

# Advantages and drawbacks of agent-based vs macroscopic approaches to evaluate adaptation measures

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Deltas in times of Climate Change II

25th September 2014



## Issues for the economic evaluation of adaptation<sup>1</sup>

### Why assessing adaptation?

- Design successful adaptation strategies
- Identify funding budget to implement these strategies
- Find a balance between adaptation and protection

### How to assess adaptation?

- Global estimates
- Local estimates

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<sup>1</sup>Patt, 2010

## Issues on the economic activities to be adapted to flooding

Focus on adaptation of economic activities to flooding

### Definition

- Definition of Climate Change in the community
- Process of adjustment to the expected climate effects<sup>2</sup>
- Actions to be taken to include protection

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<sup>2</sup> IPCC, 2013

## Issues on the economic activities to be adapted to flooding

Focus on adaptation of economic activities to flooding

### Highly interested in

- Individual level
- Corporate level
- The focus is on flood risk and economic activities
- Focus on protection levees, dikes, reservoirs, etc...
- But not economic activities characteristic of flood risk

## Issues of economic activities to flooding

Focus on adaptation of economic activities to flooding

### Adaptation of economic activities to flooding

- **Expected benefits**
  - **Protection of economic activities**
  - **Protection of infrastructure, human and security networks**
- **Expected benefits**
  - **Limit direct damage**
  - **Limit recovery duration**



## Issues of economic activities to flooding

Focus on adaptation of economic activities to flooding

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- **Expected benefits**
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  - **Protection of infrastructure, human and security networks**
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  - **Limit direct damage**
  - **Limit recovery process**



## Issues on the economic distribution

Focus on adaptation of economic activities to flooding

### Research questions

- How do the economic distribution and damage (benefits)?

## Issues on the economic distribution

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### Research questions

- How do the economic distribution and damage (benefits)?
- What is the distribution of the benefits and costs of distribution level
  - Does the spatial distribution of activities influence the total amount of distribution?
  - How much the way the network is organized influence the total amount of distribution?

## Issues on the economic adaptation to flooding

Focus on adaptation of economic activities to flooding

### Research questions

- How to assess individual damage (benefits)?
  - What is the distribution of the benefits and costs of adaptation level
    - Does the spatial distribution of activities influence the total amount of damage
    - How much the way the network is organized influence the total amount of damage
- Which methods would help to answer these questions

## Issues on the economic adaptation to flooding

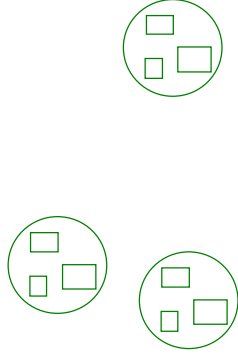
Focus on adaptation of economic activities to flooding

### Flood damage

- Direct economic impacts
- Business interruption used directly
- Indirect economic impacts

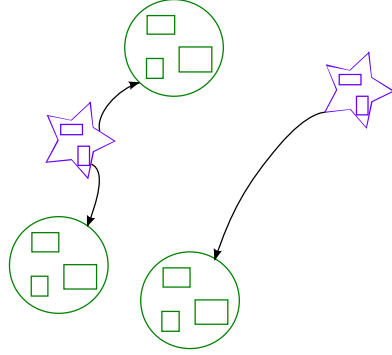
## Issues ortheconomicev lu tiono d t tion

Focus on adaptation of economic activities to flooding



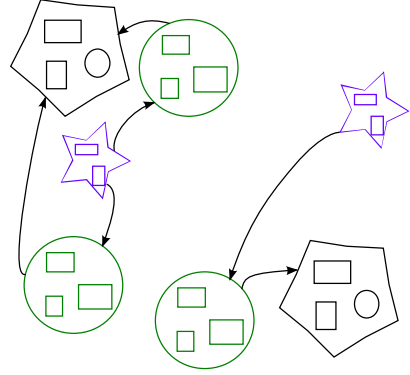
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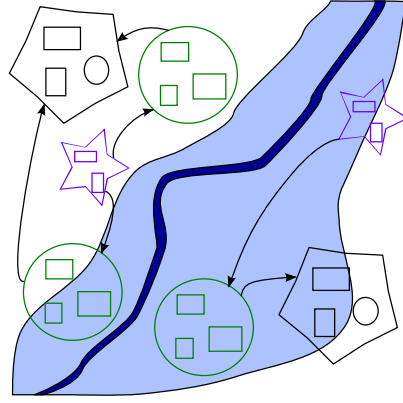
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Focus on adaptation of economic activities to flooding



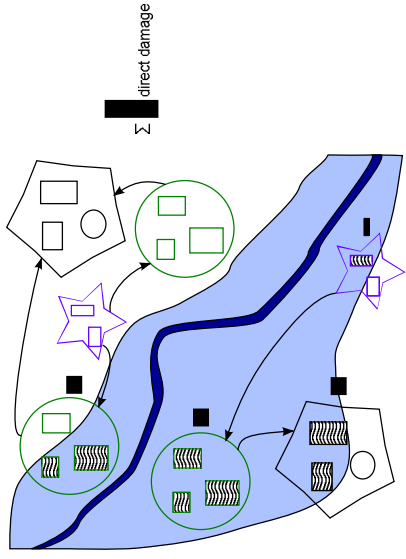
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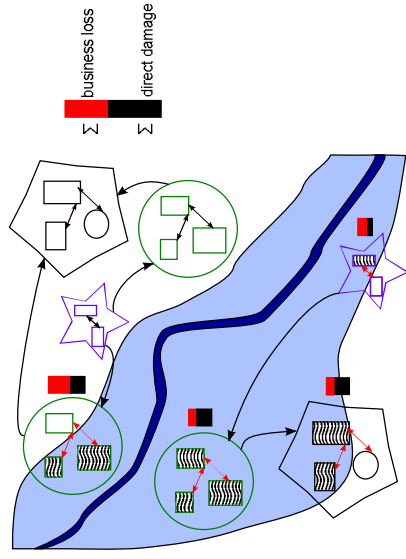
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# Issues on the economic adaptation to flooding

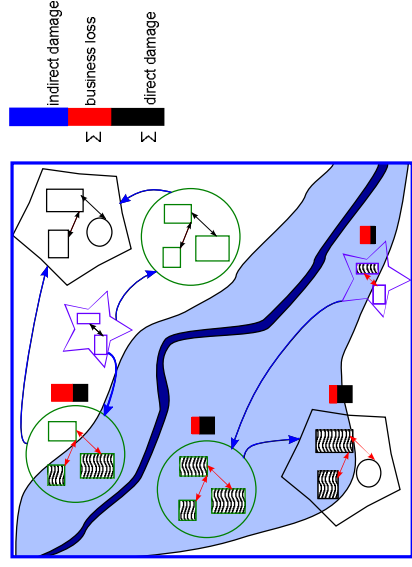
Focus on adaptation of economic activities to flooding





## Issues on the economic valuation of damage to agriculture

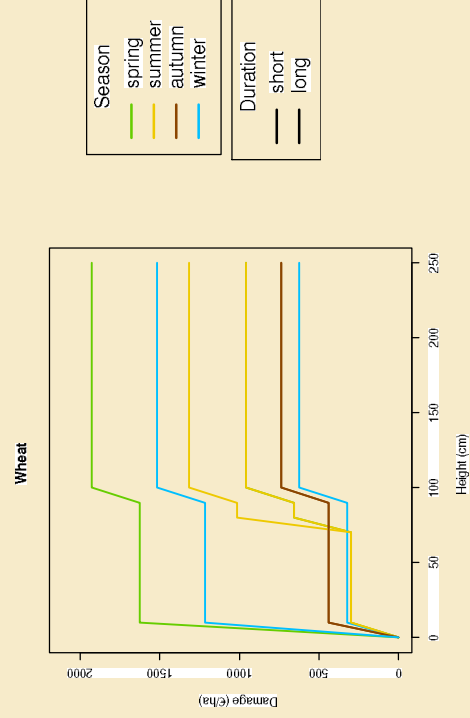
Focus on adaptation of economic activities to flooding



## Present methods for the economic valuation of damage to agriculture

Direct methods

empirical methods



## Present tiono e istin methods

Business oss

### m e unctions

- Fi edsh reo directd m e notrecommended  
Cochr ne 2004 uto tenusedin r ctice
- Sector specific business loss in function of flood parameters  
dur tion

## Present tiono e istin methods

Business oss

### odellin ro ches m inl or riculture

- einto ccountinter ctions etween rmcom onents
- m les
  - ess nd orris 1986
  - Bremond 2011
- Businesslossde endson
  - eriodo occurrence
  - s ti le osure
  - ccesstoe tern lresources

## Present tiono e istin methods

Indirect m e

### In ut/ ut ut

- Represents the interdependencies between different sectors of a n tion leconom
- ine r
- m leso use
  - lle tte 2008,2014 ro oses re ion II/ modelto ev lu tethecosto trin
  - Van Der Veen et al. (2003, 2005) simulates the effects of a l r esc leinund tionin oll nd

## Present tiono e istin methods

Indirect m e

### Com ut leGener l uili rium

- Beh viour lmodelo roducer ndconsumerres onsesto ricesi n lsin multim r etconte t
- eto e u tions neocl ssic ltheor
- online r
- inlimit intended orlon rune uili rium
- m leso use
  - Roseet l. 2005 n l sem orsu l disru tionso critic l in utsinthe term tho dis ster
  - C 2014 ev lu tetheeconomicconse uenceso m or flooding of Paris

## Present tionso e istin methods

Indirectd m e

### ent-B sed odellin - B

- imul testhe ctions ndinter ctionso utonomous ents in ivenenvironment
- m lesu use
  - No references found of ABM used to simulate flood damage
  - r ns et l. 2013 ointthe dv nt eso evolution r economics approaches to model flood damage
  - Ber er nd roost 2014 n l e d t tion ndmiti tion o tionsin riculture

## nthesis

cro ro ches

dv nt es	r w c s
<ul style="list-style-type: none"> <li>■ conom s whole</li> <li>■ Ability to reflect inter sector llin es</li> <li>■ Produce re tev lues</li> <li>■ v il ilit o d t</li> </ul>	<ul style="list-style-type: none"> <li>■ in etweendirect d m e nddiminutiono roductivec cit</li> <li>■ Mechanisms at firm scale               <ul style="list-style-type: none"> <li>■ Businessloss d t tion</li> <li>■ Beh viourdurin the recover eriod</li> </ul> </li> <li>■ os ti lre resent tion</li> </ul>

## Conclusion

B

Advantages	Drawbacks
<ul style="list-style-type: none"> <li>■ Indirect and direct effects</li> <li>■ Firms behaviour               <ul style="list-style-type: none"> <li>■ Bounded rationality</li> <li>■ Diffusion of innovation</li> </ul> </li> <li>■ Diffusion of adaptation</li> </ul>	<ul style="list-style-type: none"> <li>■ Difficulty to model the economic system</li> <li>■ Critical</li> </ul>

## Discussion

### Discussion questions

- How to measure individual contribution damage (benefits)?
- What is the distribution of the benefits and costs of diffusion level
  - Does the spatial distribution of activities influence the total amount of diffusion?
  - How much the way the network is organized influence the total amount of diffusion?

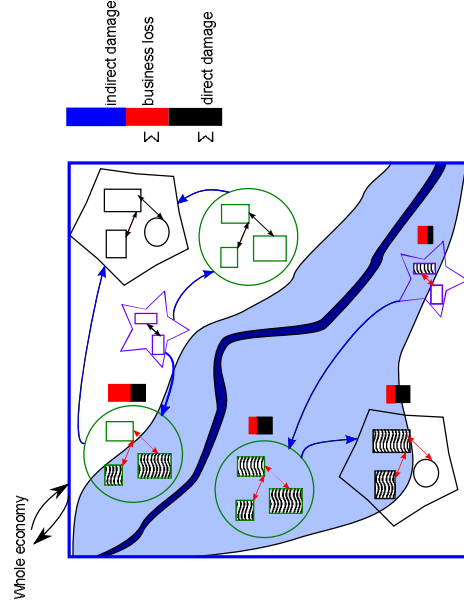
## Discussion

### Introduction | Local effects

- ABM looks attractive to capture effects at local and sectoral scales
  - effects of adaptation on damage
  - behaviour during recovery after flooding
  - interactions within sector network
- But research is needed to understand how those processes interact with the economy as a whole
  - in case of other sectoral effects
  - Price effects

## Discussion

### Competition effects



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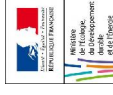
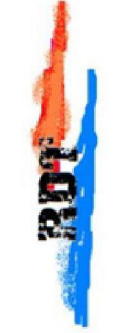
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2014-09-25

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## Credits

This research benefits from funding of  
the French minister of environment.



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2014-09-25

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