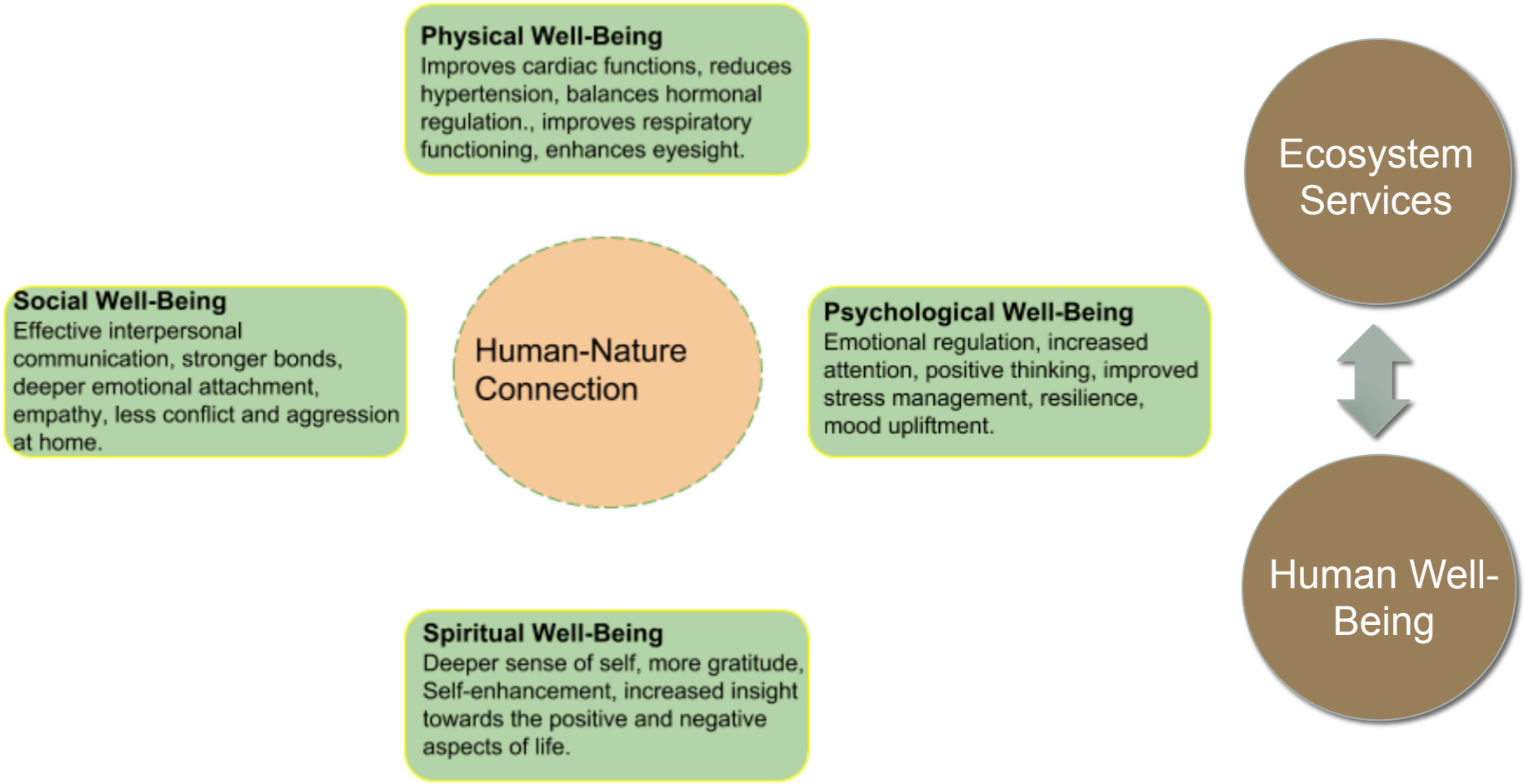
Costanza et al. 1997 Nature ***387****: 253-260.*



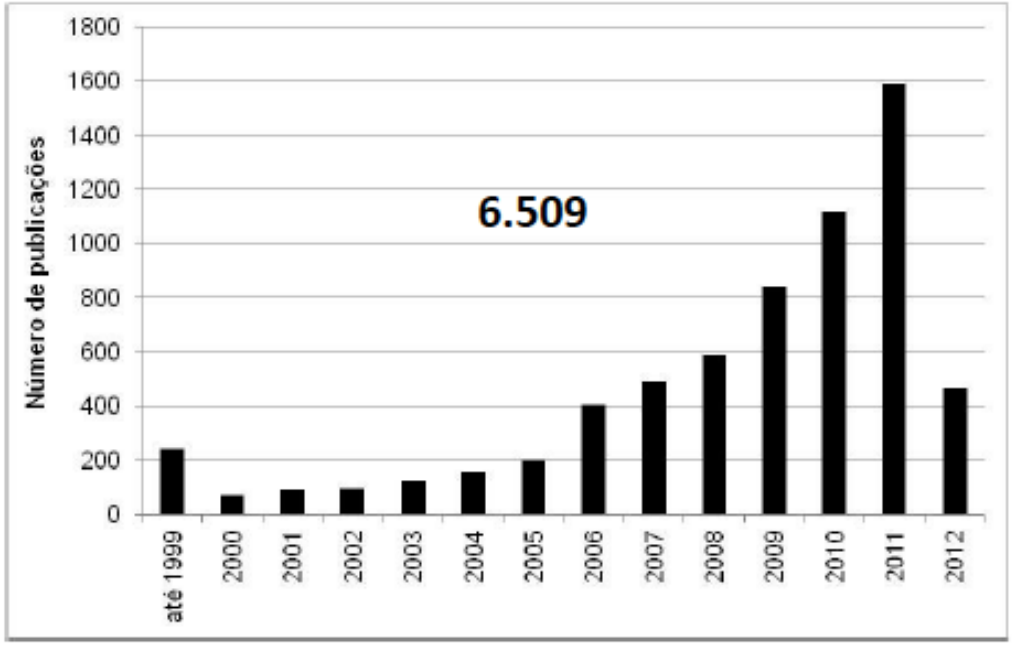
World GDP = $18 trillion



(IPBES America report 2018)


Physical Well-Being
Improves cardiac functions, reduces hypertension, balances hormonal regulation., improves respiratory functioning, enhances eyesight.
Social Well-Being
Effective interpersonal communication, stronger bonds, deeper emotional attachment, empathy, less conflict and aggression at home.
Human-Nature Connection
Psychological Well-Being
Emotional regulation, increased attention, positive thinking, improved stress management, resilience, mood upliftment.
Spiritual Well-Being
Deeper sense of self, more gratitude, Self-enhancement, increased insight towards the positive and negative aspects of life.
Ecosystem Services
Human Well-Being

Foi uma idéia que "pegou" no meio acadêmico?

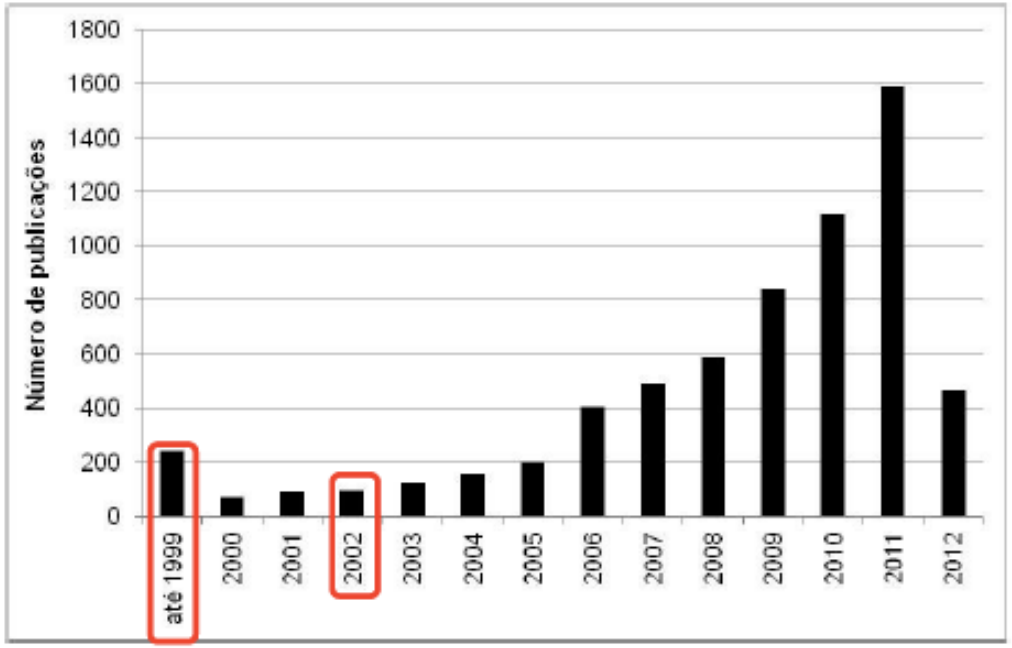


Ecological Economics – 756
Biological Conservation – 371
Forest Ecology and Management – 281
Agriculture, Ecosystem & Environment – 248
Landscape and Urban Planning - 207

Vivian Hackbart, 2012

The value of the world's ecosystem services and natural capital

Robert Costanza*†, Ralph d'Arge‡, Rudolf de Groot§, Stephen Farber‖, Monica Grasso†, Bruce Hannon¶, Karin Limburg#☆, Shahid Naeem, Robert V. O'Neill††, Jose Paruelo‡‡, Robert G. Raskin§§, Paul Sutton‖‖ & Marjan van den Belt¶¶**

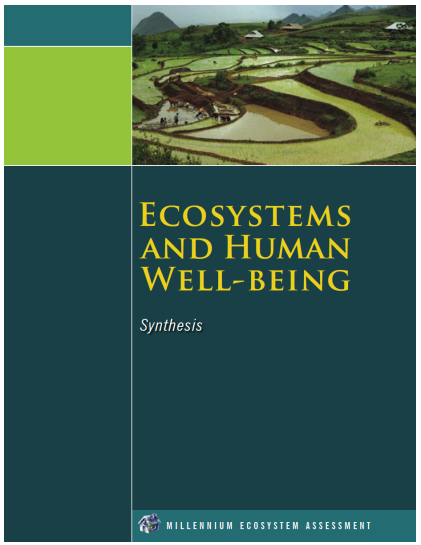


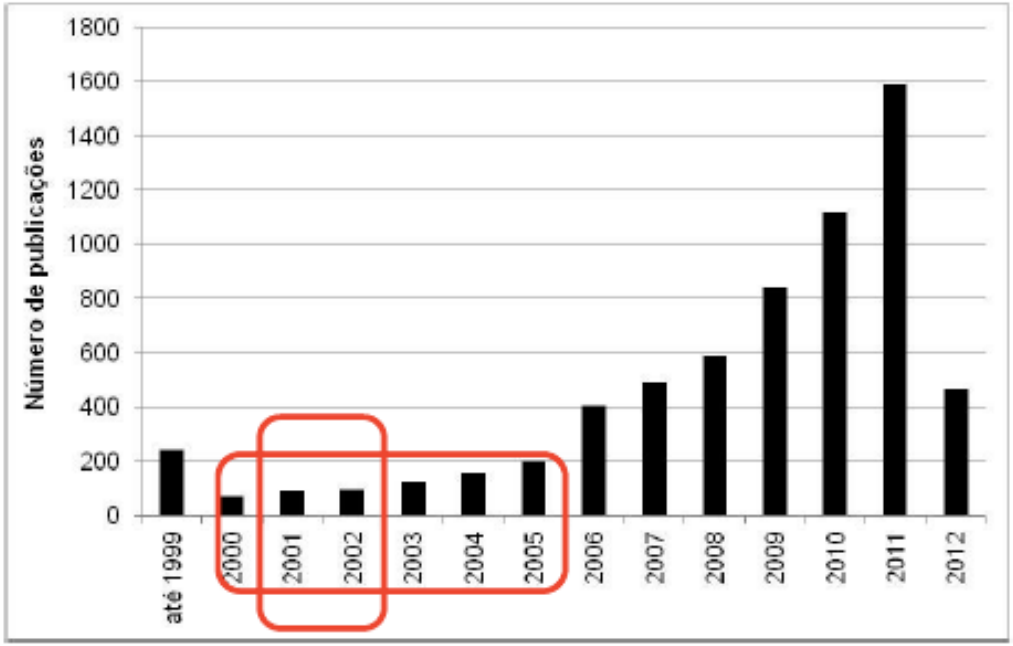
Costanza *et al., 1997*

Daily,G. 1997

De Groot *et al.,2002*

Vivian Hackbart, 2012



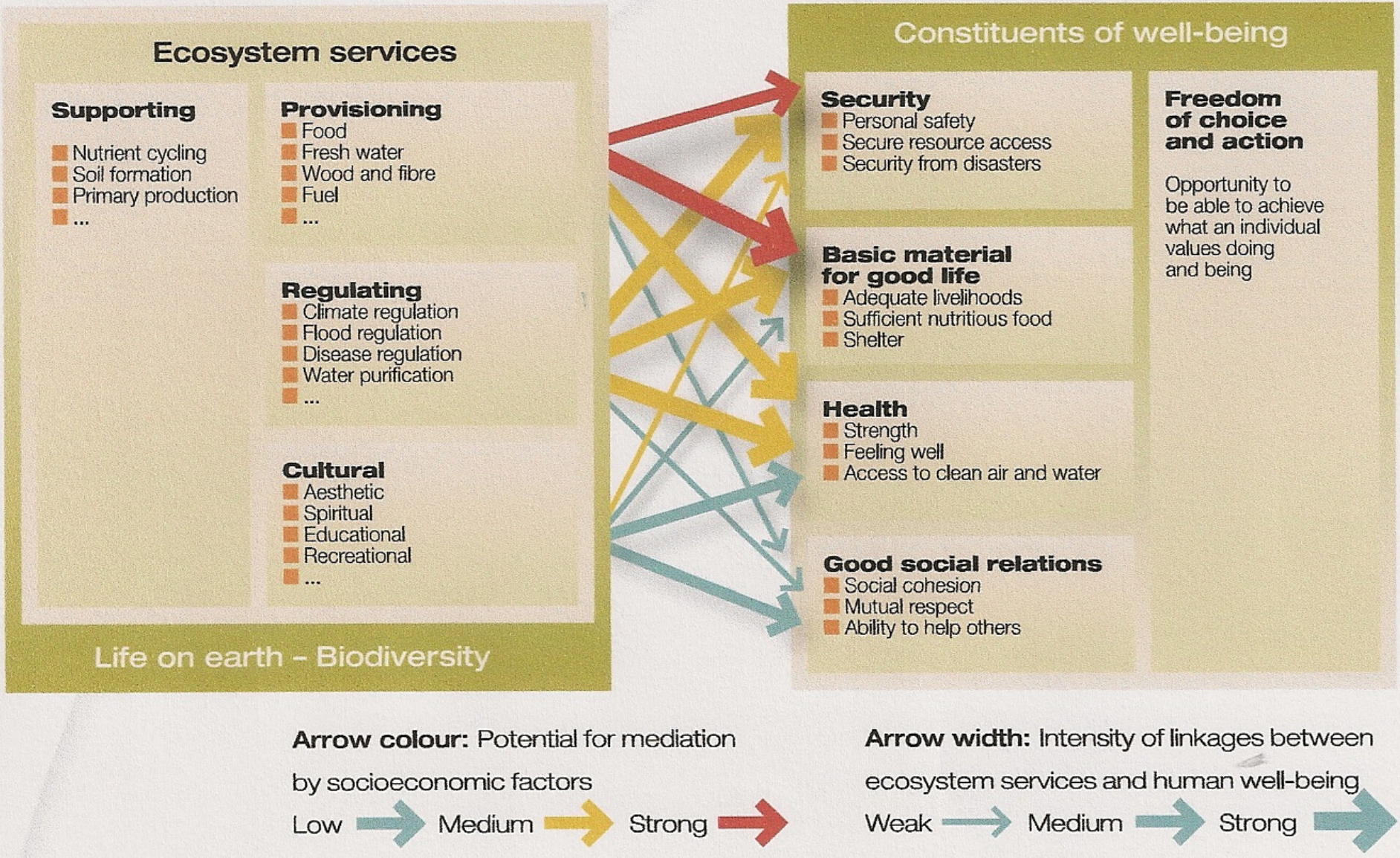


Avaliação Ecossistêmica do Milênio

Vivian Hackbart, 2012

Figure 1

Biodiversity and Ecosystem Services (BES)



(Avaliação Ecossistêmica do Milênium 2005)

Landscape Ecology (2013)

Self-transcendence

* Seek a cause or communion beyond the self
* Peak experiences with others, nature, and God, ...

Self-actualization

* Seek fulfillment of personal potential
* Matching interests with talent, creativity, morality, lack of prejudice, ...

Esteem

* Seek esteem through recognition and achievement
* Confidence, self-respect, respect of others, respect by others, ...

Love & belonging

* Seek affiliation with groups/organizations
* Family, friendship, intimacy, acceptance, ...

Safety

* Seek security through order and law
* Personal security, financial security, insurance against health and wellbeing risks, ...

Physiology

* Seek to obtain the most basic necessities of life
* Food, water, air, shelter, clothing, sex, ...

Spiritual needs

Being needs (B-needs)

Psychological needs

Deficiency needs (D-needs)

Survival needs

Maslow's Hierarchy of Needs

(Wu 2013)

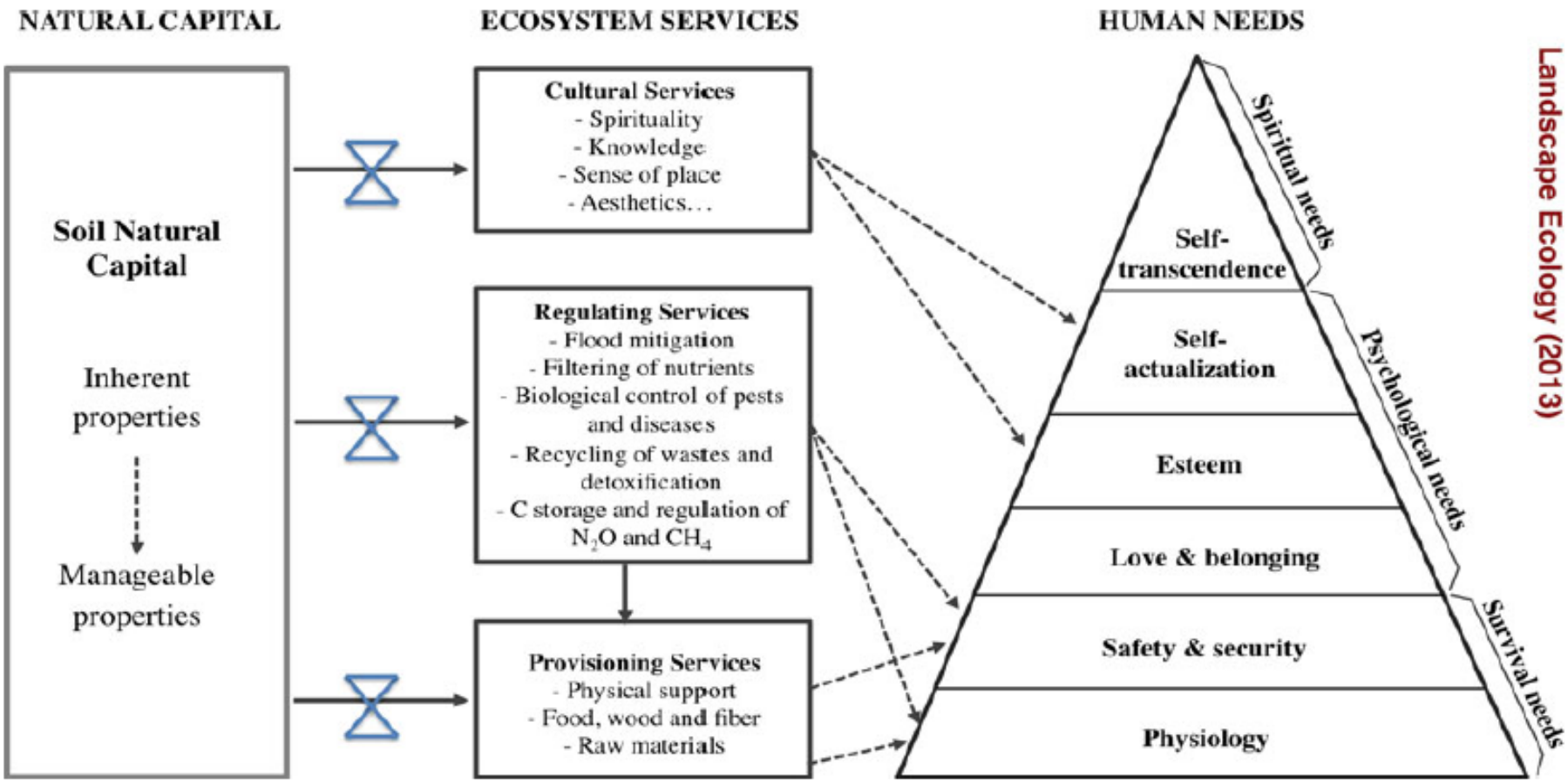
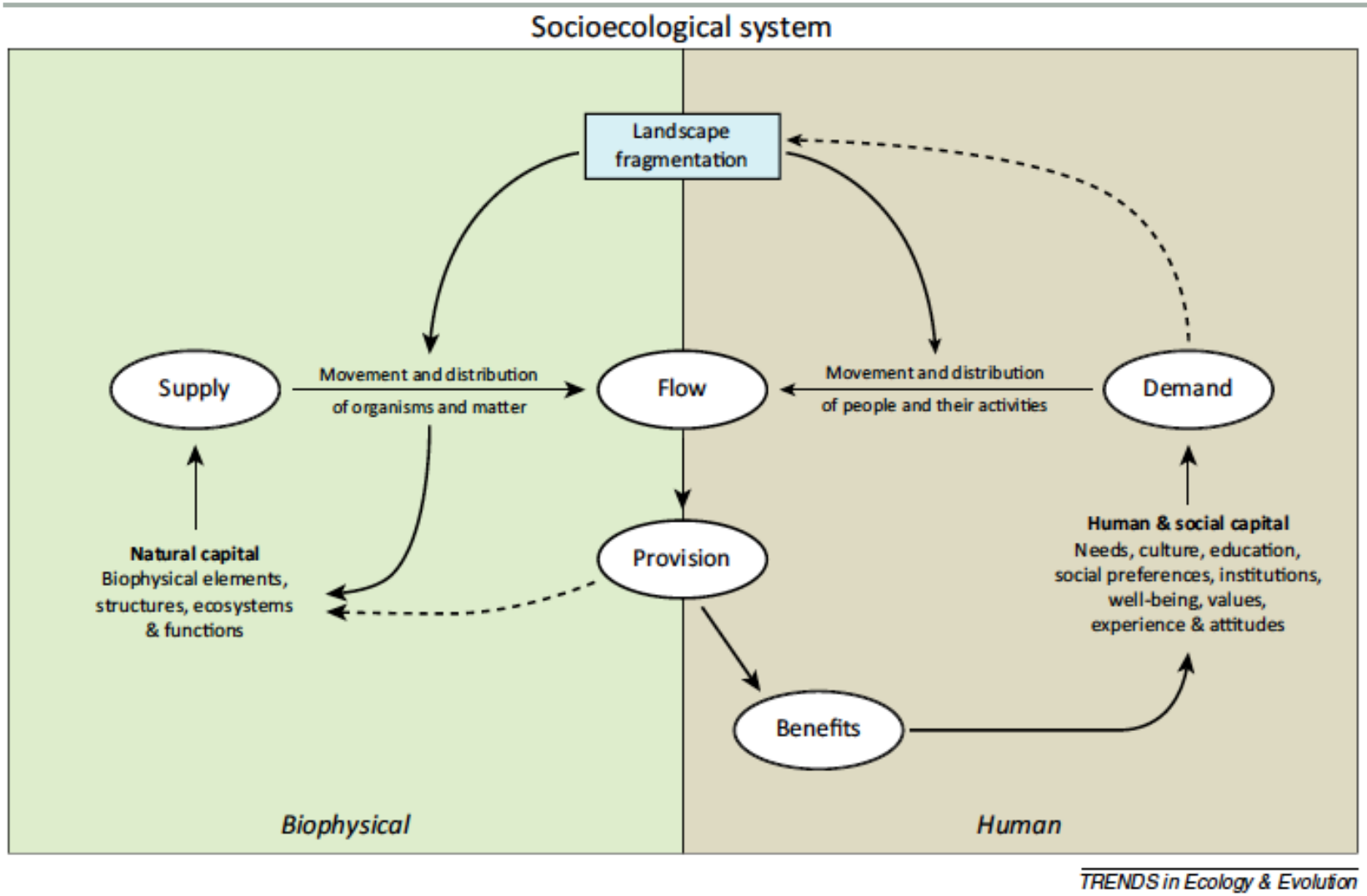


Fig. 4 The relationship among soil natural capital, ecosystem services, and human needs (modified from Dominati et al. 2010)

(Wu 2013)

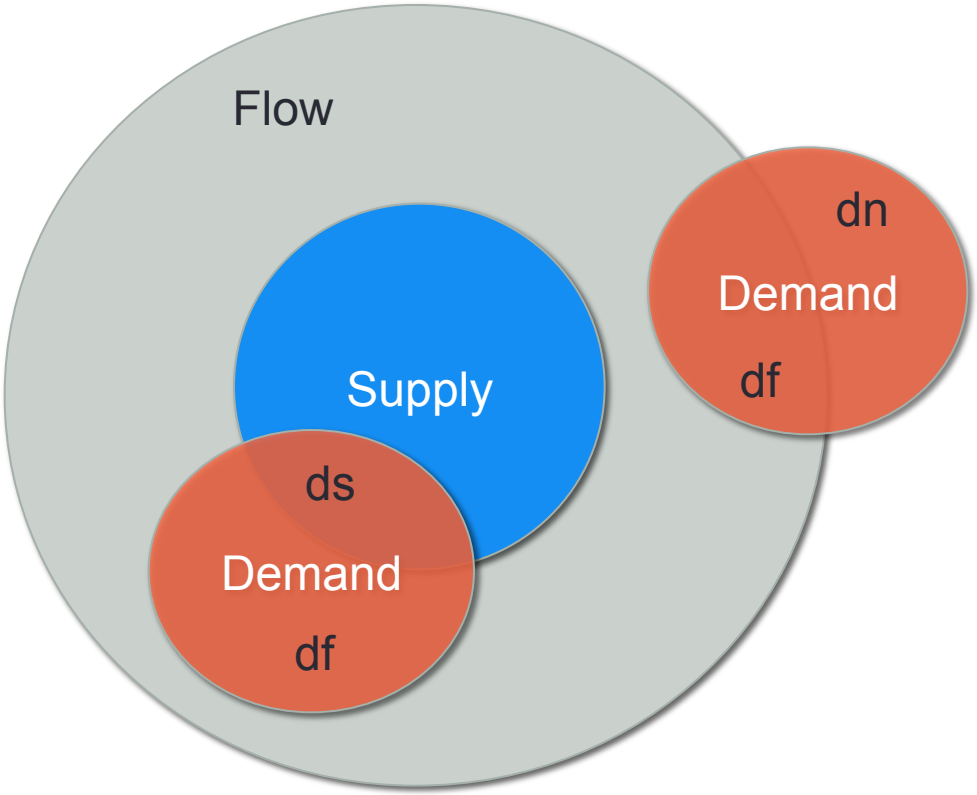
COMO ESTIMAR SERVIÇO ECOSSISTÊMICO?

Landscape perspective in ecosystem services



Mitchell et al. (2015) - TREE

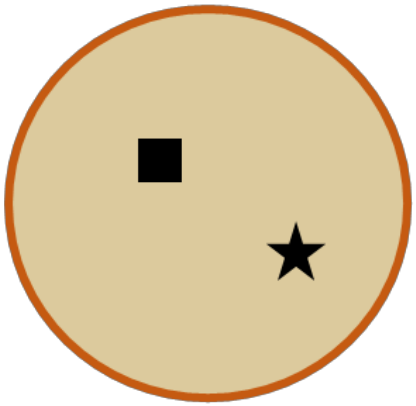
Ecosystem service provision depends on Supply, Demand and Flows



df: demand with flow
ds: demand and supply overlap
dn: demand without flow

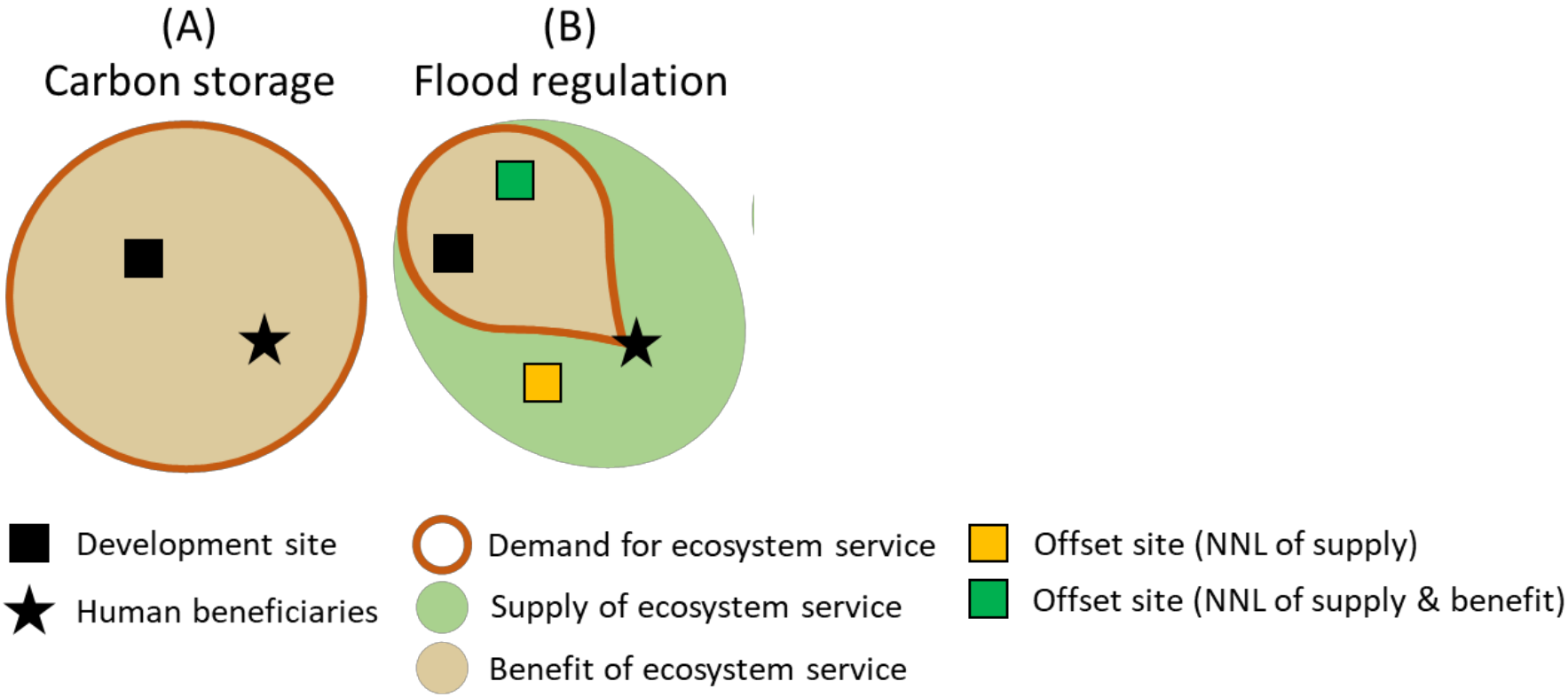
(Serna-Chavez et al. 2014, Ecological Indicators)

(A)
Carbon storage

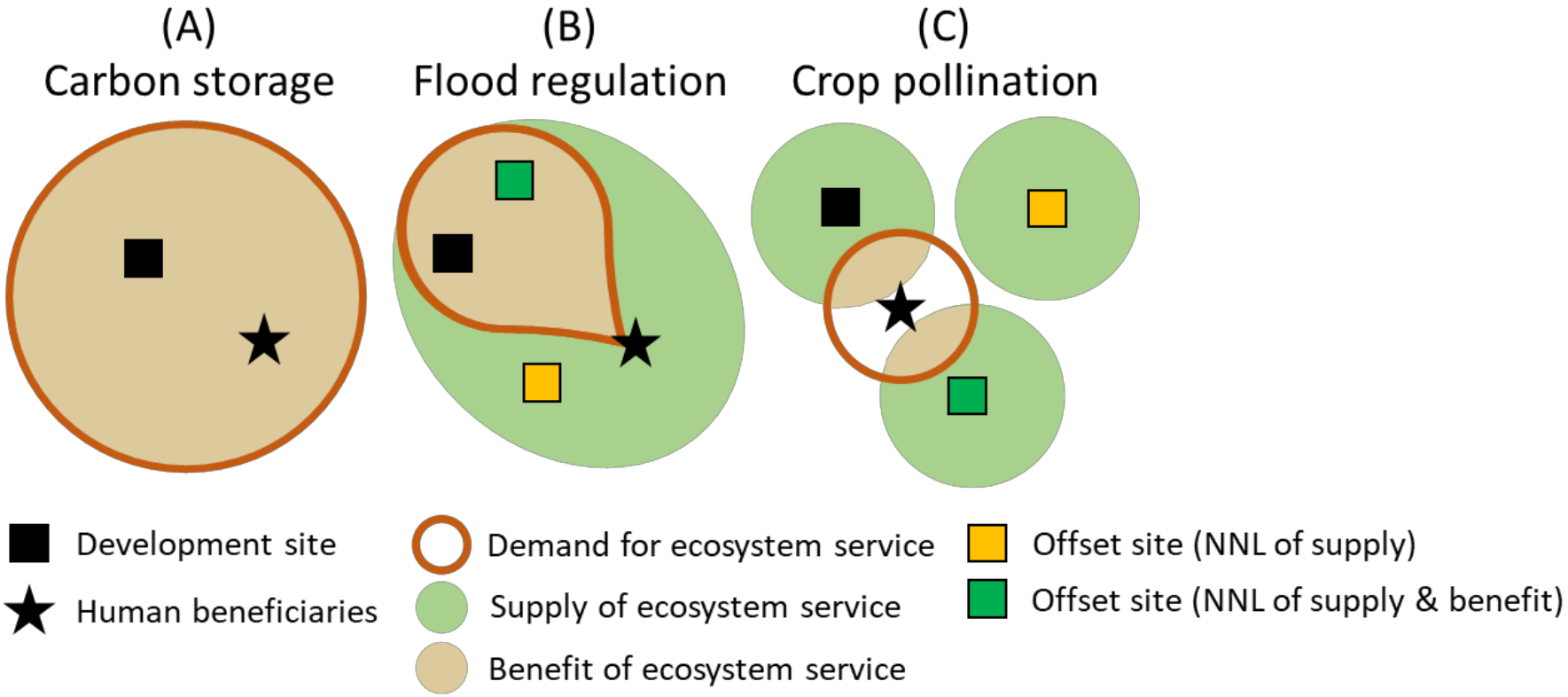


Development site
Human beneficiaries
Demand for ecosystem service
Supply of ecosystem service
Benefit of ecosystem service
Offset site (NNL of supply)
Offset site (NNL of supply & benefit)

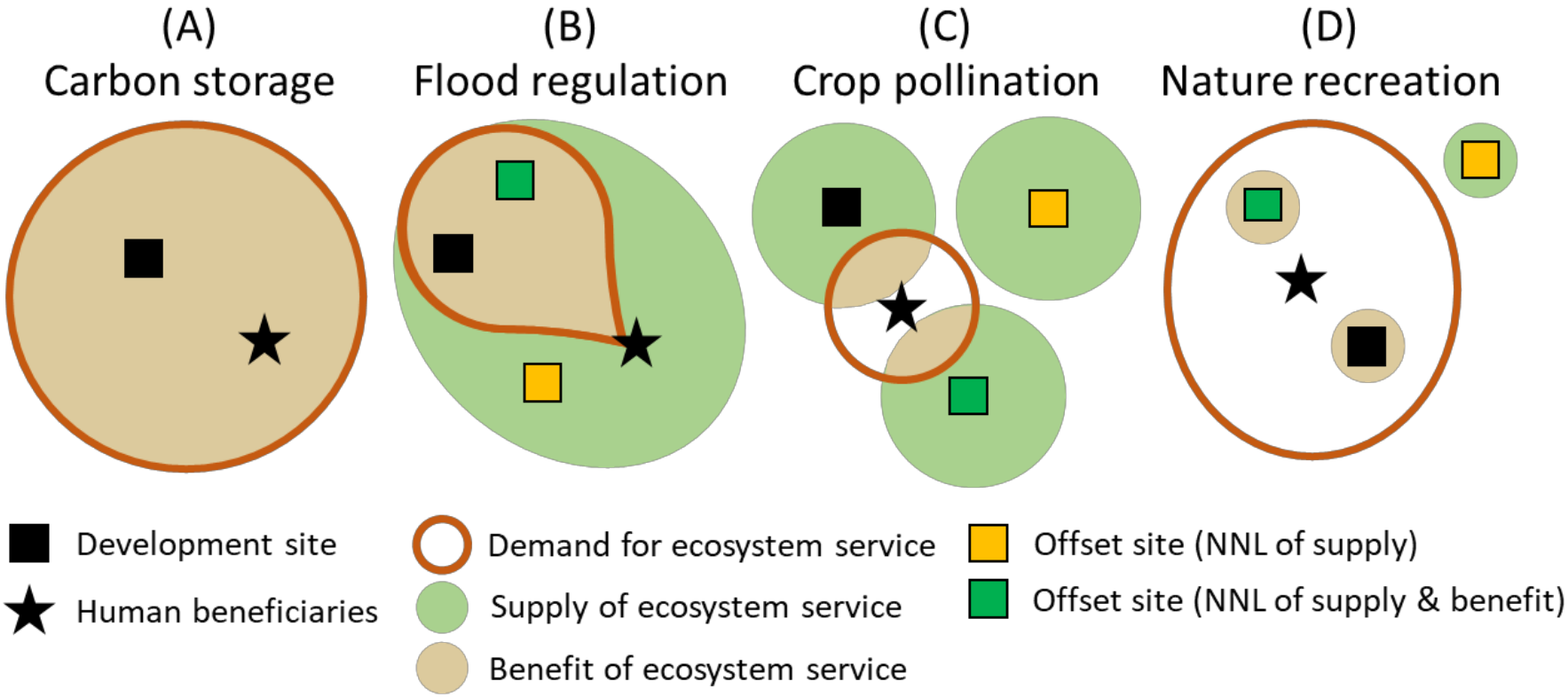
(Sonter et al. in press)



(Sonter et al. in press)

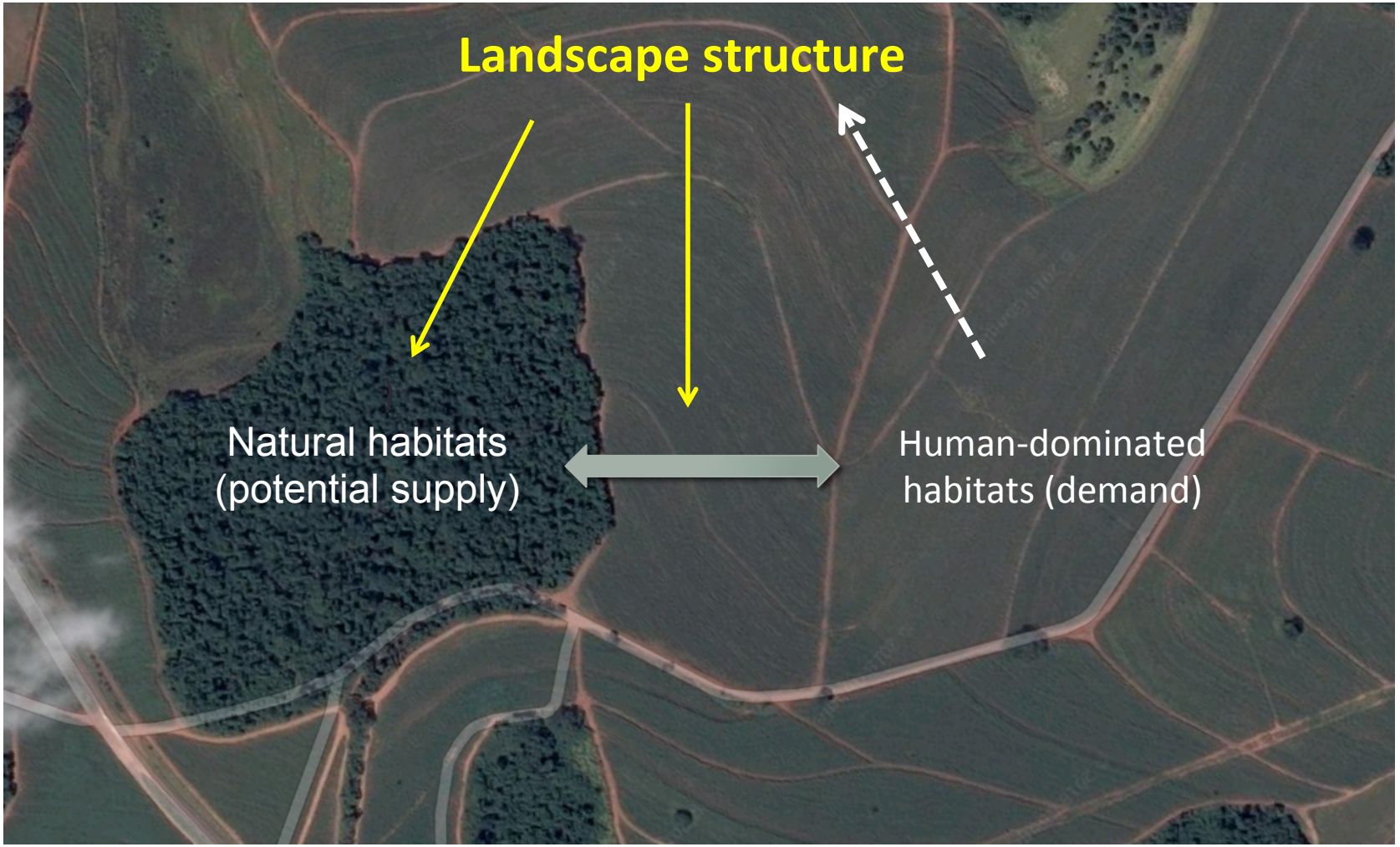


(Sonter et al. in press)



(Sonter et al. in press)

Landscape perspective in ecosystem services




Enoggera
Gallipolli Barracks
Banks St
Banks Street Reserve
Oakleigh State School
Breakfast Creek
Marist College Ashgrove
Enchanted Forest
Dorrington Park
Ashgrove Ave
Corbie Street Park
Ashgrove Bowls Club
Des Connor Fields
Grevillea Rd
Golf Course
Ashgrove Library

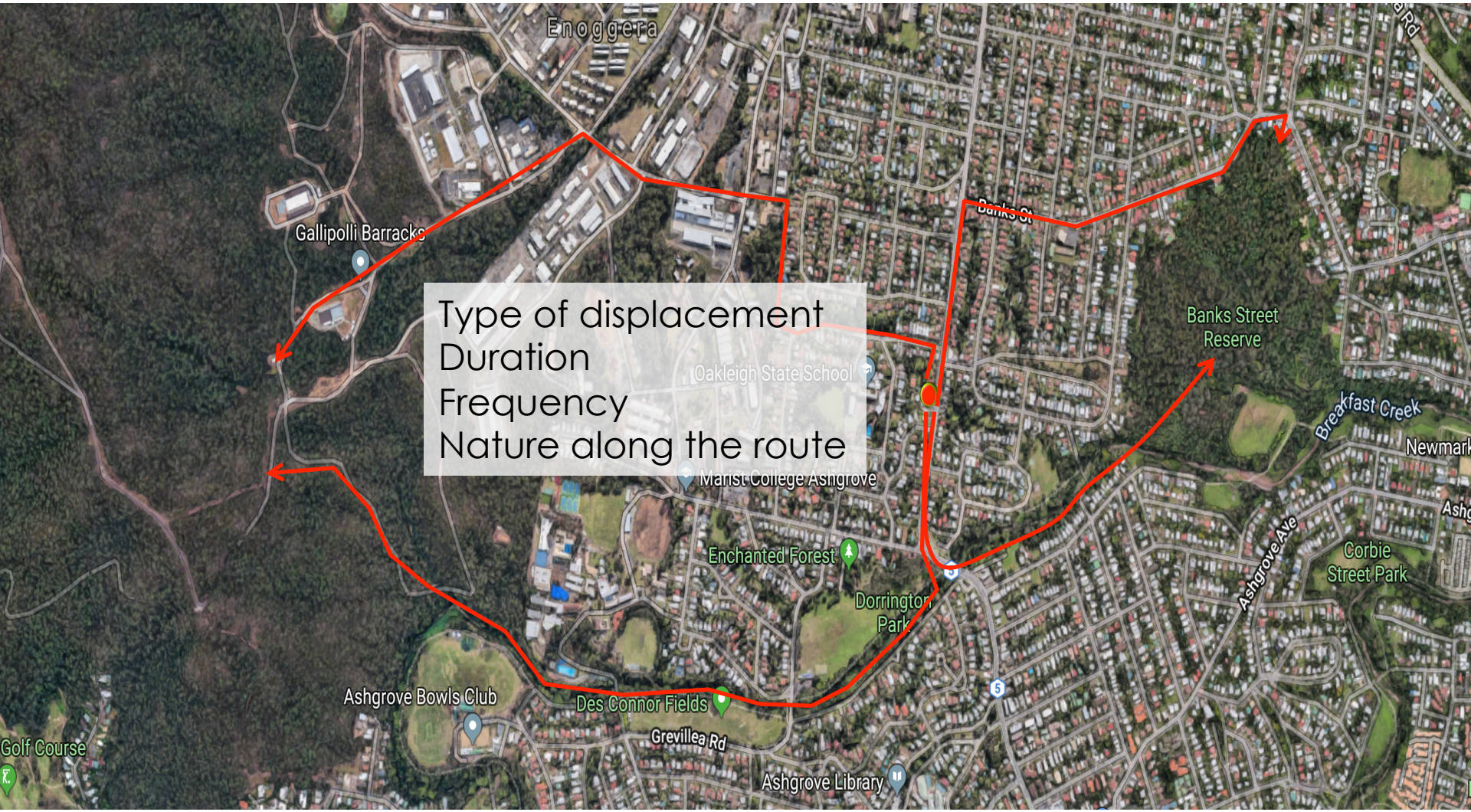
Supply


Size
Structural complexity
Biodiversity
Aesthetic condition
Soundscape
Security
...
Enoggera
Gallipolli Barracks
Banks St
Banks Street Reserve
Oakleigh State School
Marist College Ashgrove
Enchanted Forest
Dorrington Park
Ashgrove Ave
Corbie Street Park
Newmark
Ashgrov Bowls Club
Des Connor Fields
Grevillea Rd
Ashgrove Library
Golf Co

Supply


Size
Structural complexity
Biodiversity
Aesthetic condition
Soundscape
Security
…
Enoggera
Gallipolli Barracks
Banks St
Banks Street Reserve
Oakleigh State
Marist College Ashgrove
Dorrington Park
Ashgrove Ave
Corbie Street Park
Bowls Club
Ashgrove Library

Flows


Enoggera
Gallipolli Barracks
Banks St
Banks Street Reserve
Oakleigh State School
Breakfast Creek
Newmark
Marist College Ashgrove
Enchanted Forest
Dorrington Park
Ashgrove Ave
Corbie Street Park
Ashgrove Bowls Club
Des Connor Fields
Grevillea Rd
Golf Course
Ashgrove Library
Type of displacement
Duration
Frequency
Nature along the route

Flows

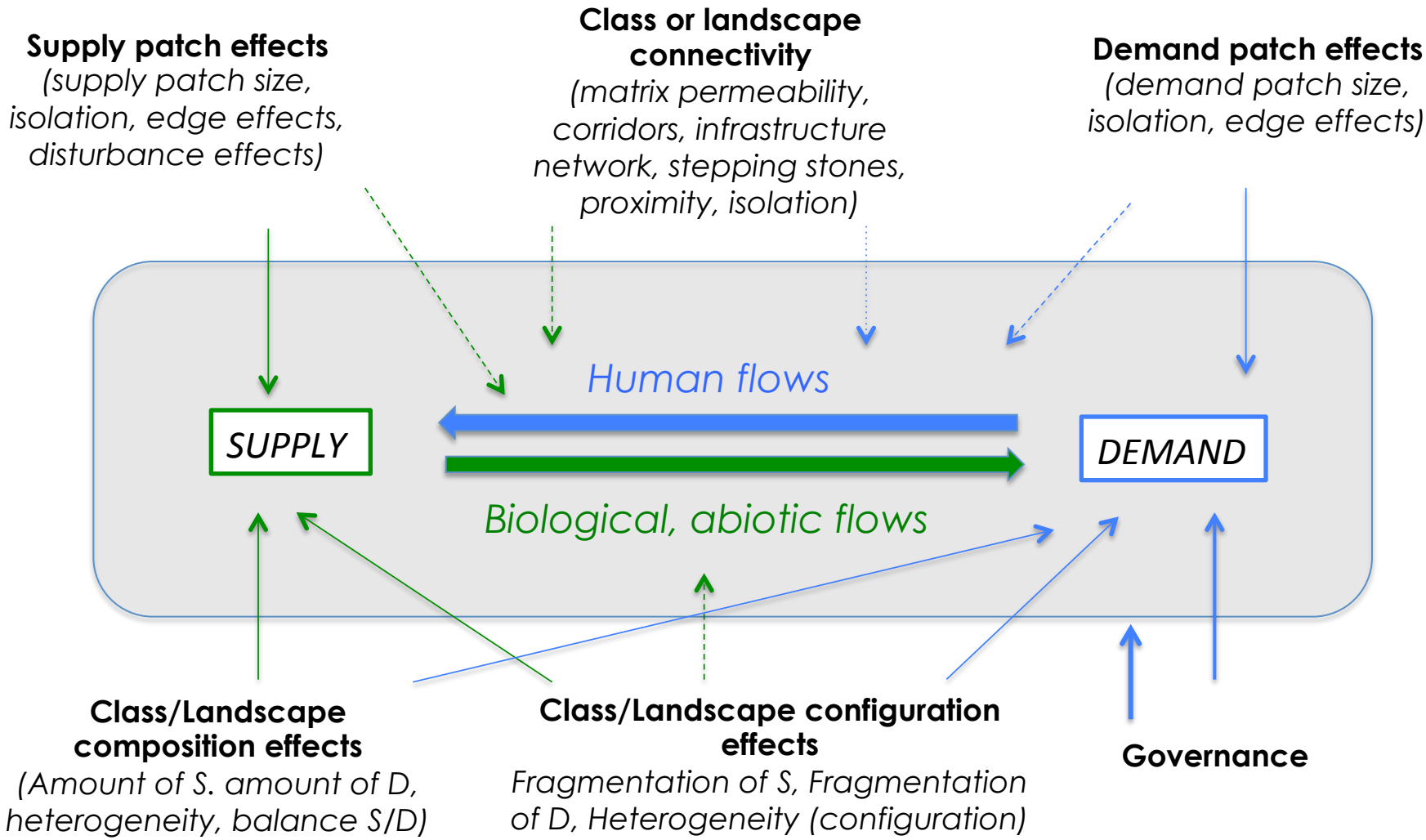
BIODIVERSITY

WALL

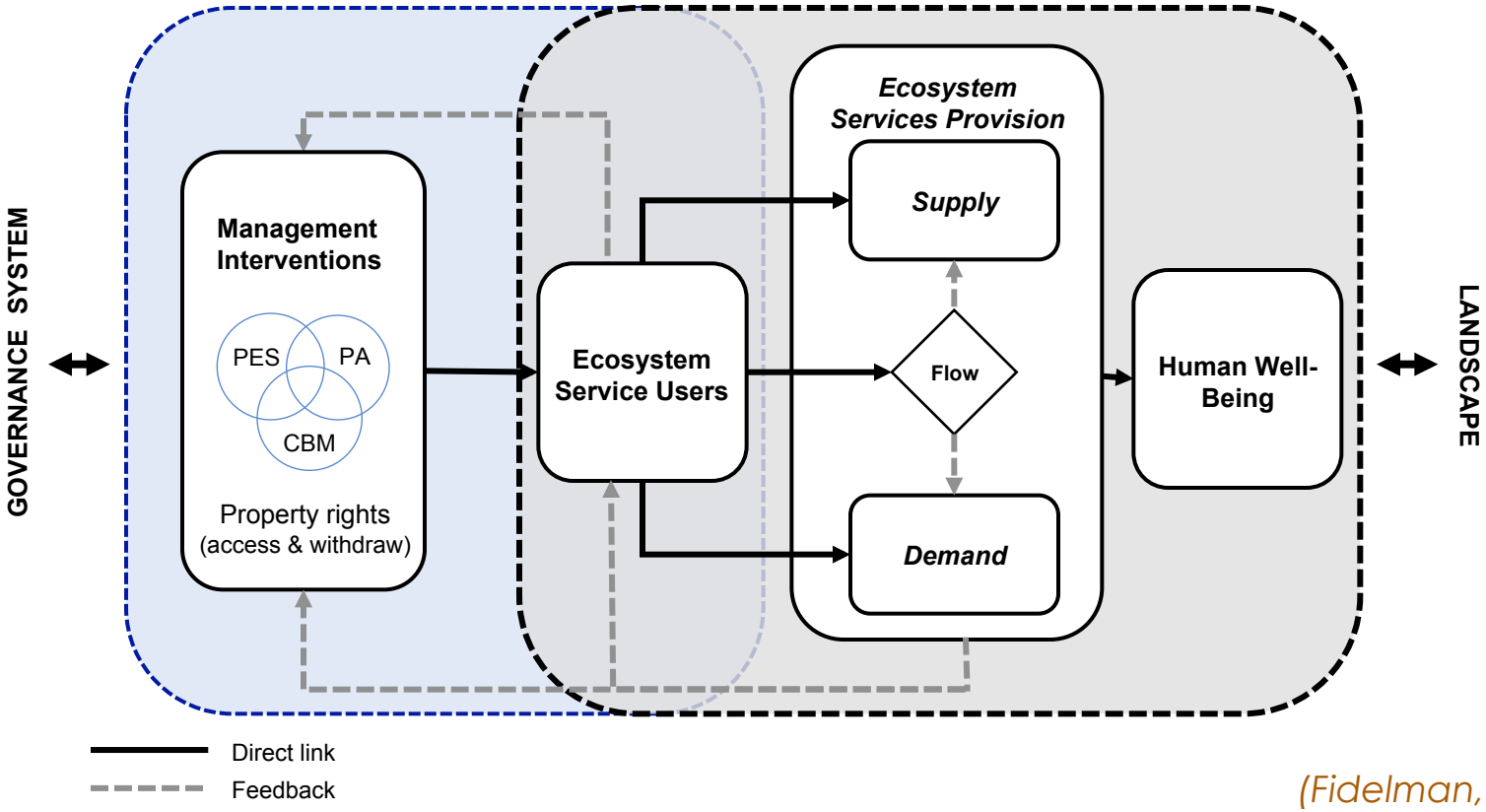
PEOPLE

Demand


Enoggera
Gallipolli Barracks
Banks St
Banks Street Reserve
Oakleigh State School
Marist College Ashgrove
Breakfast Creek
Newmark
Enchanted Forest
Dorrington Park
Ashgrove Ave
Corbie Street Park
Ashgrove Bowls Club
Des Connor Fields
Grevillea Rd
Golf Course
Ashgrove Library
Age
Education
Physical conditions
Aesthetic preferences
Time available…



(Metzger et al. in prep)



(Fidelman, Metzger, Rhodes et al. in prep.)

TRADEOFFS – PRODUÇÃO VS CONSERVAÇÃO

Brasil terá papel fundamental na produção de alimento e bioenergia

Brasil tem algumas das maiores safras dos principais produtos agropecuários mundiais

Nenhum outro país produz mais café, cana-de-açúcar, feijão e laranja. No caso da soja, boa parte da produção é exportada

 Arroz	US$ 3,46 bi	9º	 Café	US$ 2,62 bi	1º	 Cana-de-açúcar	US$ 21,88 bi	1º
	12,65 mi t	9º		2,44 mi t	1º		671,39 mi t	1º
 Carne bovina	US$ 25,68 bi	2º	 Carne suína	US$ 4,49 bi	5º	 Feijão	US$ 1,99 bi	1º
	9,50 mi t	2º		2,92 mi t	5º		3,48 mi t	1º
 Frango	US$ 14,19 bi	3º	 Laranja	US$ 3,40 bi	1º	 Leite	US$ 8,99 bi	4º
	9,96 mi t	3º		17,61 mi t	1º		29,11 mi t	5º
 Milho	US$ 2,38 bi	3º	 Soja	US$ 15,49 bi	2º			
	51,23 mi t	3º		57,34 mi t	2º			

Fonte: Faostat, *Organização das Nações Unidas para Agricultura e Alimentação, 2009*

Legenda

Brasil é um país megadiverso

Paradigma atual: produção vs conservação

Produção *vs* Conservação

Brasil tem algumas das maiores safras dos principais produtos agropecuários mundiais

Nenhum outro país produz mais café, cana-de-açúcar, feijão e laranja. No caso da soja, boa parte da produção é exportada

Arroz	US$ 3,46 bi	9º	Café	US$ 2,62 bi	1º	Cana-de-açúcar	US$ 21,88 bi	1º
	12,65 mi t	9º		2,44 mi t	1º		671,39 mi t	1º
Carne bovina	US$ 25,68 bi	2º	Carne suína	US$ 4,49 bi	5º	Feijão	US$ 1,99 bi	1º
	9,50 mi t	2º		2,92 mi t	5º		3,48 mi t	1º
Frango	US$ 14,19 bi	3º	Laranja	US$ 3,40 bi	1º	Leite	US$ 8,99 bi	4º
	9,96 mi t	3º		17,61 mi t	1º		29,11 mi t	5º
Milho	US$ 2,38 bi	3º	Soja	US$ 15,49 bi	2º			
	51,23 mi t	3º		57,34 mi t	2º			

Legenda

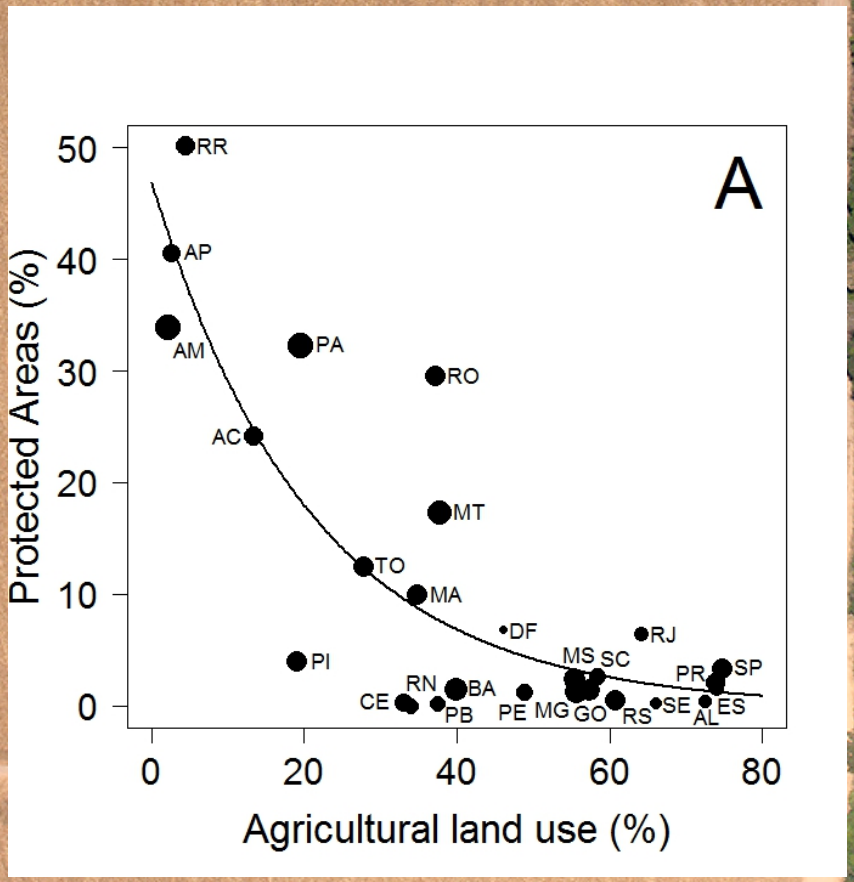
Produto — Produção (bilhões de dólares) 2º — Quantidade (milhões de toneladas) 4º

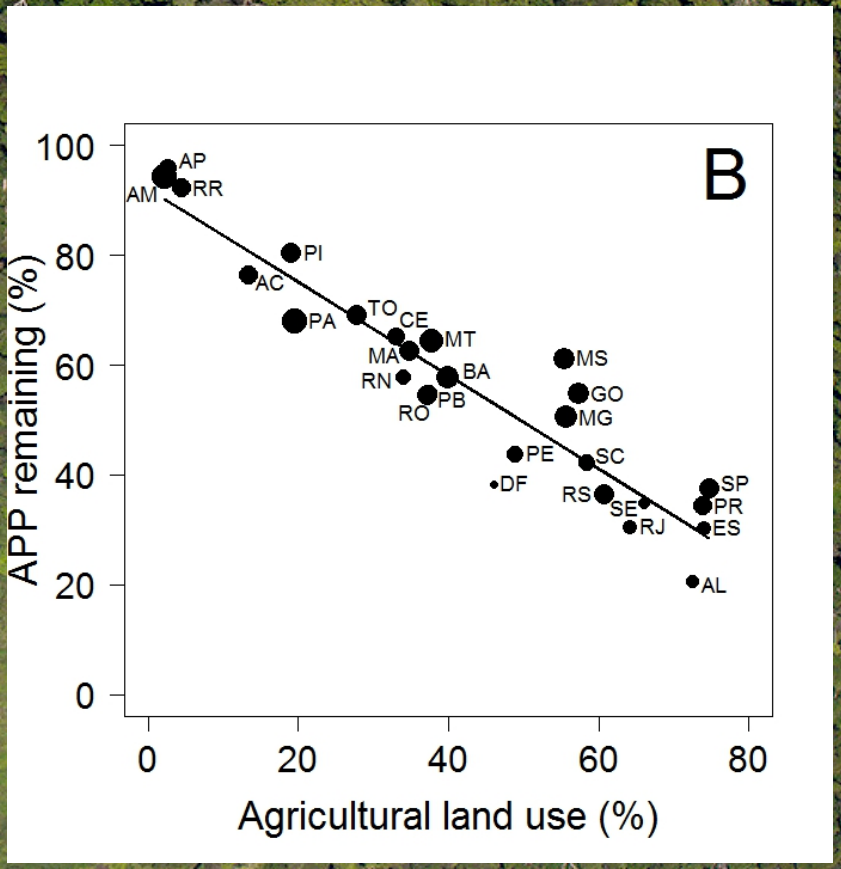
Colocação mundial em quantidade

Colocação mundial em produção

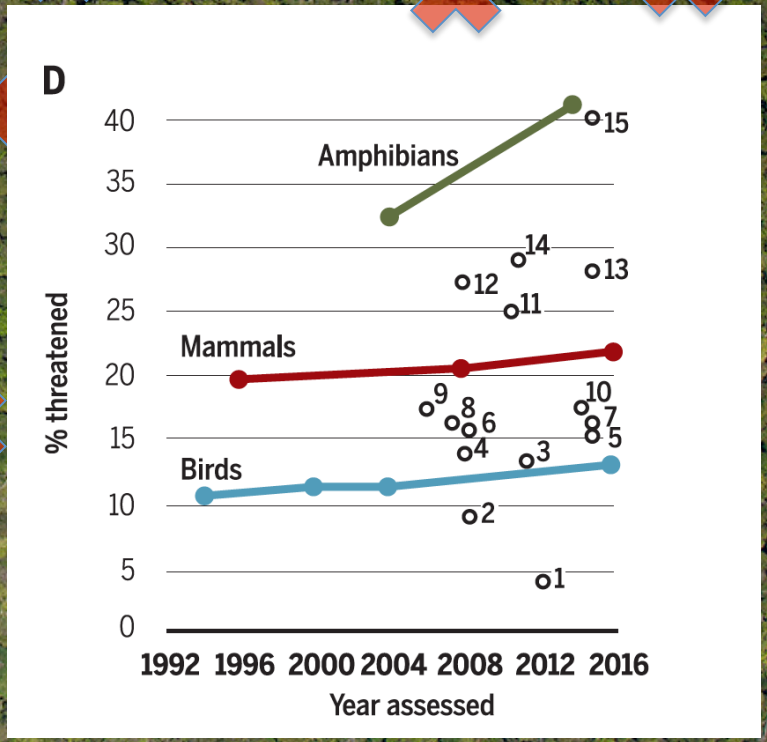
Fonte: Faostat, Organização das Nações Unidas para Agricultura e Alimentação, 2009

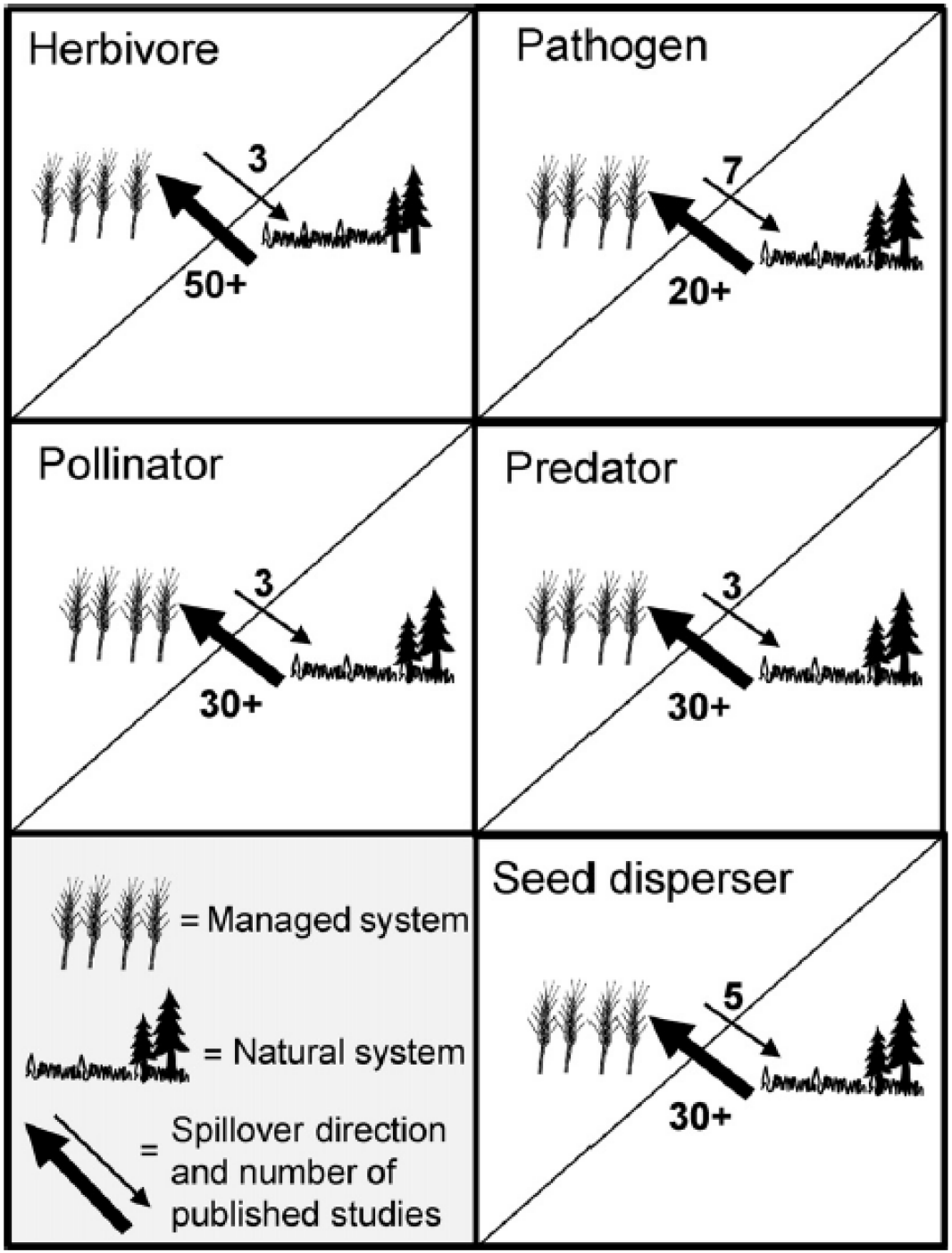
Paradigma atual: produção vs conservação





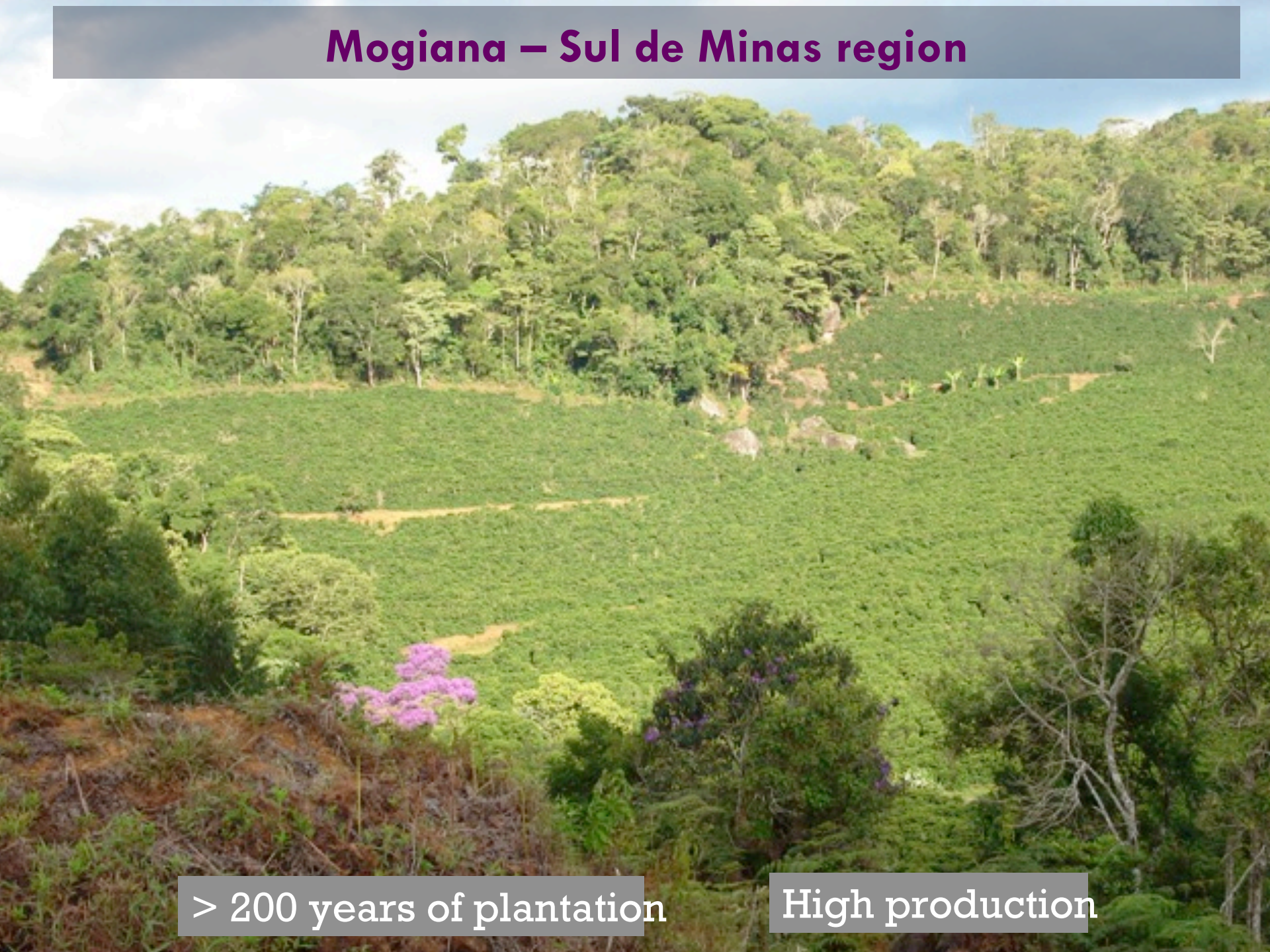
Paradigma atual: produção vs conservação



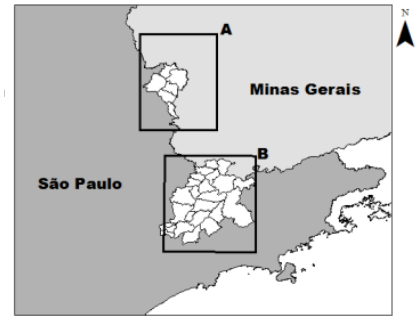


(Blitzer et al. 2012, AE&E)

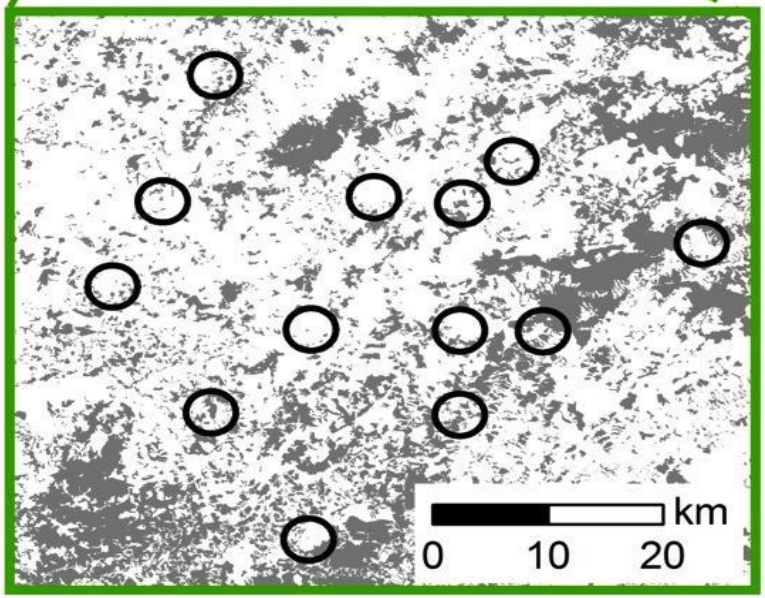
Mogiana – Sul de Minas region



Study regions



Mogiana – Sul de Minas



Cantareira-Mantiqueira

Coffee matrix

Pasture matrix

Atlantic Forest Biome

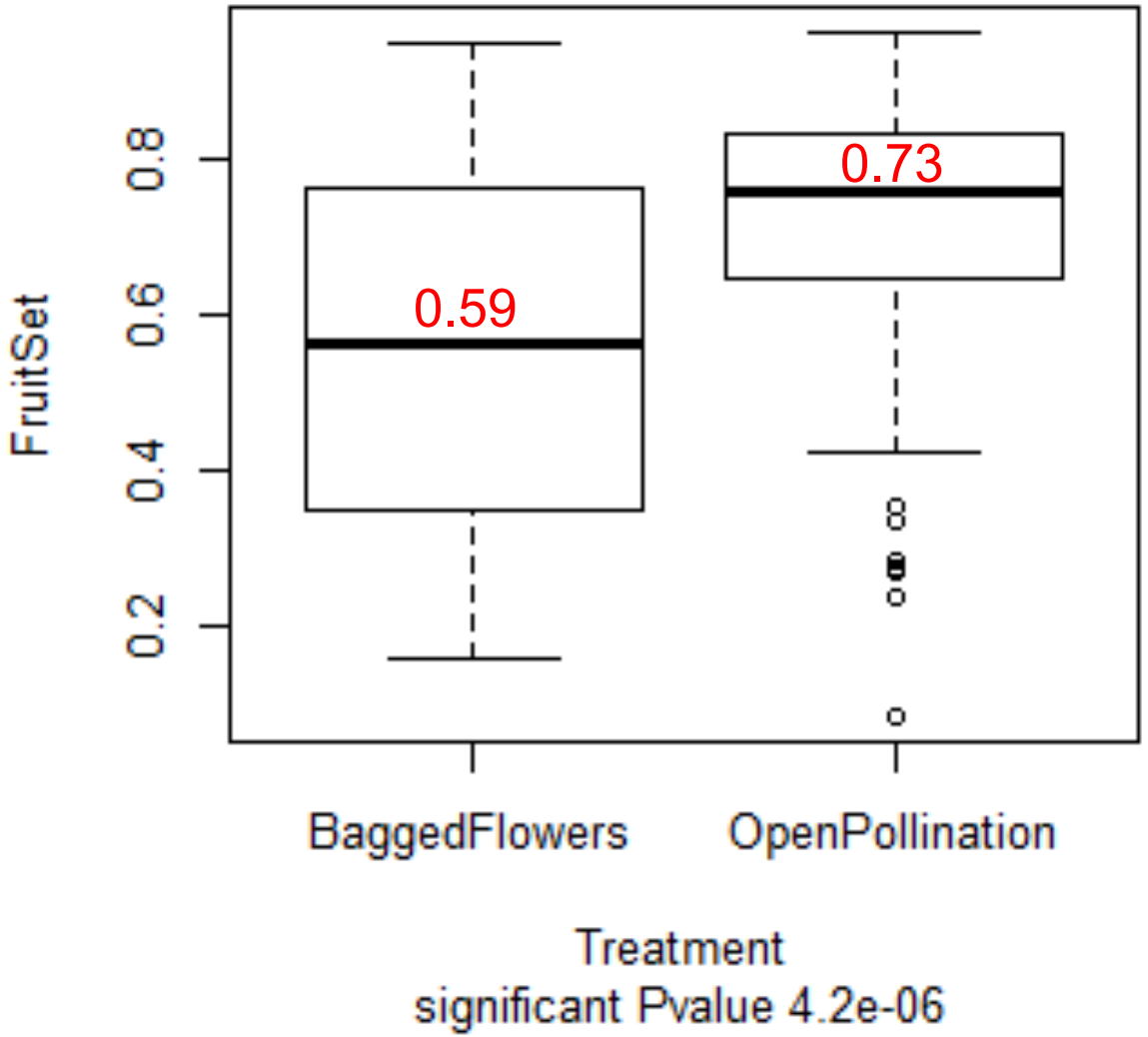
Forest remnants

BEES

COFFEE POLLINATION

INTERFACE

Bee presence increases fruit set in 28%



(Saturni et al. 2016; Agriculture, Ecosystem and Environment)

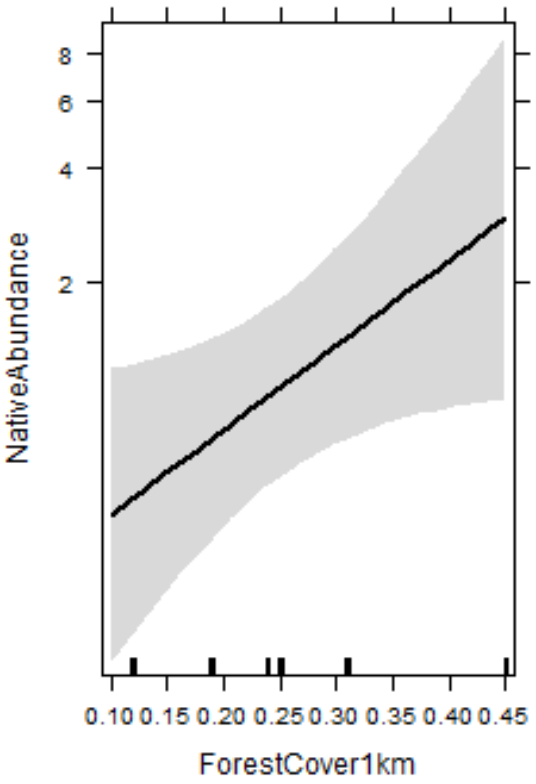
LANDSCAPE

BEES

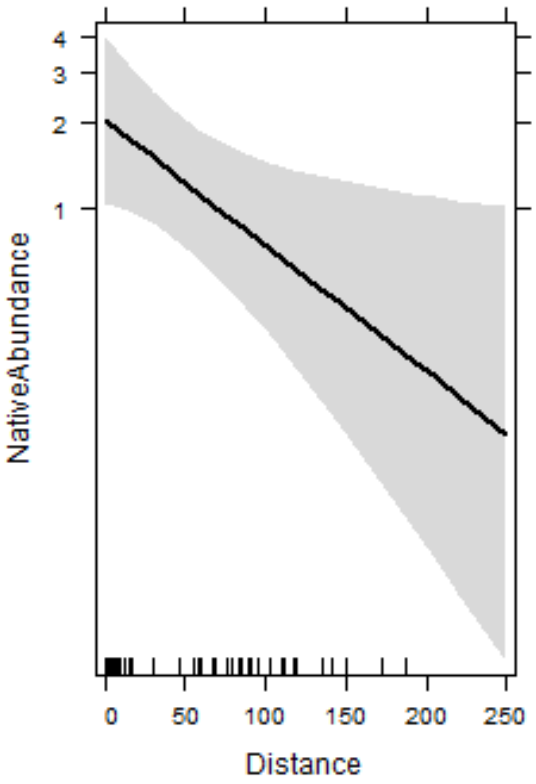
INTERFACE

Best model for Native Abundance

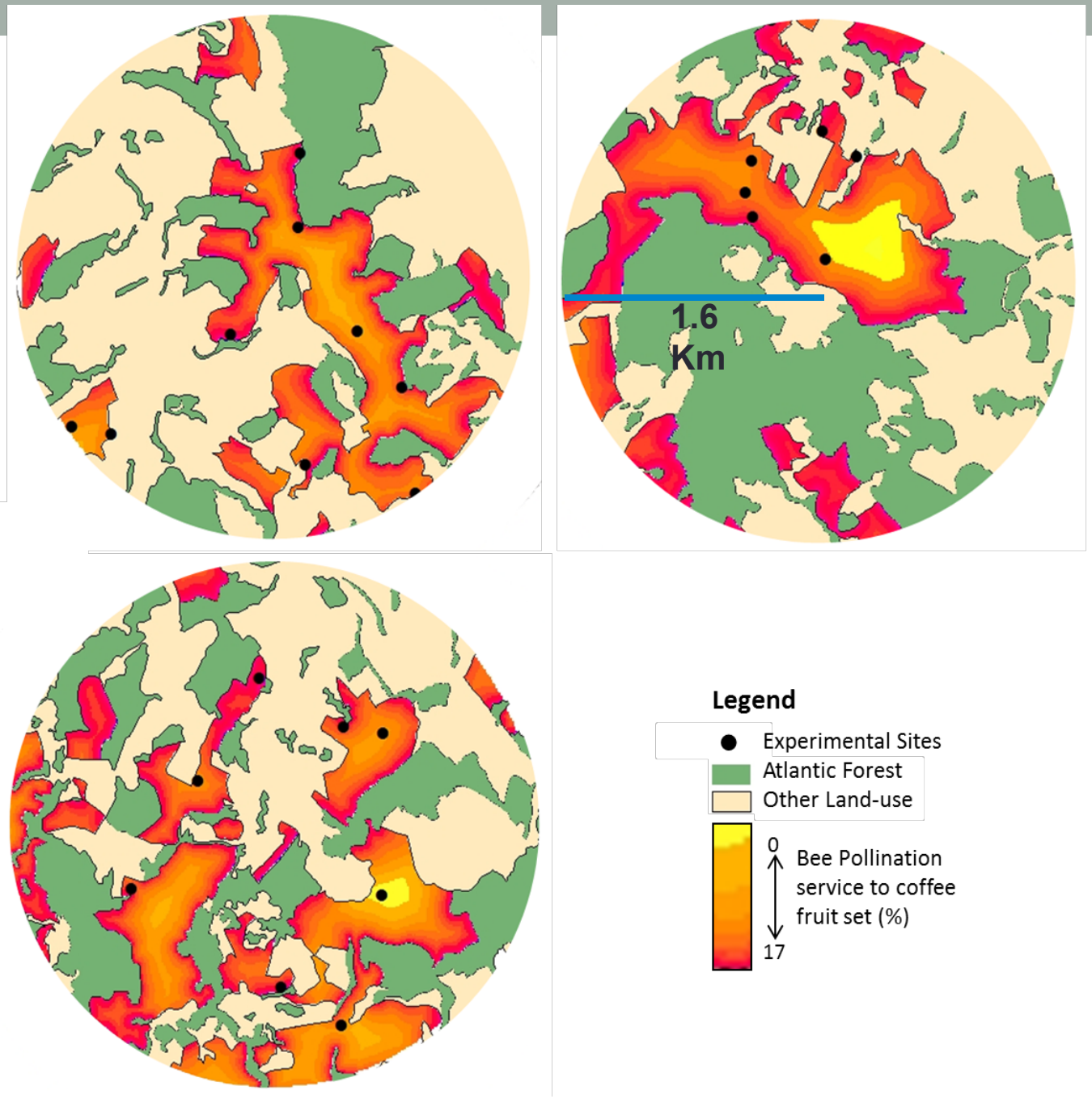
Forest cover (1 km)



Distance to forest



(Saturni et al. 2016; Agriculture, Ecosystem and Environment)


1.6
Km
Legend
Experimental Sites
Atlantic Forest
Other Land-use
0
Bee Pollination
service to coffee
fruit set (%)
17

Economic value of tropical forest to coffee production

Taylor H. Ricketts*†‡, Gretchen C. Daily†, Paul R. Ehrlich†, and Charles D. Michener§

*Conservation Science Program, World Wildlife Fund, 1250 24th Street NW, Washington, DC 20037-1124; †Department of Biological Sciences, Stanford University, 371 Serra Mall, Stanford, CA 94305-5020; and §Division of Entomology, Natural History Museum, University of Kansas, 1460 Jayhawk Boulevard, Lawrence, KS 66045-7523

Contributed by Charles D. Michener, July 17, 2004

Costa Rica

Equador

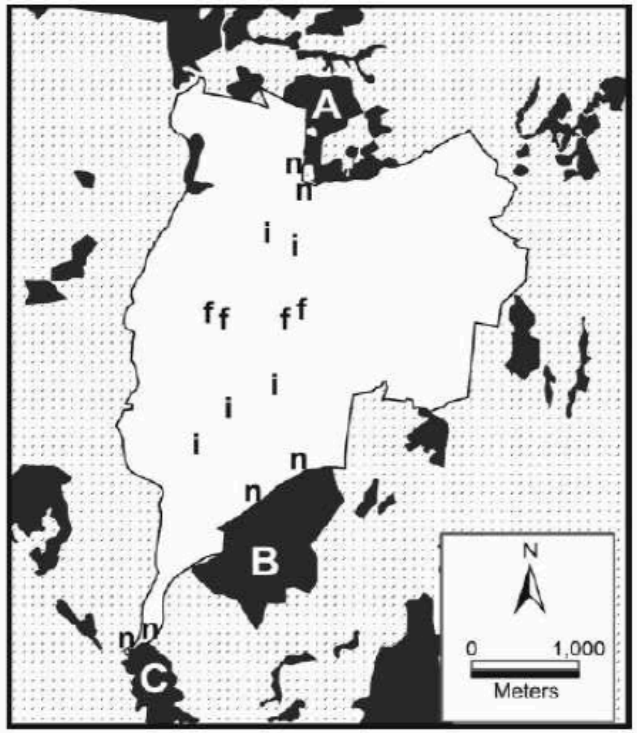


Fig. 1. Map of study area and sites. Finca Santa Fe (1,065 ha) is in white; stippled area is a mix of coffee, pasture, and sugar cane; black areas are forests. The three focal forest patches are labeled A (46 ha), B (111 ha), and C (34 ha). Study sites are labeled n, i, and f for near, intermediate, and far distance classes.

- Using pollination experiments along replicated distance gradients, they found that forest-based pollinators increased coffee yields by 20% within 1km of forest.
- Pollination also improved coffee quality near forest by reducing the frequency small misshapen seeds by 27%.

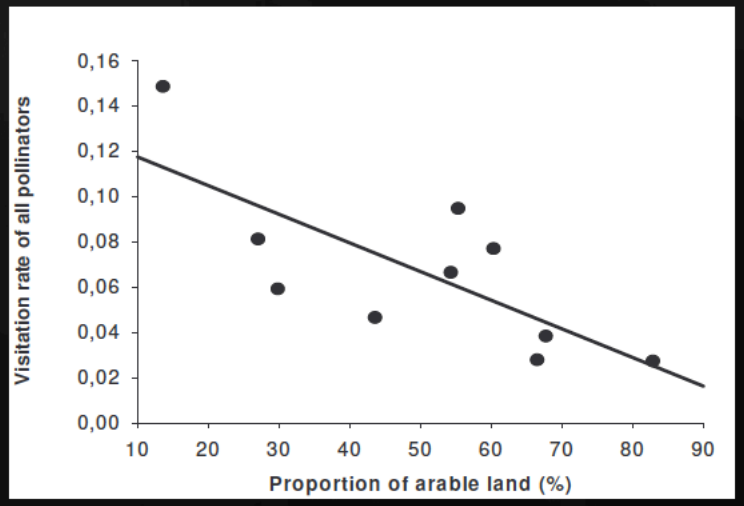
Ricketts et al (2004):PNAS 101(34):12579–12582

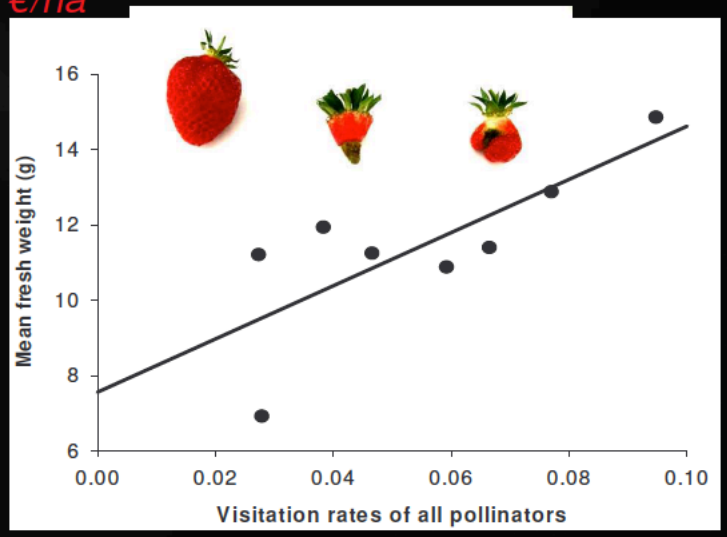
(slide V. Fonseca)

Serviços de polinização e visitas de abelhas

Alemanha:

- *taxas mais baixas de visitas em paisagens simples*
- *O peso do fruto depende de muitas visitas*
- *Valor econômico dos polinizadores: ~ 700 €/ha*





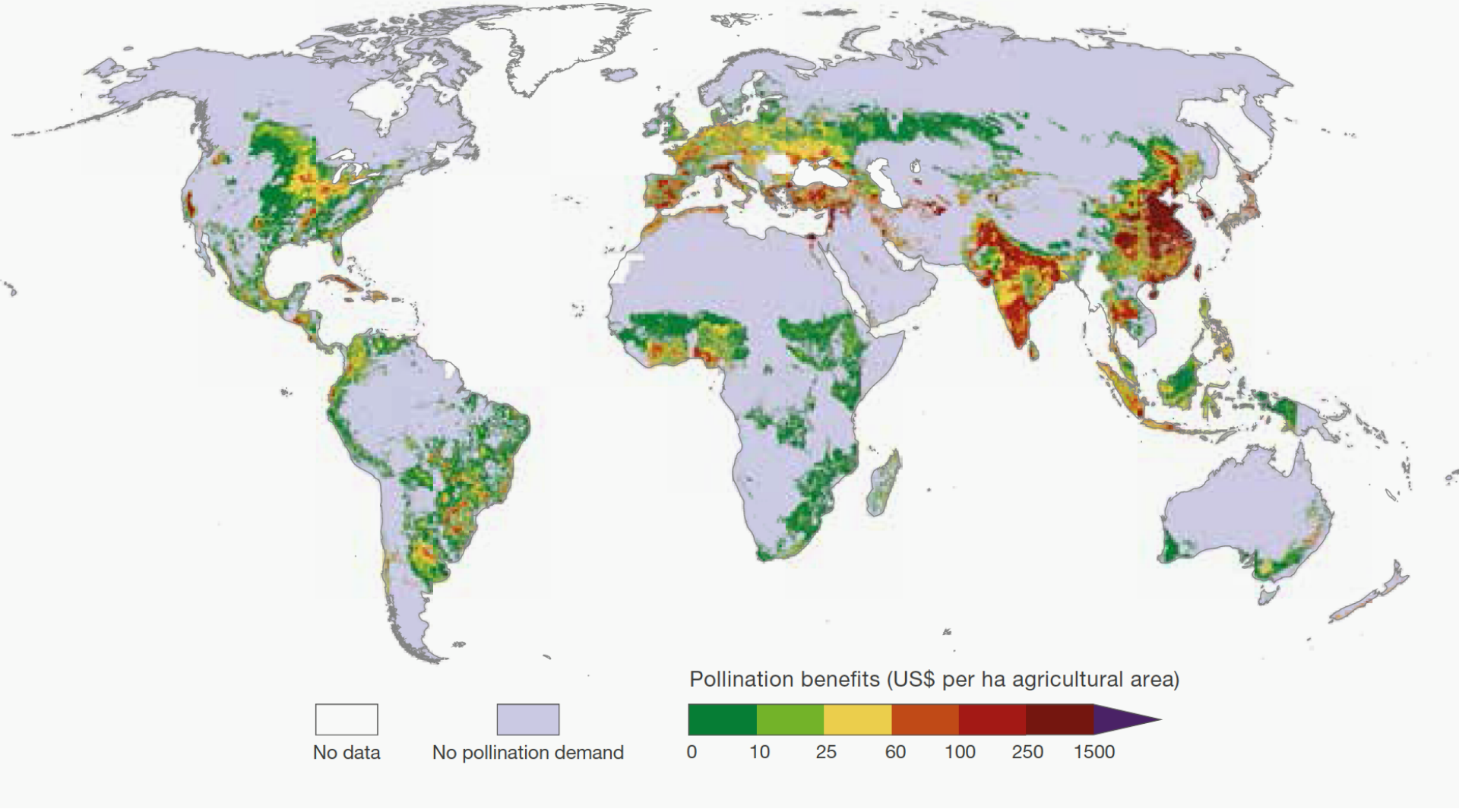
Krewenka et al. in preparation

Brasil faturamento em 2016: R$ 23 bilhões

➔ Valor da polinização ~ R$ 3,5 – 6,5 bilhões

THE ASSESSMENT REPORT ON POLLINATORS, POLLINATION AND FOOD PRODUCTION OF THE INTERGOVERNMENTAL SCIENCE-POLICY PLATFORM ON BIODIVERSITY AND ECOSYSTEM SERVICES

(B) Pollination service to direct crop market output in US$

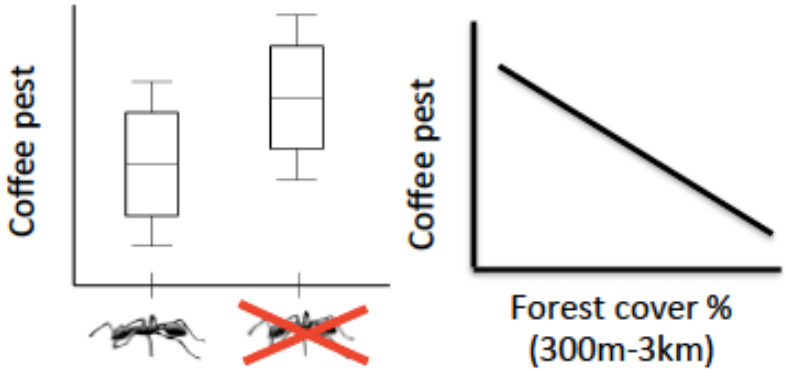


Land-use and ant-mediated pest control services in coffee-dominated landscapes

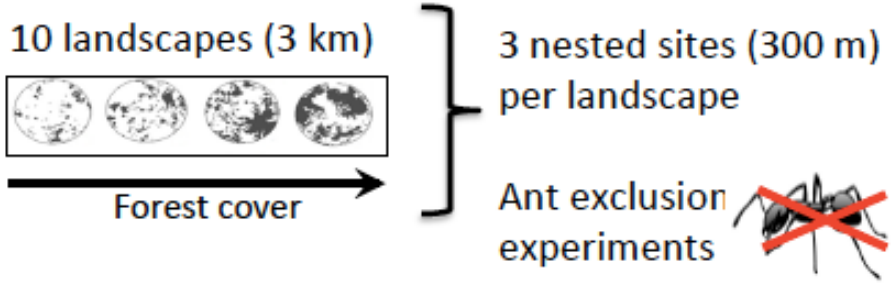
Natalia Aristizábal and Jean P.W. Metzger

INTERFACE

Hypotheses and predictions

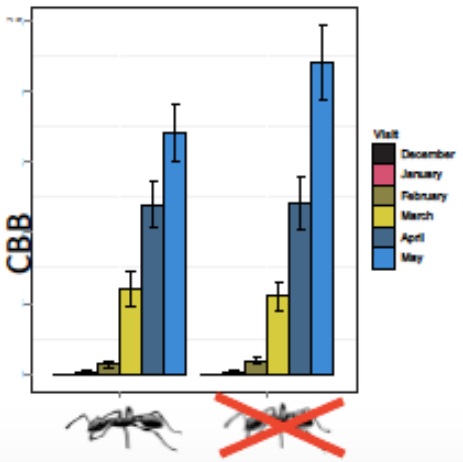


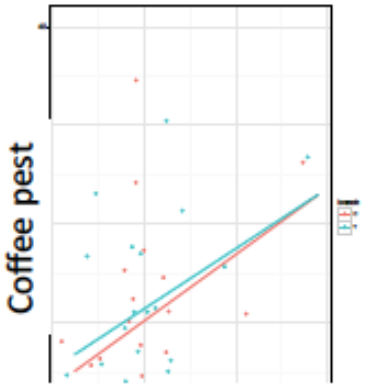
Methods



Preliminary results

coffee borer beetle control





Ecosystem Services in Landscapes

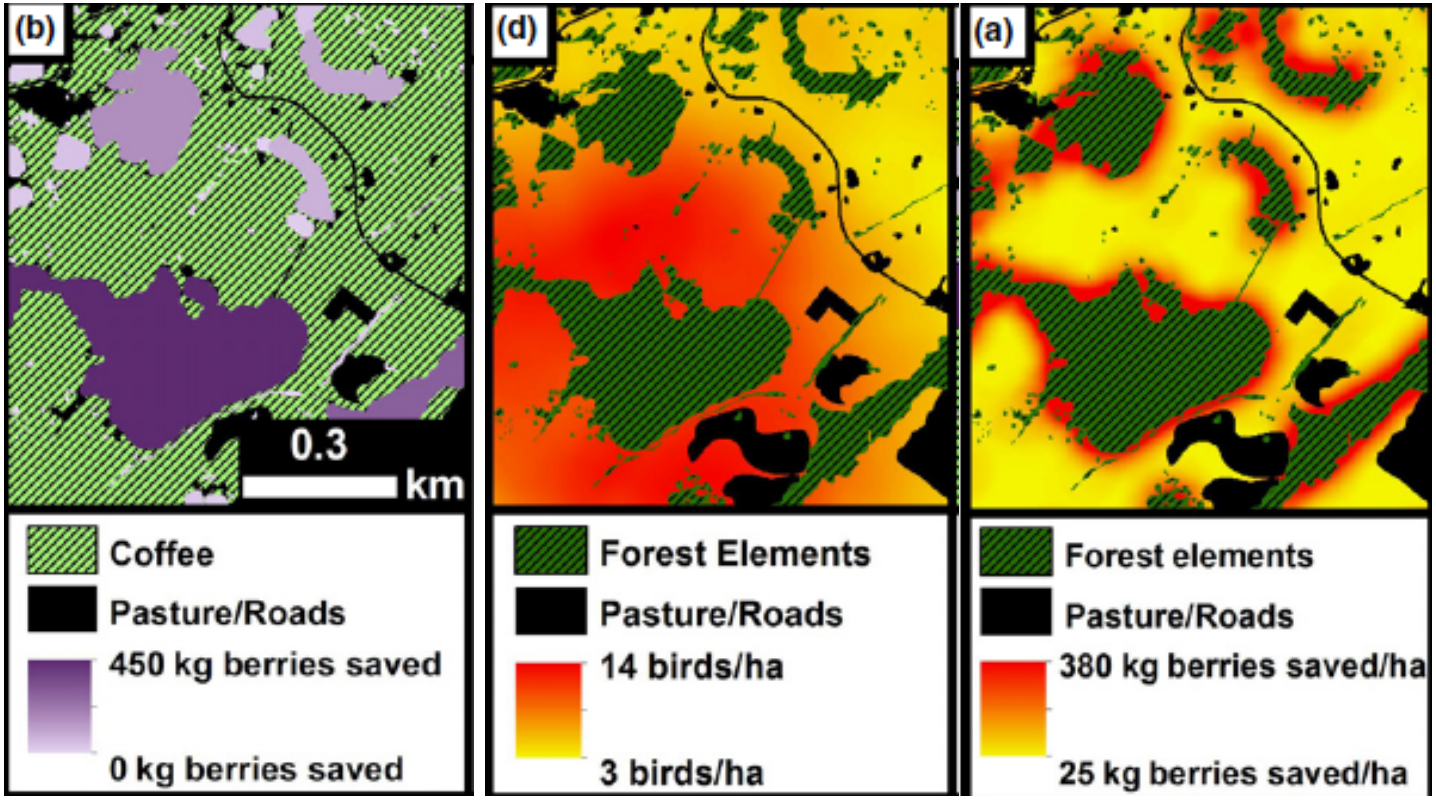
ECOLOGY LETTERS

Ecology Letters, (2013) doi: 10.1111/ele.12173

LETTER

Forest bolsters bird abundance, pest control and coffee yield

(Karp et al. 2013)



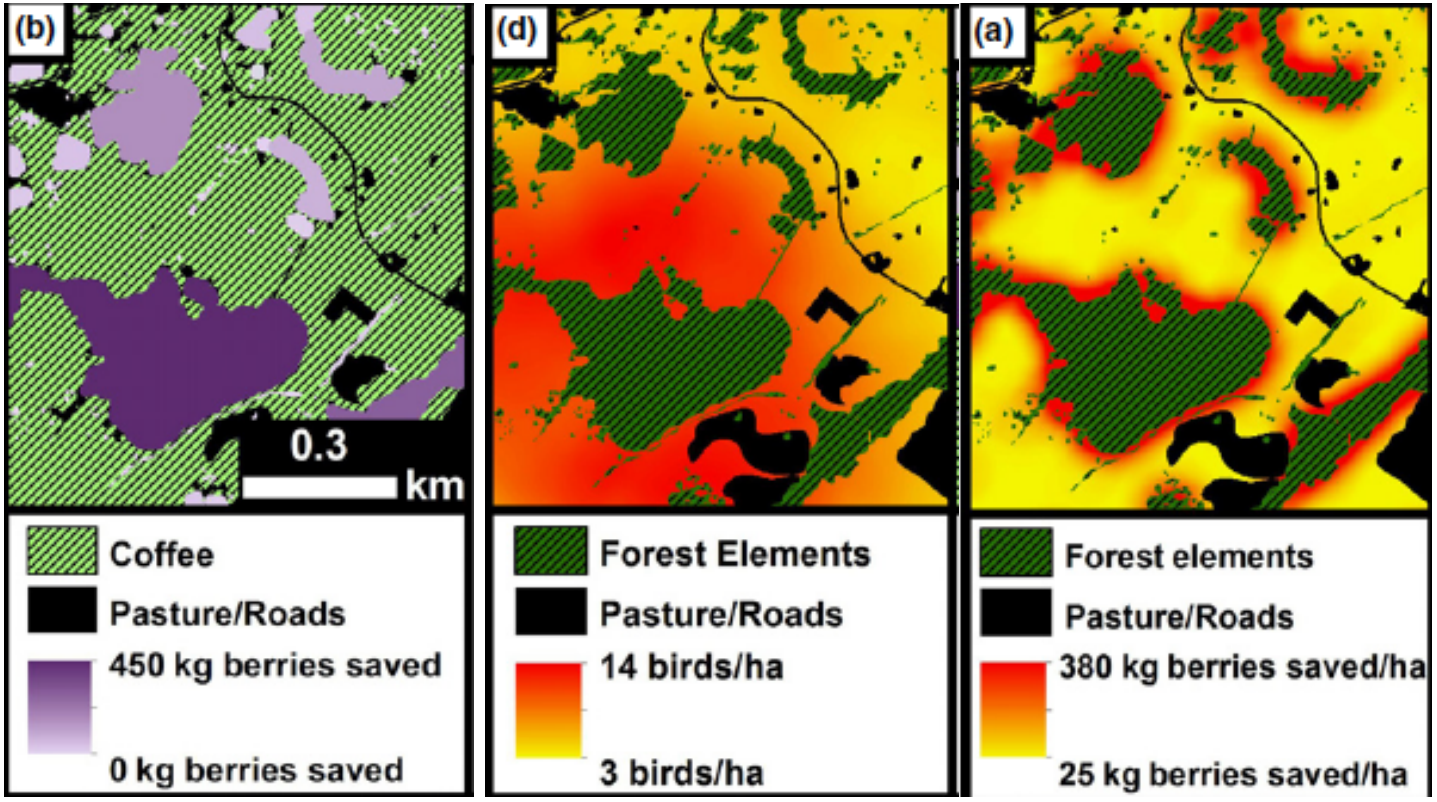
ECOLOGY LETTERS

Ecology Letters, (2013) doi: 10.1111/ele.12173

LETTER

Forest bolsters bird abundance, pest control and coffee yield

Daniel S. Karp,[1]* Chase D. Mendenhall,[1] Randi Figueroa Sandí,[2] Nicolas Chaumont,[3] Paul R. Ehrlich,[1] Elizabeth A. Hadly[4] and Gretchen C. Daily[5]



- O serviço de controle de pragas permite uma economia de US$75–US$310 ha-ano em plantações de café da Costa Rica.

Resultados – Artigo "The value of the world´s ecosystem services and natural capital" (Costanza *et al*, 1997) – Nature v.19 (15)

- Valoração de 17 serviços ecossistêmicos
- Trabalhos em 16 biomas
- VET = US$ 33 trilhões / ano
- PIB = US$ 18 trilhões / ano

2014: VET = US$ 125 trilhões / ano

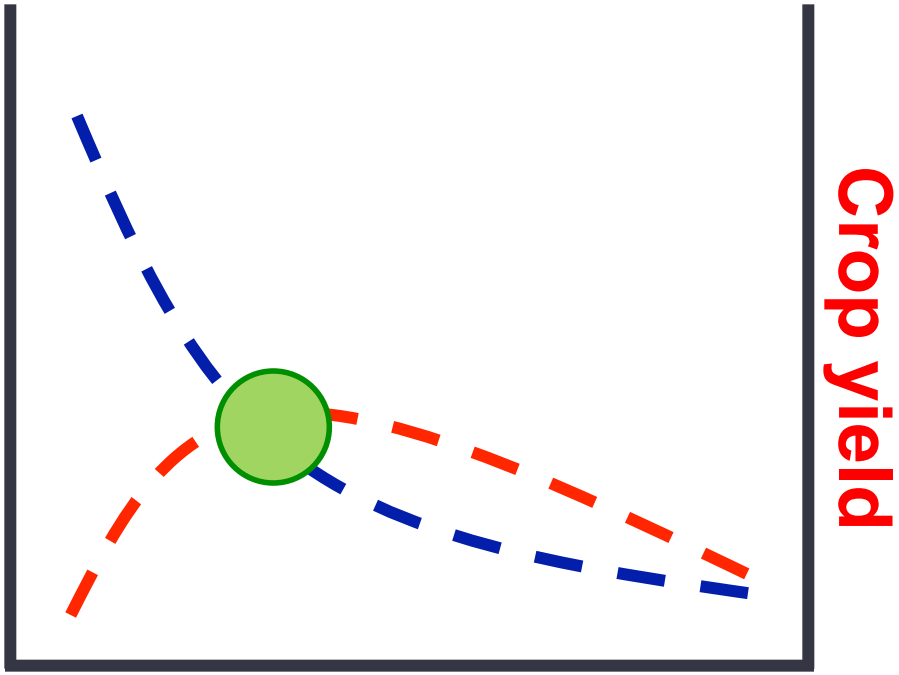
Biome	Area (e6 ha)		Change	Unit values 2007$/ha/yr		Change
	1997	2011	2011-1997	1997	2011	2011-1997
Marine	**36,302**	**36,302**	0	796	1,368	572
Open Ocean	**33,200**	**33,200**	0	348	660	312
Coastal	**3,102**	**3,102**	0	5,592	8,944	3,352
Estuaries	180	**180**	0	31,509	28,916	-2,593
Seagrass/Algae Beds	200	**234**	34	26,226	28,916	2,690
Coral Reefs	62	**28**	-34	8,384	352,249	343,865
Shelf	2,660	**2,660**	0	2,222	2,222	0
Terrestrial	**15,323**	**15,323**	0	1,109	4,901	3,792
Forest	**4,855**	**4,261**	-594	1,338	3,800	2,462
Tropical	1,900	**1,258**	-642	2,769	5,382	2,613
Temperate/Boreal	2,955	**3,003**	48	417	3,137	2,720
Grass/Rangelands	**3,898**	**4,418**	520	321	4,166	3,845
Wetlands	**330**	**188**	-142	20,404	140,174	119,770
Tidal Marsh/Mangroves	165	**128**	-37	13,786	193,843	180,057
Swamps/Floodplains	165	**60**	-105	27,021	25,681	-1,340
Lakes/Rivers	**200**	**200**	0	11,727	12,512	785
Desert	**1,925**	**2,159**	234	-	-	0
Tundra	**743**	**433**	-310	-	-	0
Ice/Rock	**1,640**	**1,640**	0	-	-	0
Cropland	**1,400**	**1,672**	272	126	5,567	5,441
Urban	**332**	**352**	20	-	6,661	6,661
Total	**51,625**	**51,625**	0			

(Costanza et al. 2014)

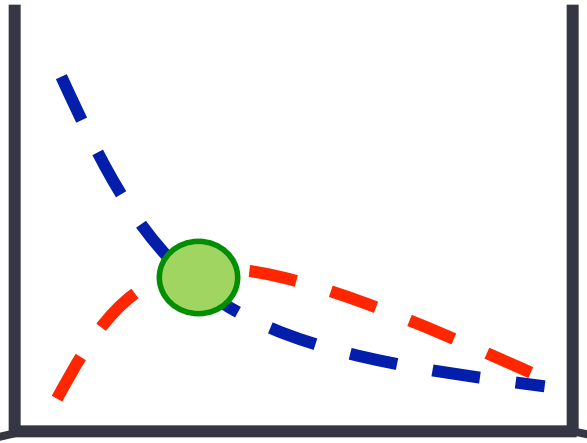
Serviço	Sub-categoria	Condições	Observações
Serviços de Provisão			
Alimentos	lavouras	↑	aumento substancial da produção
	animais de criação	↑	aumento substancial da produção
	pesca de captura	↓	produção em queda devido à exploração predatória
	aqüicultura	↑	aumento substancial da produção
	alimentos silvestres	↓	produção em queda
Fibras	madeira	+/–	perda de floresta em algumas regiões, crescimento em outras
	algodão, cânhamo, seda	+/–	produção de algumas fibras em queda, crescimento de outras
	combustível de madeira	↓	produção em queda
Recursos genéticos		↓	perda por extinção e perda de recursos genéticos da lavoura
Produtos bioquímicos, remédios naturais, produtos farmacêuticos		↓	perda por extinção, exploração predatória
Água	água doce	↓	uso não sustentável para consumo humano, indústria e irrigação; volume da energia hidráulica não alterado, mas os diques aumentam nossa capacidade de utilizar essa energia
Serviços Reguladores			
Regulação da qualidade do ar		↓	capacidade da atmosfera para se despoluir diminuiu
Regulação climática	global	↑	fonte de seqüestro de carbono desde meados do século
	regional e local	↓	preponderância de impactos negativos
Regulação hídrica		+/–	varia dependendo da mudança e do local do ecossistema
Regulação da erosão		↓	aumento da degradação do solo
Purificação da água e tratamento de resíduos		↓	piora na qualidade da água
Regulação de doenças		+/–	varia dependendo da mudança do ecossistema
Regulação de pragas		↓	controle natural degradado por uso de pesticidas
Polinização		↓[a]	aparente queda global no volume de polinização
Regulação de ameaças naturais		↓	perda de isoladores naturais (zonas úmidas, manguezais)
Serviços Culturais			
Valores espirituais e religiosos		↓	rápido declínio de bosques e espécies sagradas
Valores estéticos		↓	declínio na quantidade e qualidade de terras naturais
Recreação e ecoturismo		+/–	mais áreas acessíveis, muitas delas degradadas

(MAE, 2005)

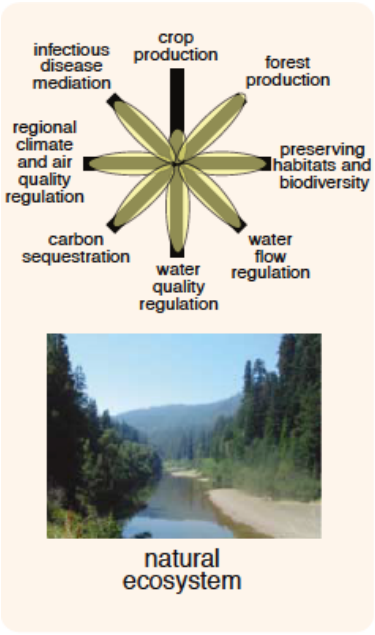
(IPBES, May 2019)

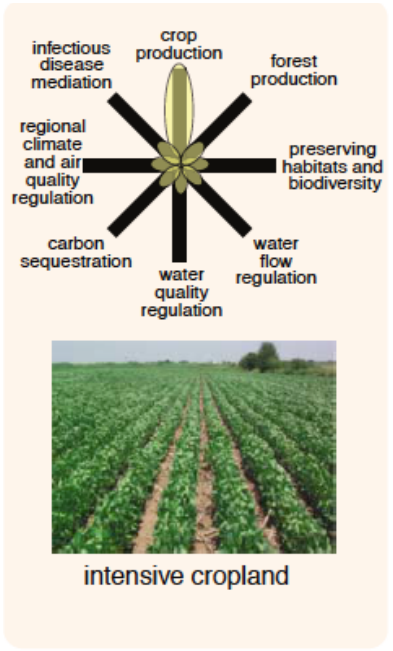

Pollination services
Crop yield
Land use intensity/area

(Foley et al. 2005)

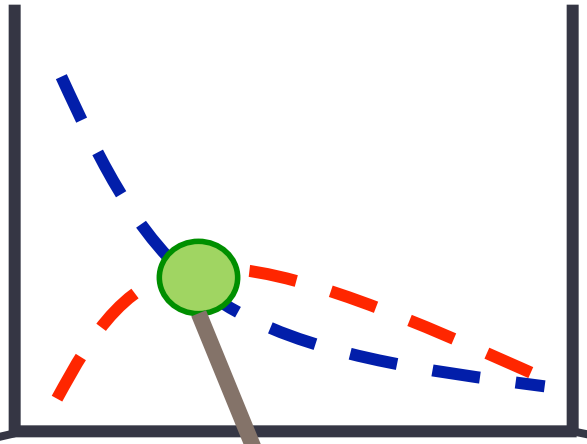


Land use intensity/ area

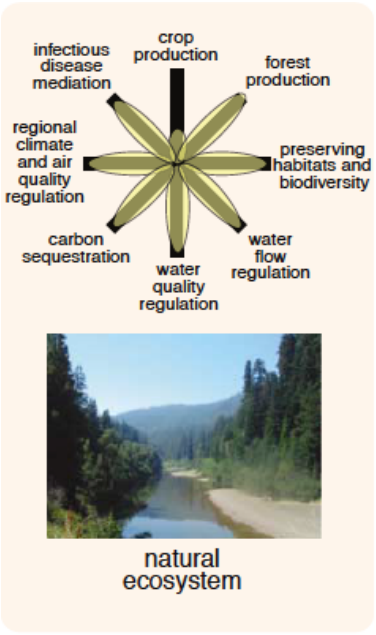




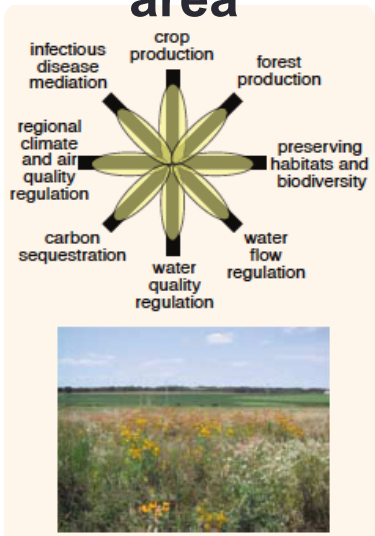
(Foley et al. 2005)



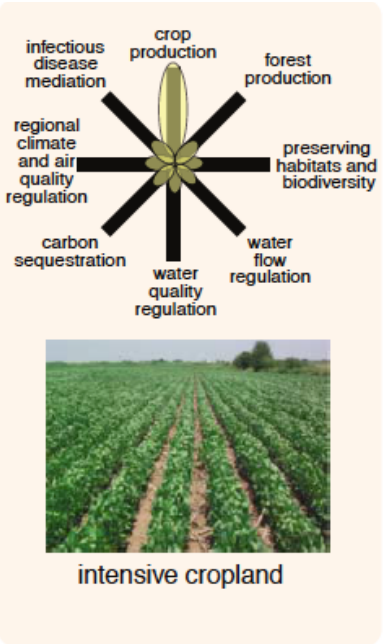
Land use intensity/ area



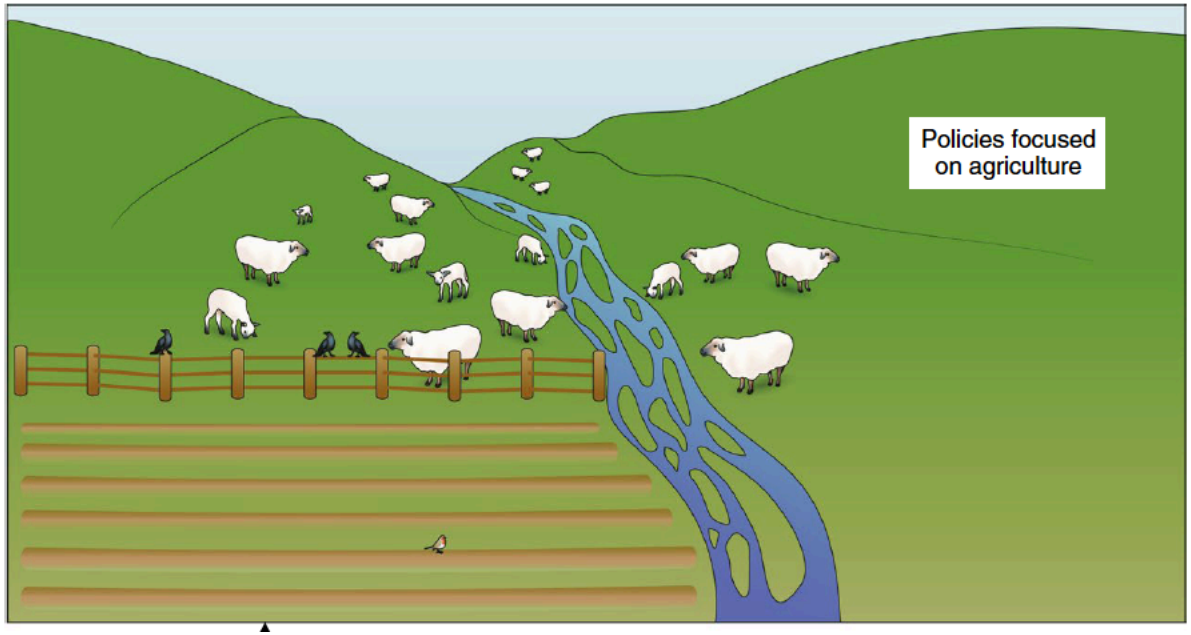
natural ecosystem

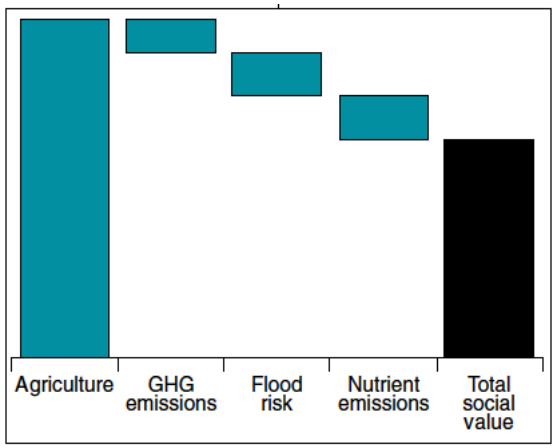


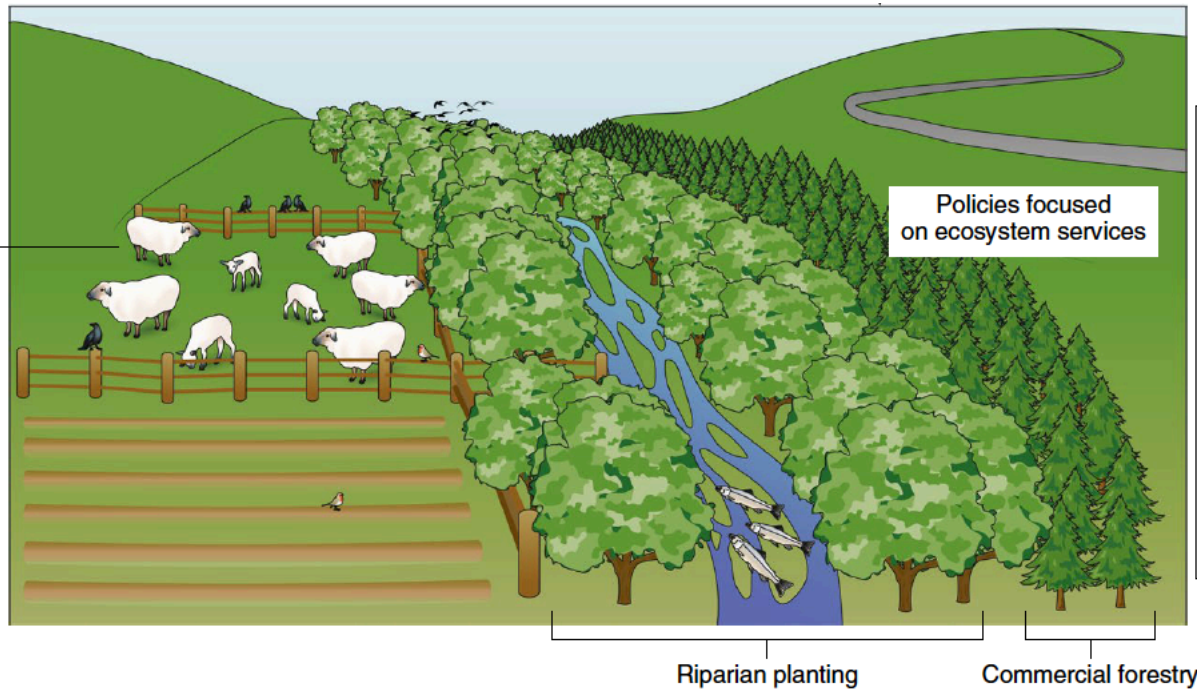
cropland with restored ecosystem services

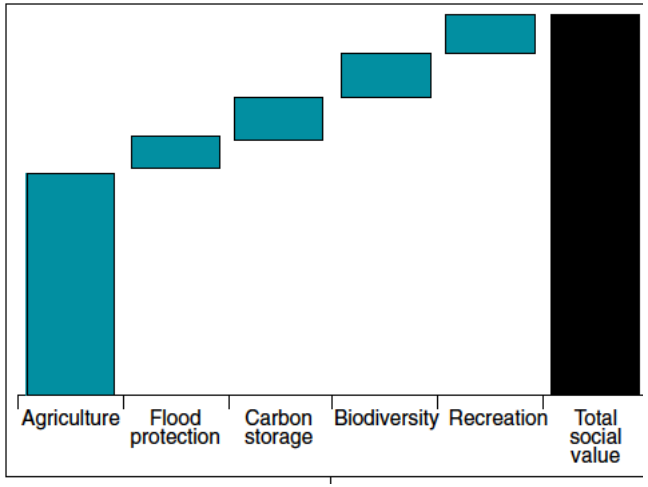


intensive cropland







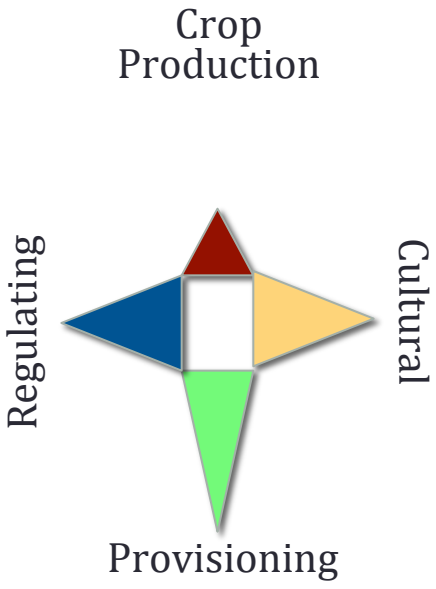


Gawith & Hodge (2019) - Nature

Agricultural landscape without Legal Reserves

Agricultural landscape with Legal Reserves

Landscape with a Protected Area



Metzger et al. (2019) - PECON

Novo paradigma : produção E conservação

+ Produção + E Conservação

Brasil tem algumas das maiores safras dos principais produtos agropecuários mundiais

Nenhum outro país produz mais café, cana-de-açúcar, feijão e laranja. No caso da soja, boa parte da produção é exportada

Arroz	US$ 3,46 bi	9º	Café	US$ 2,62 bi	1º	Cana-de-açúcar	US$ 21,88 bi	1º
	12,65 mi t	9º		2,44 mi t	1º		671,39 mi t	1º
Carne bovina	US$ 25,68 bi	2º	Carne suína	US$ 4,49 bi	5º	Feijão	US$ 1,99 bi	1º
	9,50 mi t	2º		2,92 mi t	5º		3,48 mi t	1º
Frango	US$ 14,19 bi	3º	Laranja	US$ 3,40 bi	1º	Leite	US$ 8,99 bi	4º
	9,96 mi t	3º		17,61 mi t	1º		29,11 mi t	5º
Milho	US$ 2,38 bi	3º	Soja	US$ 15,49 bi	2º			
	51,23 mi t	3º		57,34 mi t	2º			

Legenda

Produto	Produção (bilhões de dólares)	2º
	Quantidade (milhões de toneladas)	4º

Colocação mundial em quantidade

Colocação mundial em produção

Fonte: Faostat, Organização das Nações Unidas para Agricultura e Alimentação, 2009

ipbes

www.ipbes.net

What is IPBES?

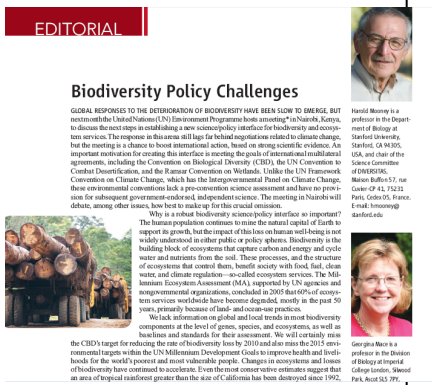
IPBES-3 (Jan 2015, Bonn)

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”


EDITORIAL

Biodiversity Policy Challenges

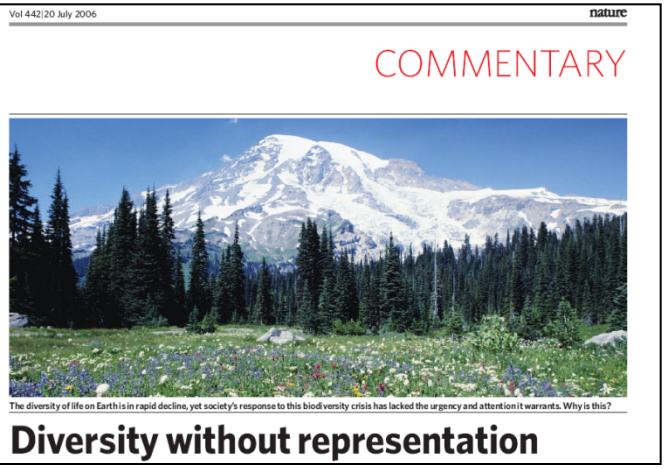
GLOBAL RESPONSES TO THE DETERIORATION OF BIODIVERSITY HAVE BEEN SLOW TO EMERGE, BUT next month the United Nations (UN) Environment Programme hosts a meeting* in Nairobi, Kenya, to discuss the next steps in establishing a new science/policy interface for biodiversity and ecosystem services. The response in this arena still lags far behind negotiations related to climate change, but the meeting is a chance to boost international action, based on strong scientific evidence. An important motivation for creating this interface is meeting the goals of international multilateral agreements, including the Convention on Biological Diversity (CBD), the UN Convention to Combat Desertification, and the Ramsar Convention on Wetlands. Unlike the UN Framework Convention on Climate Change, which has the Intergovernmental Panel on Climate Change, these environmental conventions lack a pre-convention science assessment and have no provision for subsequent government-endorsed, independent science. The meeting in Nairobi will debate, among other issues, how best to make up for this crucial omission.

Why is a robust biodiversity science/policy interface so important? The human population continues to mine the natural capital of Earth to support its growth, but the impact of this loss on human well-being is not widely understood in either public or policy spheres. Biodiversity is the building block of ecosystems that capture carbon and energy and cycle water and nutrients from the soil. These processes, and the structure of ecosystems that control them, benefit society with food, fuel, clean water, and climate regulation—so-called ecosystem services. The Millennium Ecosystem Assessment (MA), supported by UN agencies and nongovernmental organizations, concluded in 2005 that 60% of ecosystem services worldwide have become degraded, mostly in the past 50 years, primarily because of land- and ocean-use practices.

We lack information on global and local trends in most biodiversity components at the level of genes, species, and ecosystems, as well as baselines and standards for their assessment. We will certainly miss the CBD's target for reducing the rate of biodiversity loss by 2010 and also miss the 2015 environmental targets within the UN Millennium Development Goals to improve health and livelihoods for the world's poorest and most vulnerable people. Changes in ecosystems and losses of biodiversity have continued to accelerate. Even the most conservative estimates suggest that an area of tropical rainforest greater than the size of California has been destroyed since 1992.

Harold Mooney is a professor in the Department of Biology at Stanford University, Stanford, CA 94305, USA, and chair of the Science Committee of DIVERSITAS, Muséum Buffon 57, rue Cuvier-CP 41, 75231 Paris, Cedex 05, France. E-mail: hmooney@stanford.edu

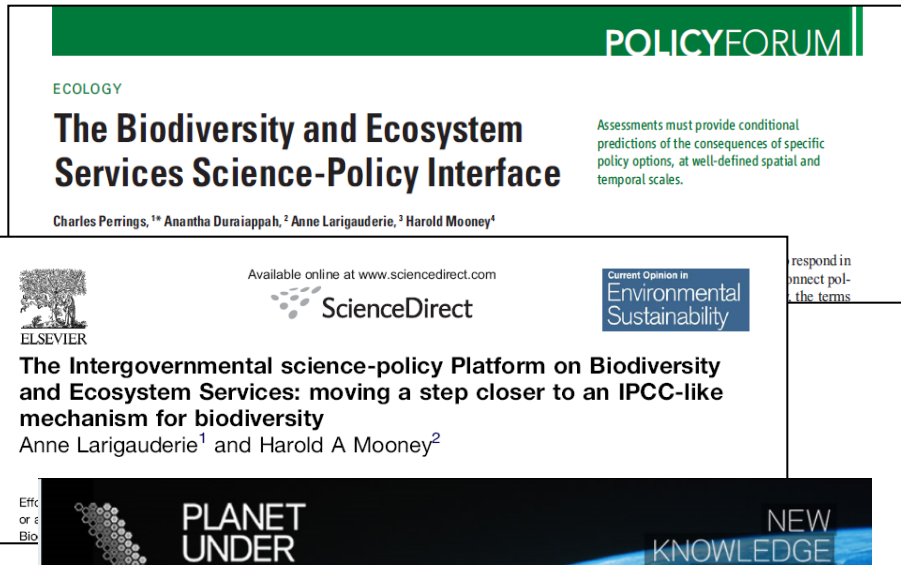
Georgina Mace is a professor in the Division of Biology at Imperial College London, Silwood Park, Ascot SL5 7PY.


Vol 442|20 July 2006 nature

COMMENTARY

The diversity of life on Earth is in rapid decline, yet society's response to this biodiversity crisis has lacked the urgency and attention it warrants. Why is this?

Diversity without representation


POLICYFORUM

ECOLOGY

The Biodiversity and Ecosystem Services Science-Policy Interface

Assessments must provide conditional predictions of the consequences of specific policy options, at well-defined spatial and temporal scales.

Charles Perrings,[1]* Anantha Duraiappah,[2] Anne Larigauderie,[3] Harold Mooney[4]

ELSEVIER

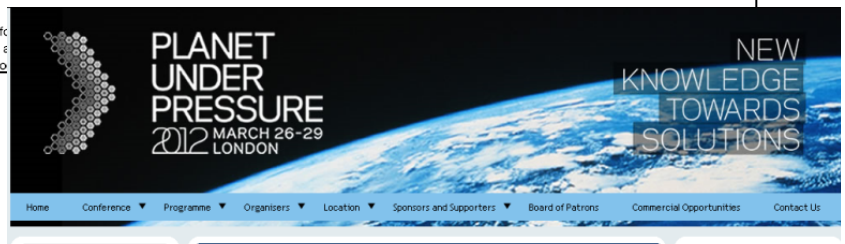
Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Environmental Sustainability

The Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services: moving a step closer to an IPCC-like mechanism for biodiversity

Anne Larigauderie[1] and Harold A Mooney[2]


PLANET UNDER PRESSURE 2012 MARCH 26-29 LONDON

NEW KNOWLEDGE TOWARDS SOLUTIONS

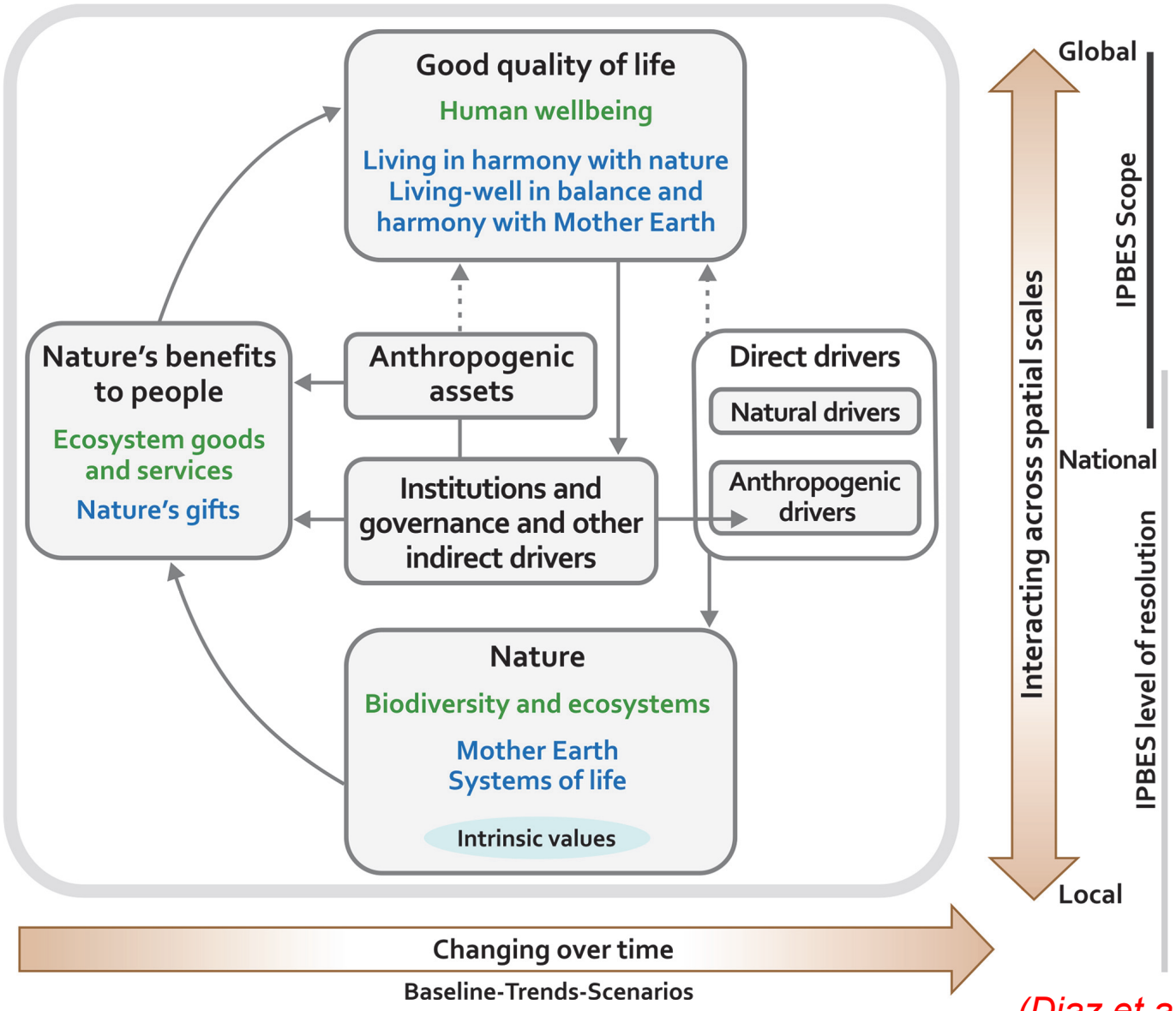
Home Conference Programme Organisers Location Sponsors and Supporters Board of Patrons Commercial Opportunities Contact Us


Biodiversity Science and Governance

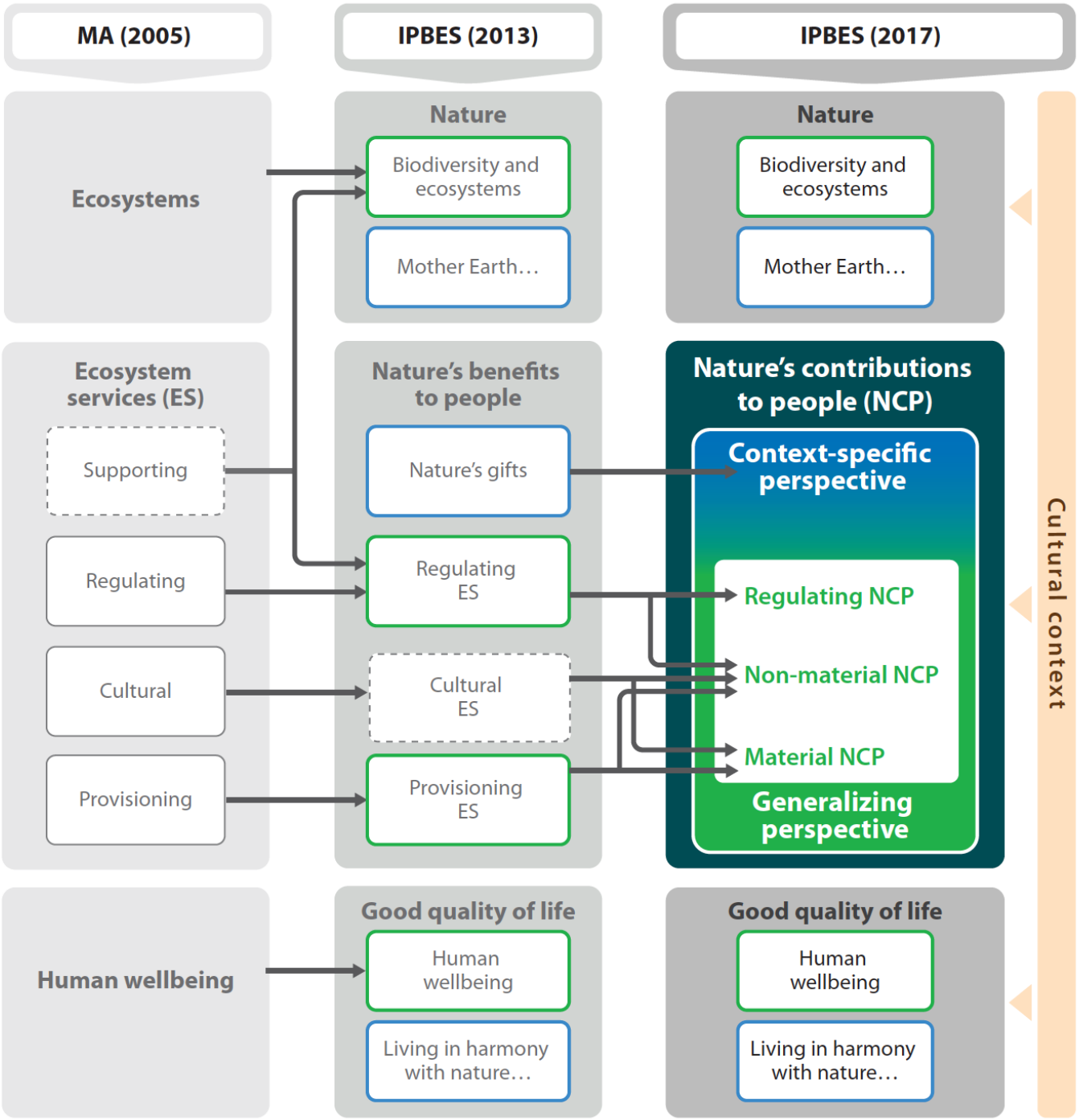
Paris, January 24-28, 2005

www.recherche.gouv.fr/biodiv2005paris

IPBES Conceptual Framework



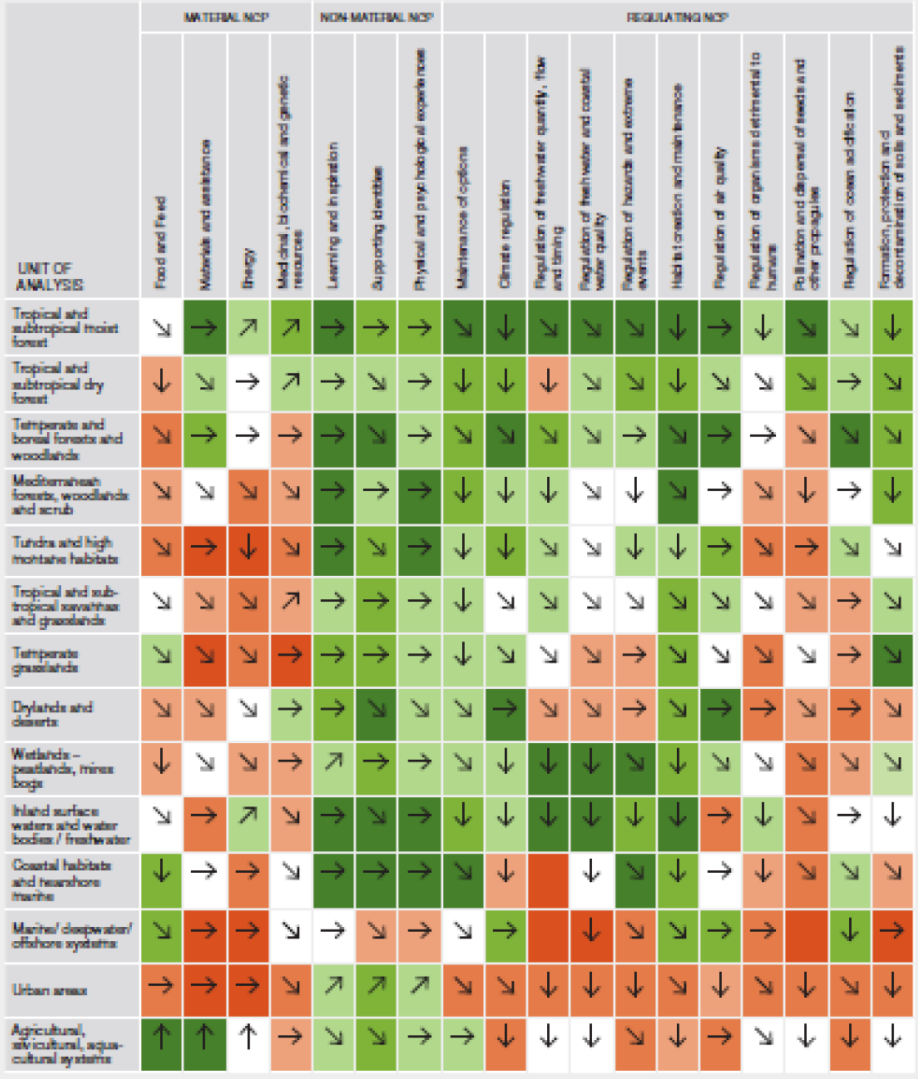
(Diaz et al. 2015 a,b)



(Dias et al. 2018)

SPM 5 **Trends in the provision of nature's contributions to people (NCP) for each unit of analysis.**

Trends and importance values are based on a modified Delphi process* to build consensus, as indicated by synthesis among experts from Chapters 2 and 3. Values were assigned based on the proportion of the unit of analysis that has not been converted by human activities. Squares without arrows indicate that there is no clear link (or trend) between nature's contributions to people for that category and the corresponding unit of analysis. (Note: the cryosphere is not considered in this analysis.)



* The Delphi method is a structured and iterative evaluation process that uses expert panels to establish consensus regarding the assessment of a specific topic.

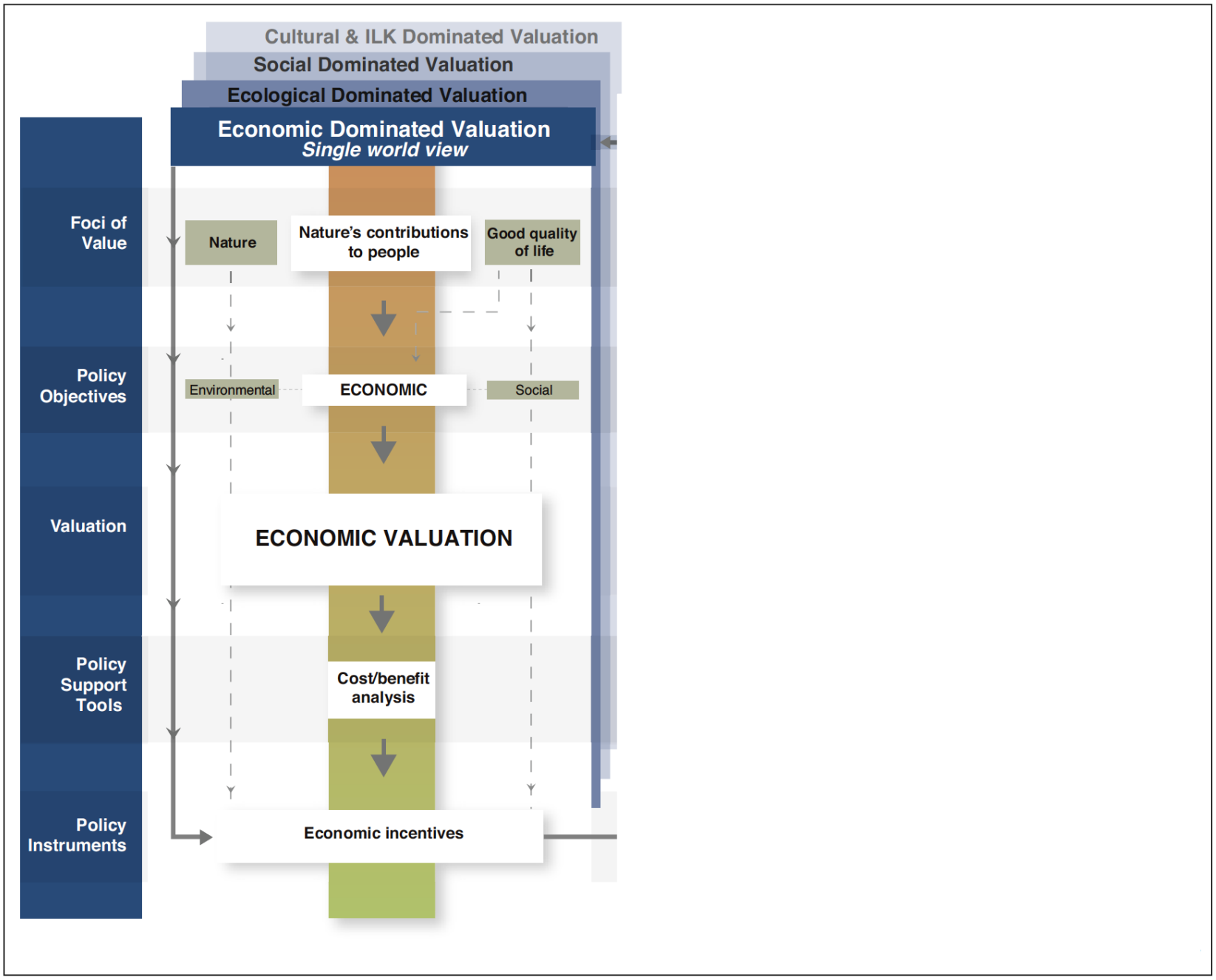
Importance of unit of analysis for delivering each nature's contribution to people

Very High | High | Medium High | Medium | Medium Low | Low | Very Low

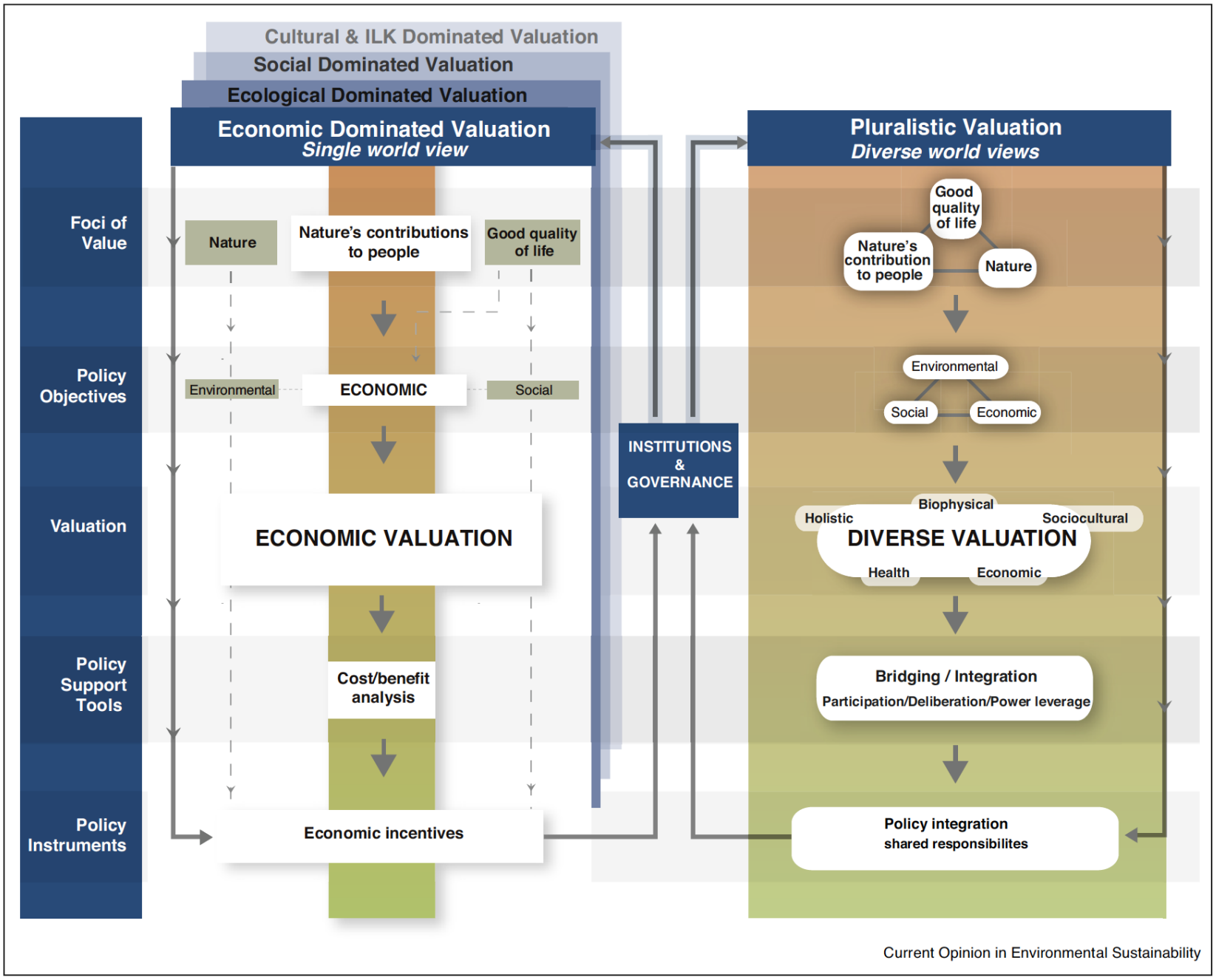
Direction of change in provision of each nature's contribution to people

↑ Strongly Increasing ↗ Increasing → Stable ↘ Decreasing ↓ Strongly Decreasing

(IPBES – America – 2018)



(Pascual et al. 2017)



(Pascual et al. 2017)

(Joly et al. 2019)