BASE BOTTOM-UP CLIMATE ADAPTATION STRATEGIES TOWARDS A SUSTAINABLE EUROPE

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Payment for ecosystem services – paying farmers for using farmland for flood control

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Overview

- Background
- Aim
- Methods
- Data
- Results
- Conclusions

Photo: Janne Hansen

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Background

- Increasingly wet climate in Northern Europe -> more frequent and severe fluvial floodings with subsequent high damage costs from the built environment
- Water requires space & water knows no ownership boundaries => Ecosystem-based approaches to CC adaptation appear necessary in many cases, at least in combination with grey solutions, to protect selected areas at least cost
- One essential issue is how to solve the **legal access for water** to areas where damages are minimised: Expropriation? Voluntary contracts? Land use reorganisation? Relocation?

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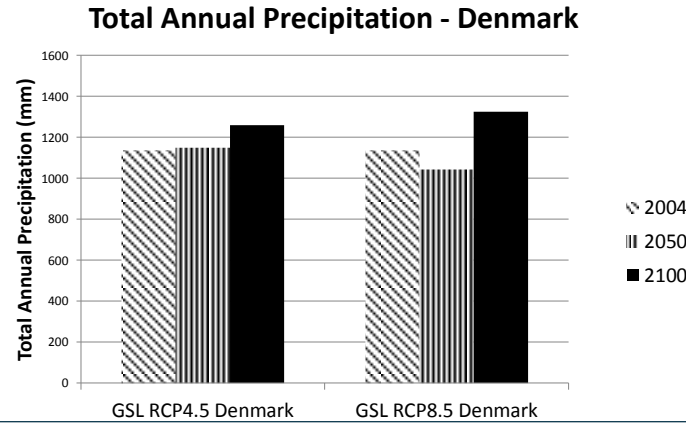
For Denmark, total annual precipitation is projected to increase in the long term by 11% in RCP4.5 and by 16% in RCP8.5 in Denmark.



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Background – Payment for Ecosystem Services (PES)

1) a *voluntary* transaction where
2) a *well-defined* environmental service (ES) or a land-use likely to secure that ES
3) is being "bought" by minimum one ES *buyer*
4) from minimum one ES *provider*
5) if, and only if, the ES provider continuously secures ES provision (*conditionality*)

(Source: Wunder, 2005)

- Promoted as a potentially effective tool for providing increased levels of ES through compensation of farmers for changing land management practices (Engel *et al.*, 2008; Pagiola, 2008; Wunder *et al.*, 2008)
- Avoids negative relations and resistance from land owner community
- Issue of ensuring appropriate spatial coverage / sufficient participants

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Aim

- Investigate farmer preferences toward a PES contract to allow for periodic flooding of their land to protect urban areas from flooding

=> Are farmers willing to manage water on their land?

⇒ What elements are important to farmers in a contractual agreement?

⇒ What level of payment would they be asking for?

=> Is this economically a sound approach?

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Case Area – 2nd longest stream, 104km; 1565km² catchment area

Source: Wiborg et al., 2014

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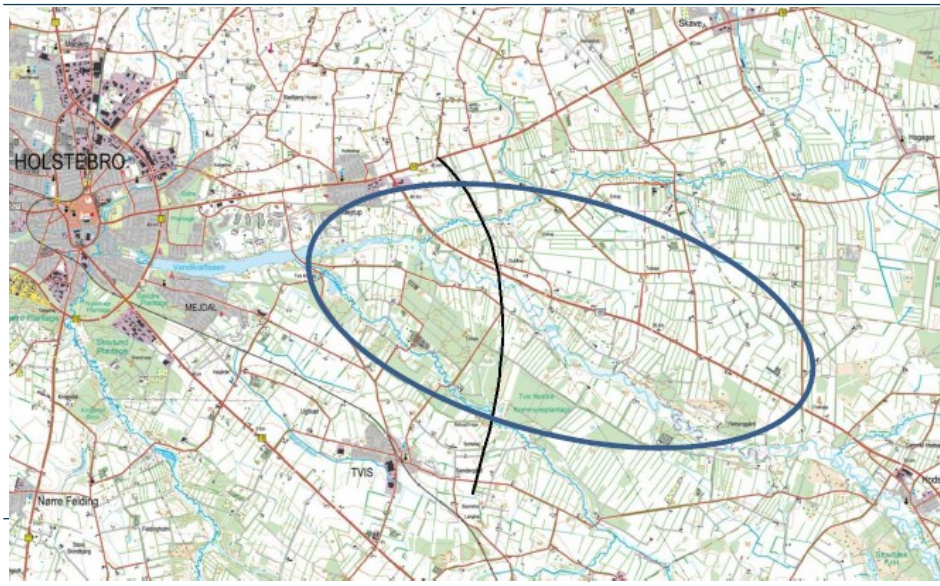

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Method – Choice modelling theory

Developed by economists and cognitive psychologists to attempt to model the decision process of an individual in a particular context based on the assumption of an underlying rational decision process (utility maximisation)

- Useful for estimating non-market environmental benefits and costs; value of hypothetical products or services; also applied in marketing studies

Choice Experiments (CE) elicit respondents' preferences for specific scheme attributes. The respondents have to choose one scheme out of a given number of alternative schemes. This is repeated a number of times in different choice situations

- the inclusion of a payment attribute makes it possible to obtain, indirectly, respondents' willingness to accept payment in return for accepting periodical flooding

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CE Attributes and levels

Attribute	Level description
Restriction on crop choices	Requirement to have flood resistant crops
	No requirement to have flood resistant crops
Yearly payment for making area available for flooding under 5 year events	500 dkk/ha
	1000 dkk/ha
	2000 dkk/ha
	3000 dkk/ha
Coverage of losses of crops during inundations on contracted area	No coverage of crop losses
	Value of crop losses assessed by professional valuer
Negotiation situation	Individual negotiation with your municipality
	Collective negotiation together with other farmers from your sub-catchment

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Example choice card

	Contract A	Contract B	Status Quo
Crop choice restriction	Requirement to use flood resistant crops	No requirements to use flood resistant crops	No restrictions
Yearly payment for making area available for flooding under 5 year events	2000 dkk	1000 dkk	No payment
Coverage of losses of crops during inundations on contracted area	No coverage of crop losses	Value of crop losses assessed by professional valuer	No coverage
Negotiation situation	Individual negotiation with your municipality	Collective negotiation with other farmers from your sub-catchment	No negotiation
My Choice (pls. tick only once)			

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Data

- Administration to a total of 449 farmers. 67 responses (18% response rate); 62 retained for analysis.
- Farmers surveyed are all within the Storå catchment area
- Farm size significantly larger than average
- Very few report having experienced significant yield losses (losses > 30%)
- Farmers act rationally in CE
- About 26% chose in all choice occasions NOT to participate

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Results

Variable	Coefficients (Std. Errors) Protesters excluded (N=62)	
asc_change	1,4810 ***	(0,2020)
Specific Crop Requirement	-0,0936	(0,0768)
Compensation	0,2944 ***	(0,0768)
Individual negotiation	-0,1244 *	(0,0756)
Payment	0,0006 ***	(0,8319D-04)
Log-likelihood	-367,62	
ρ^2	0,08	

On average:

Farmers prefer the current situation

No preference for or against crop req.

Positive preference for compensation

Preference for collective negotiation

Positive preference for payment

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Results

Based on the coefficients from the conditional logit regression, we calculate the average willingness to accept a full contract with the municipality.

$$WTA \text{ of full constract} = \frac{\beta_{compensation} + \beta_{negotiation} - \beta_{ASC}}{\beta_{payment}}$$

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Contract payments range from EUR250 - 447/ha/yr depending on the conditions in the contract

Contract	WTA/ha (EUR)
collective negotiation + compensation at crop loss – alternative specific constant	-250
Individual negotiation + compensation at crop loss – alternative specific constant	-309
collective negotiation + no compensation at crop loss – alternative specific constant	-389
individual negotiation + no compensation at crop loss – alternative specific constant	-447

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Comparison to contribution margin/ha

- CM based on following crops: permanent grass, energy crops, oat, spring barley, winter barley, winter wheat, winter rapeseed and rotational grass

EUR/ha/yr	Average	Min	Max
Weighted contribution margin (CM)	336	-23	1134
Contract with NO crop loss compensation foreseen	389-447		
Contract WITH crop loss compensation foreseen	250-309		

Note: Contribution margin based on weighted permuted 4-year data of crop choice on fields in Limfjorden catchment area and associated contribution margin.

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Conclusions

- Farmers are on average willing to manage water on their land
- They prefer compensation for crop losses; higher rather than lower yearly payments for making their land available for flooding and collective rather than individual negotiation with the municipality
- Costs appear high compared to current income generated from their land.
- However: this 'activity' is yet unproven for farmers; uncertainty about climate impact variability; what happens to crops and soil over time? Is it necessary to reorganise land use in catchment areas?
- Issue remains on ensuring spatial coordination of lands involved

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Thank you!

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