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A novel cascade model for ecosystem services and disservices applied in a Brazilian working landscape

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The ES cascade model: maturation of a conceptual framework

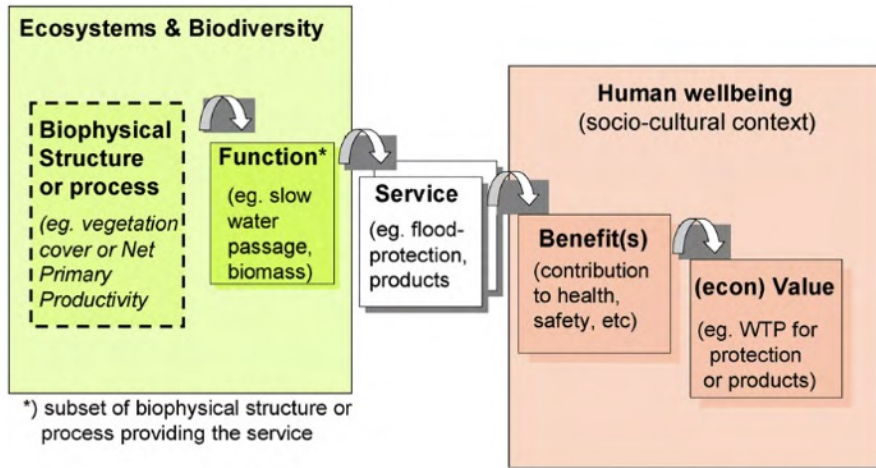


Fig. 2. Framework for linking ecosystems to human wellbeing (adapted from Haines-Young and Potschin, in press).

Avoiding double counting

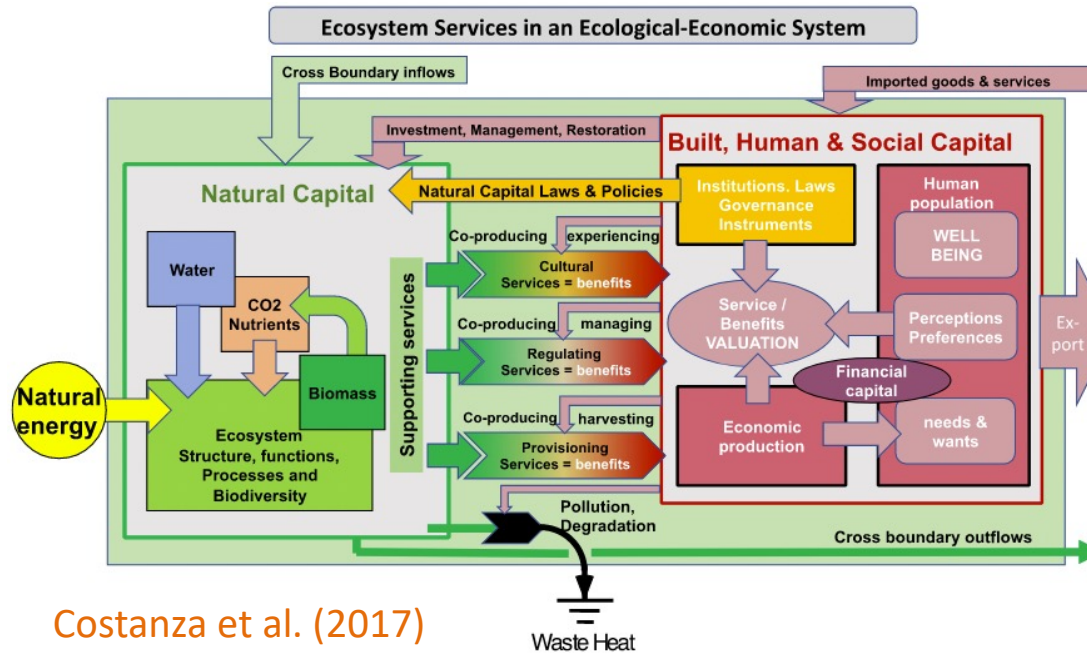


Intermediate Services	Final Services	Benefits
pollination	clean water provision	drinking water; domestic use water
primary productivity	storm protection	property protection; decreased livelihood vulnerability
water regulation	constant stream flow	recreation; water for irrigation; water for hydroelectric power
soil formation		

Fisher et al. (2009)

Typically require other forms of capital to realize these benefits, e.g. hydro-power will require some built capital to harness the energy.

de Groot et al. (2010)



Costanza et al. (2017)

Taking into account Coproduction processes

Contributions of the cascade model

- Articulates Ecosystem services (ES) and Ecosystem structures & functions
- Articulates ES and benefits (Fisher et al. 2009:646)
- Distinguishes intermediate and final ES (Boyd & Banzhaf 2007)
- Acknowledges coproduction processes (Palomo et al. 2016)

But cascade models **do not explicitly take into account ecosystem-based nuisances**

The concept of ecosystem disservices (EDS)

“Ecosystem disservices are the ecosystem generated functions, processes and attributes that result in **perceived or actual** negative impacts on human wellbeing” (Shackleton et al. 2016:590)

(Shackleton et al. 2016)

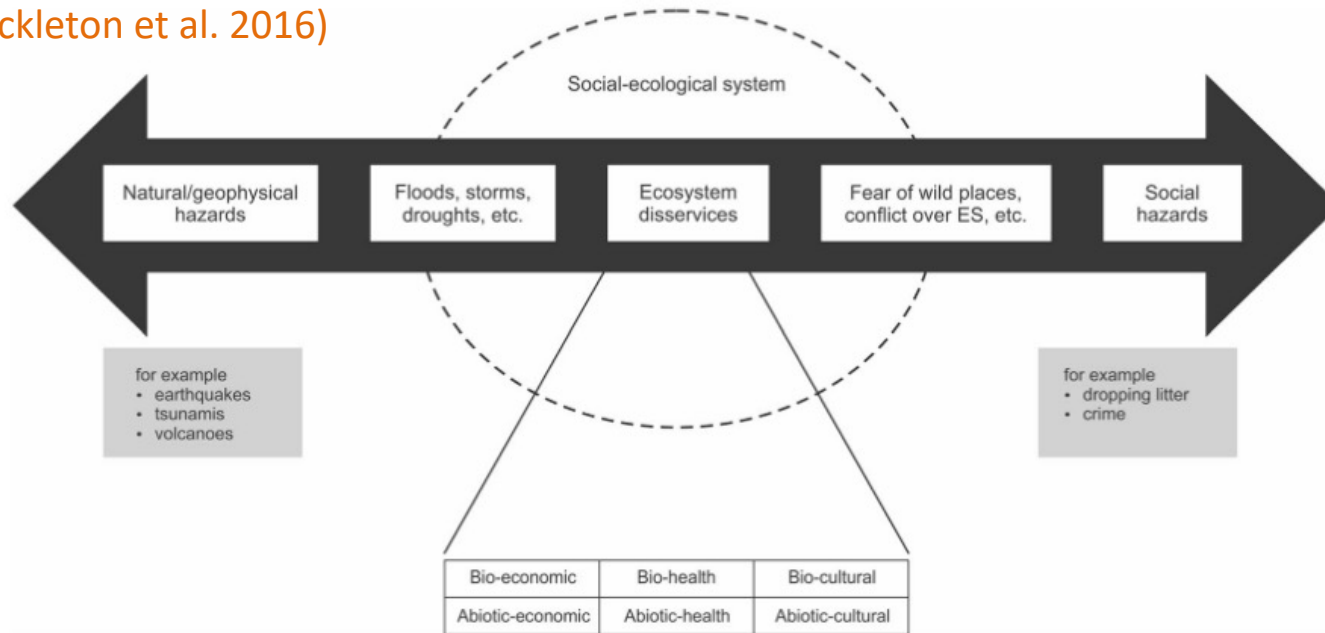


Figure 1. Ecosystem disservices within the continuum from natural to social hazards. The social-ecological system boundary is not solid to reflect that the boundaries between ecosystem disservices and other harmful phenomena (termed hazards) are usually fuzzy

EDS are not

- Reduced or constrained supply of an ES
- Events or phenomena that have no ecosystem origin
- Social responses
- Land management actions that impact biodiversity

Integrating EDS in the ES cascade model



Defining and articulating ES and EDS

Delineating E(D)S from benefits and detriments

Integrating coproduction processes

Conceptualizing the ES/EDS cascade model

Application in a case study in Brazil

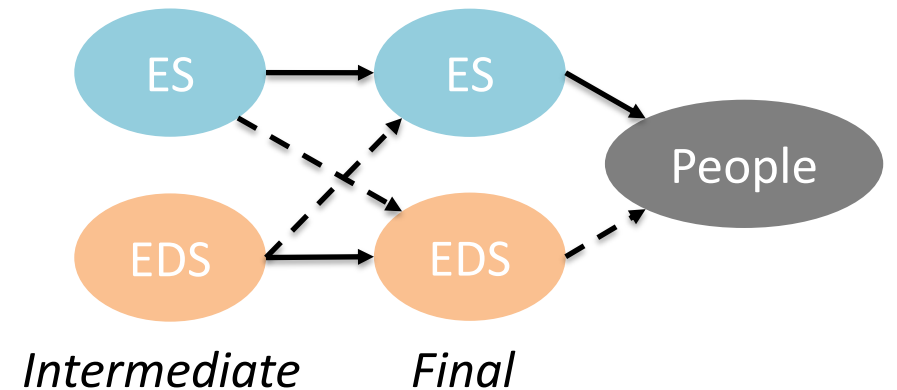
A constructivist definition of ES and EDS

ES and EDS as
social constructs

They are subjective interpretations, socially situated and constructed, of ecological phenomena

Intermediate vs.
final

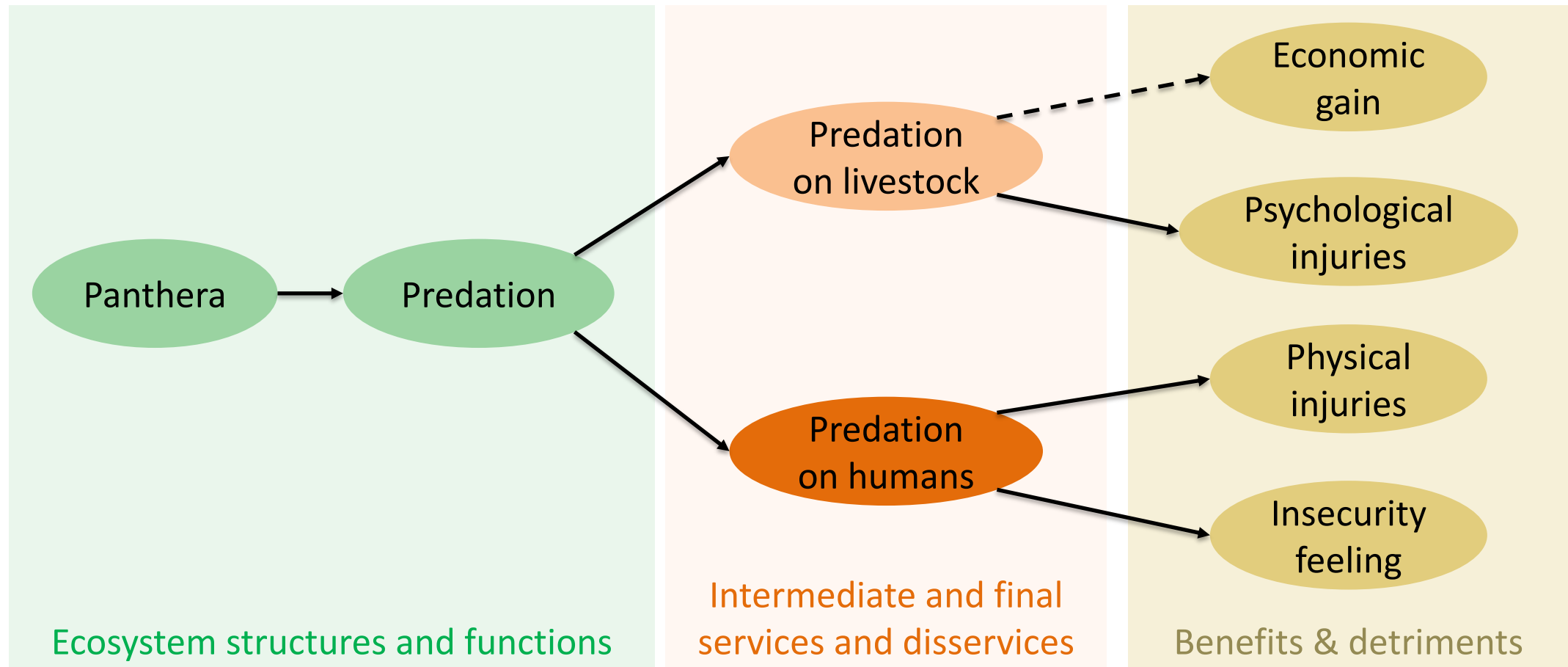
They influence human well-being either directly or indirectly



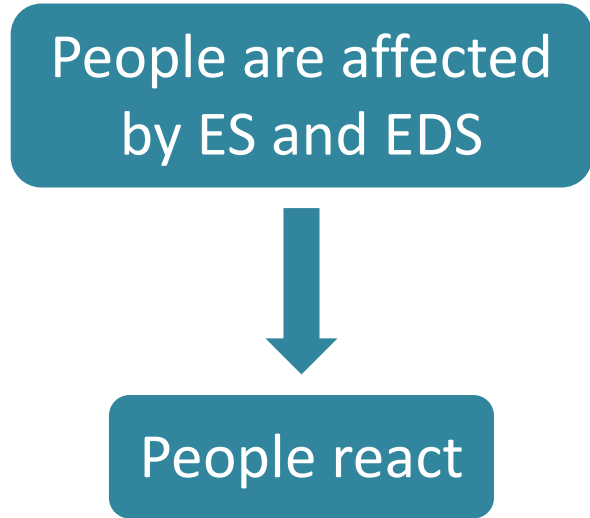
- **Ecosystem services**: the ecological structures, functions and processes **that people recognize as supporting**, directly or indirectly, their wellbeing
- **Ecosystem disservices**: the ecological structures, functions and processes **that people recognize as detrimental**, directly or indirectly, to their well-being

Delineating benefits and detriments

ES and EDS must be ecosystem-based



Integrating coproduction processes

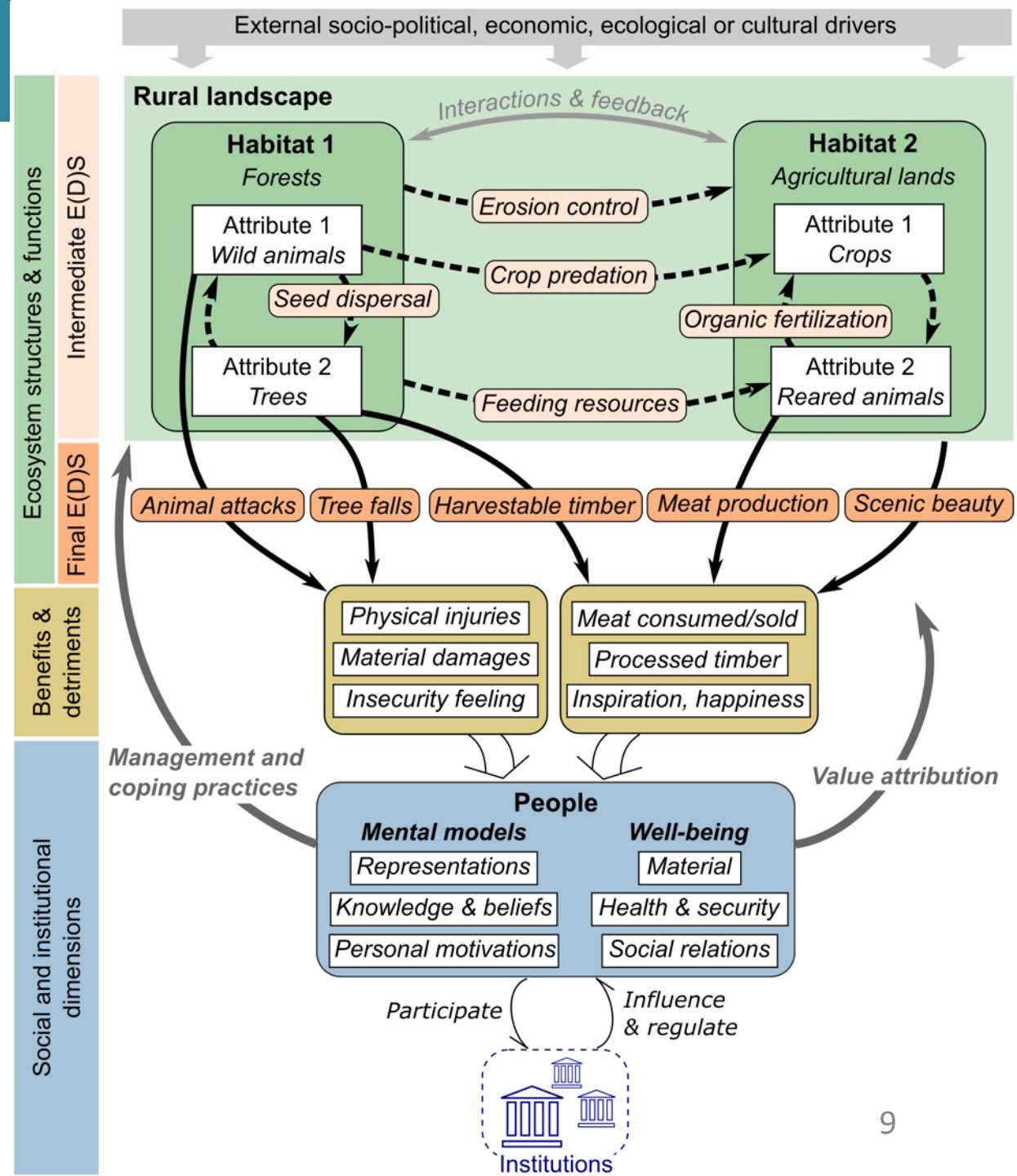


People's mental models (representations, knowledge, motivation)
People's well-being (material and non-material)

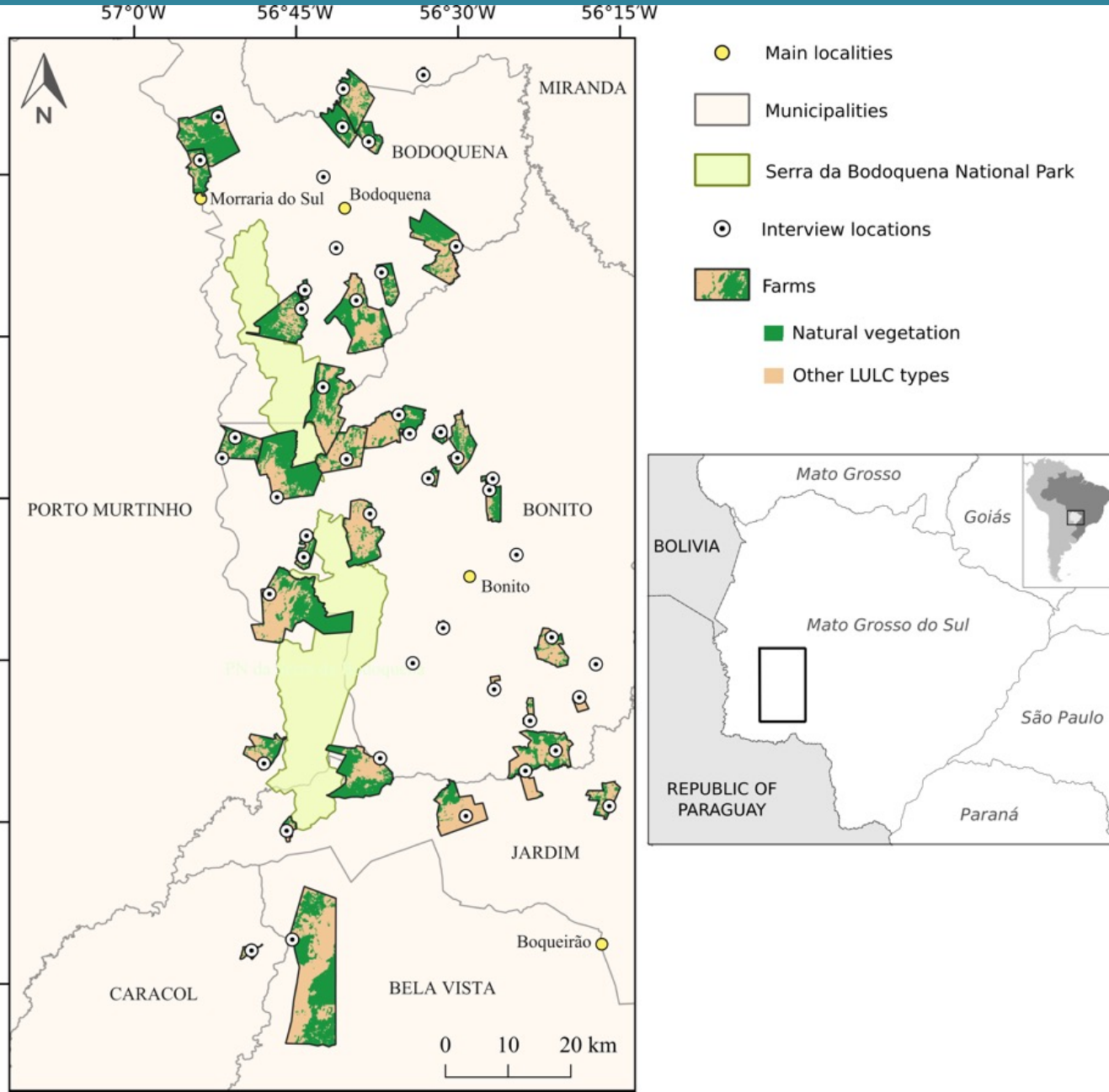
Through management and coping practices
Through value attribution processes
Through institutional arrangements

The ES/EDS cascade model

- ES and EDS are produced at different organizational levels
- ES and EDS can be intermediate or final
- Benefits and detriments are either material or non-material
- ES and EDS induce a response from the society at different levels



An application example in Brazil



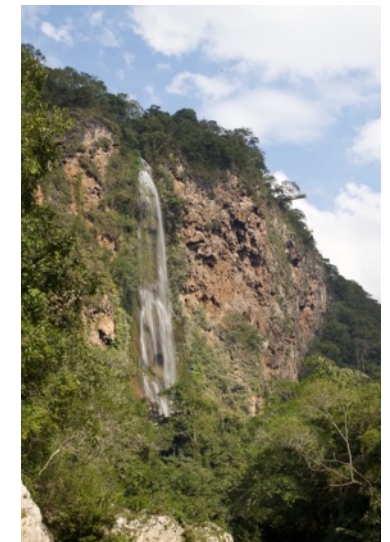
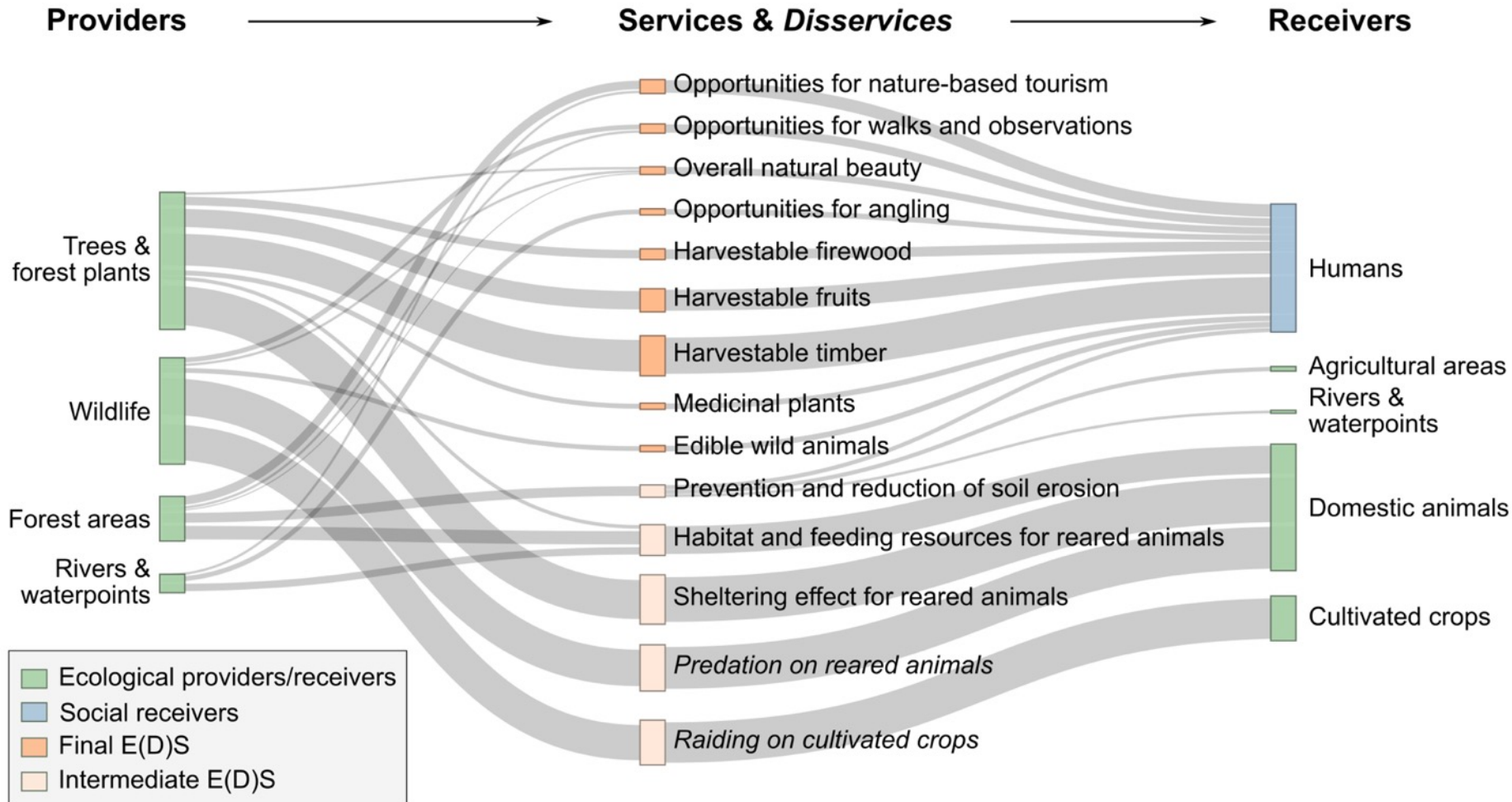
Semi-structured interviews in 46 farms (~120 000 ha)

- Farming systems and strategies
- Perceived advantages & drawbacks associated with trees and forests



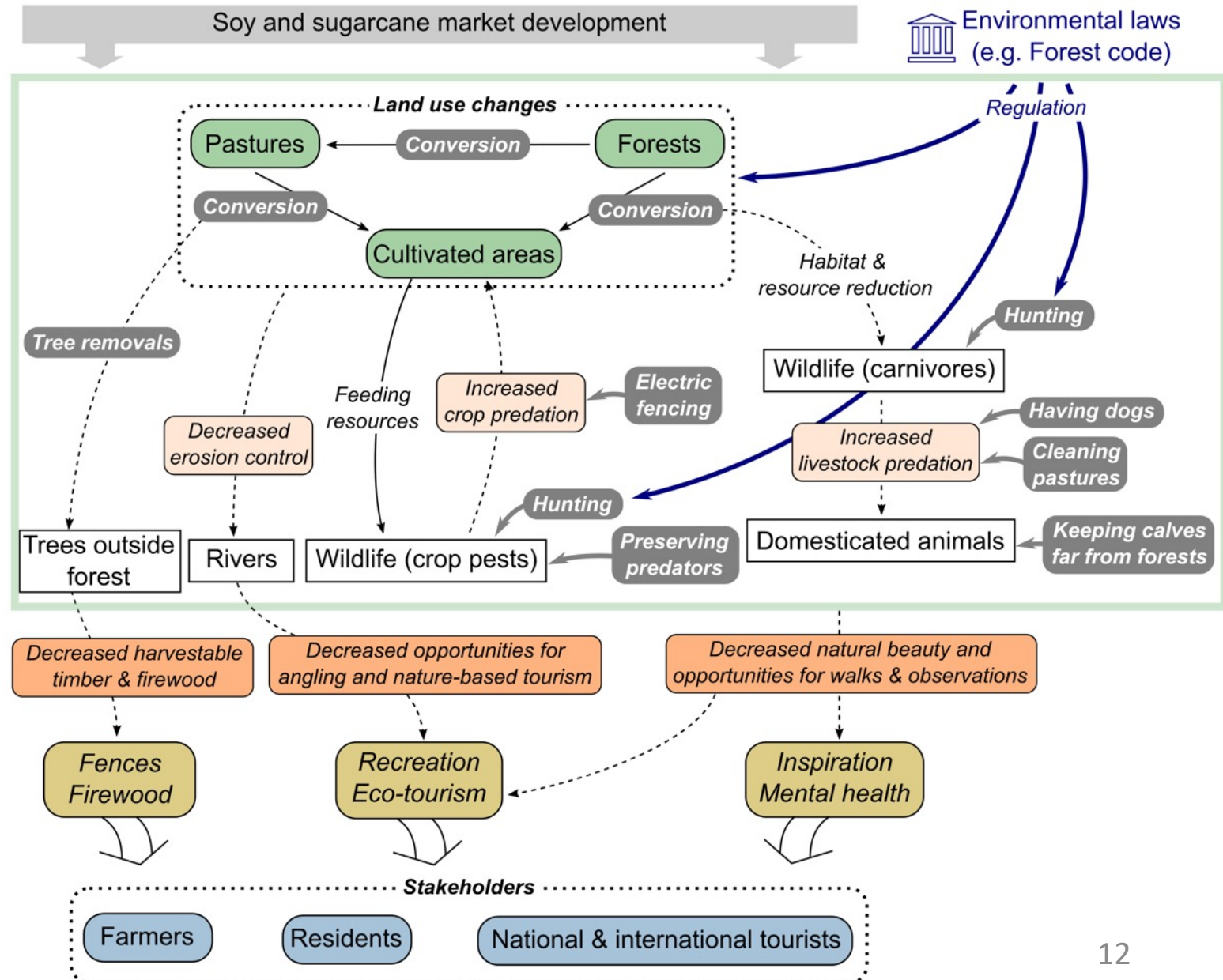
An application example in Brazil

➤ **30 ES** (15 final + 15 intermediate) and **18 EDS** (6 final + 12 intermediate)





An application example in Brazil

➤ ... which allowed us to identify how farmers cope with ecosystem disservices



Potential and limits of this novel E(D)S cascade framework

- 
- Capturing the **complex trade-offs** associated with any conservation decision
 - Understanding who benefit and who suffer from a decision, and tackling **social conflicts** and **justice and equity issues**
 - **Balanced systemic approach** of the complexity of human-nature relationships
 - Towards innovative pathways to **cope with disservices without harming ecosystems**
 - **Anthropocentric and utilitarian** framework
- 
- The **ES / EDS dichotomy** might not always be easy to sustain as the frontier between the two could be porous
 - What added value compared to an **environmental values** framework?

Thank you for your attention!

And thank you to the research group involved in this research...



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