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# Agro-ecosystems as ecological funds: a condition for innovative design?

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# Introduction

- Increasing challenges in environmental issues: new distributed but “common” objects
    - Ex.: smart cities, sustainable agricultural systems...
  - Strong design challenges:
    - Stakeholders with diverging interests
    - Multifunctional and multidimensional objects
    - High uncertainty and unknown
- ⇒ A need for methods and tools to better qualify the objects of design and initiate their collective design process

- Agro-ecosystems: emblematic of these design challenges
- However, in the literature, their design is a blind spot
  - Economy:
    - Damages on ecosystems = externalities
    - Ecosystems = stocks of natural capital
  - Ecology:
    - Ecosystems are given (modeling approaches)
    - Human activities disrupt their functioning
  - Agronomy:
    - Ecosystems = “context” of agricultural production
    - Avoiding hazards through “artificialization”

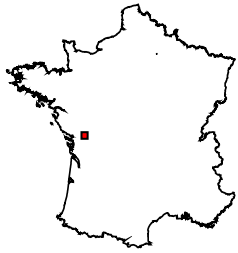
Costanza & Daly  
1992

Blandin 2009

Meynard & Girardin  
1991

# Toward a model for agro-ecosystem design

## ... building on an empirical case

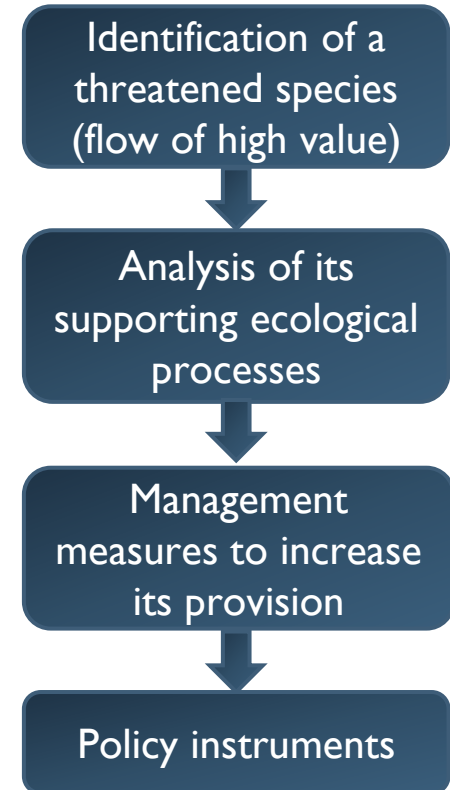


- ▶ Case study in the West of France
- ▶ Intensive cereal plain
- ▶ Biodiversity and water quality degradation



- ▶ Initial situation: a conflict about « known » values

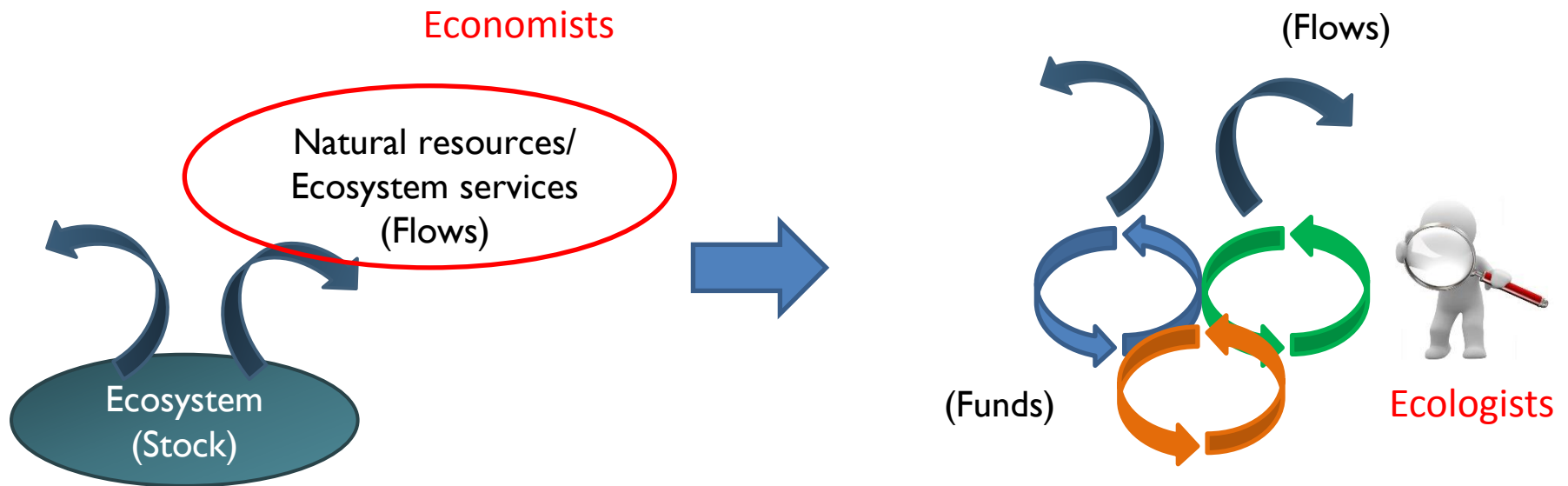
Initial approach  
(*Ecologists, naturalists, local authorities*)



Problems: public spending, conflicts...

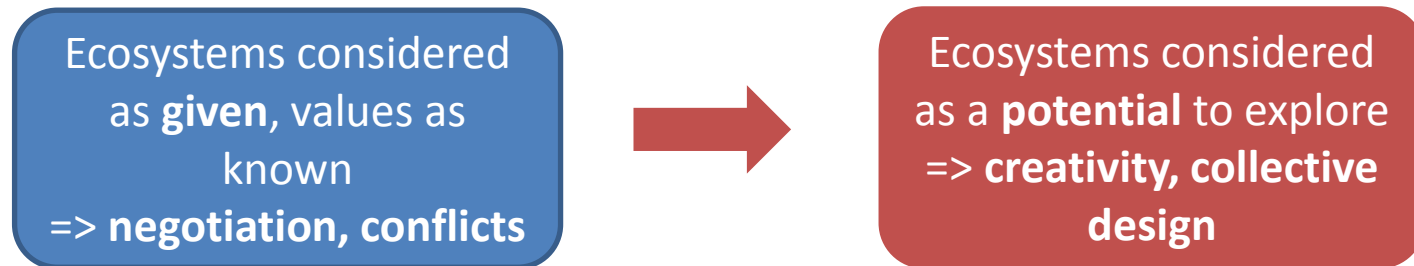
# Toward a model for agro-ecosystem design

- Proposition 1: Ecosystems are not stocks, but funds



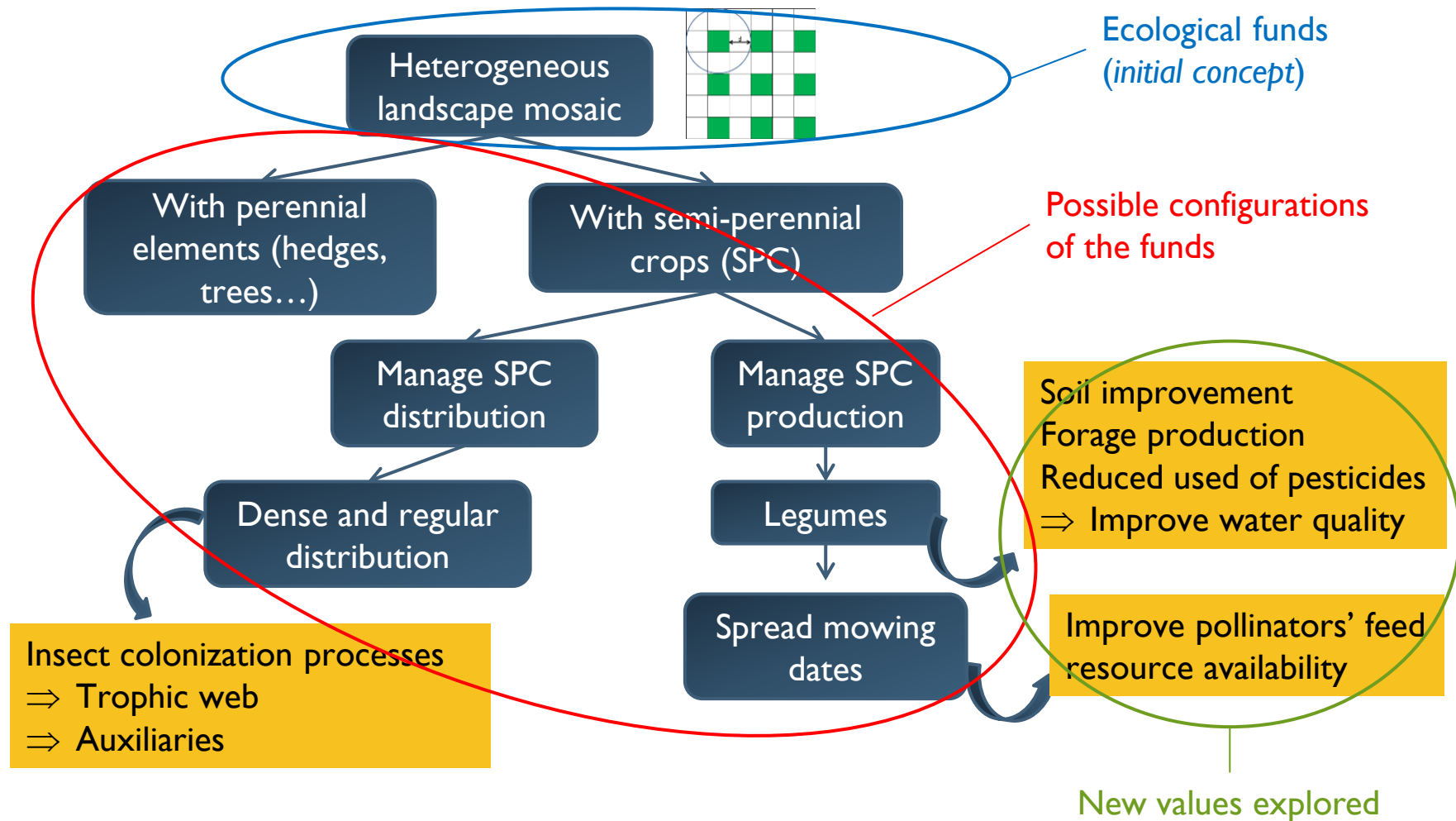
- A need to identify key regulations  
⇒ knowledge in ecology
- Ex. "Landscape"

- Proposition 2: Ecosystems can be designed
- Are all flows known?
- A change of perspective



- Ecological funds: departure point of a design process
  - Ecological core regulations as basic rules for design
  - Exploration of various configurations and potential values of these funds

# Exploring the potential of the ecological funds



New values explored



# Ecological funds and the management of innovation

- Identification of key regulations
  - ⇒ Initial design **specifications**
- Not a common good, but a **common unknown**
  - Funds are open-ended
  - A variety of stakeholders may be involved in their design to ensure acceptability

# Ecological funds and technological platforms

	<b>Ecological funds</b>	<b>Technological platforms</b>
<b>Structure</b>	A fund as a common unknown	A core and a periphery (modules)
<b>Context</b>	Conflicts and innovation deadlock	Competition by innovation
<b>Leader</b>	No leader	Leader firm
<b>Aims</b>	<ul style="list-style-type: none"> <li>- Initiate innovative design for a sustainable management of AES</li> <li>- Involve and coordinate stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Control value creation</li> <li>- Stimulate innovation of complementors</li> <li>- Address uncertainty</li> </ul>
<b>Principle</b>	<ul style="list-style-type: none"> <li>- Identify key ecological regulations</li> <li>- Then consider funds as open-ended (New properties)</li> </ul>	<ul style="list-style-type: none"> <li>- Define design standards</li> <li>- Generate new uses/applications</li> </ul>
<b>Role in a design process</b>	<ul style="list-style-type: none"> <li>- Initial specifications</li> <li>- Make visible interdependences between stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Initial specifications</li> <li>- Facilitate complementation</li> <li>- Generate interdependencies</li> </ul>

## Implication for design theories

- Ecology: From a modeling science to a design science
  - ⇒ How to support this shift?
  - ⇒ From « scientific concepts » to « concepts for design »
    - Ex.: landscape
- Identifying « funds » for design issues in other contexts: e.g. sustainable cities
  - Key regulations as « grips » for design
  - Orientation of collective learning
  - Identify a common unknown to involve stakeholders in conflict

# Thank you for your attention



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