BASE BOTTOM-UP CLIMATE ADAPTATION STRATEGIES FOR EUROPE

Integrated adaptation pathways at EU level

How to combine case data with models

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The research leading to these results has received funding from the European Community's Seventh Framework Programme under Grant Agreement No.308337 (Project BASE)

Two elements

- Adaptation pathways
- Upscaling (matching Bottom up with top down research)

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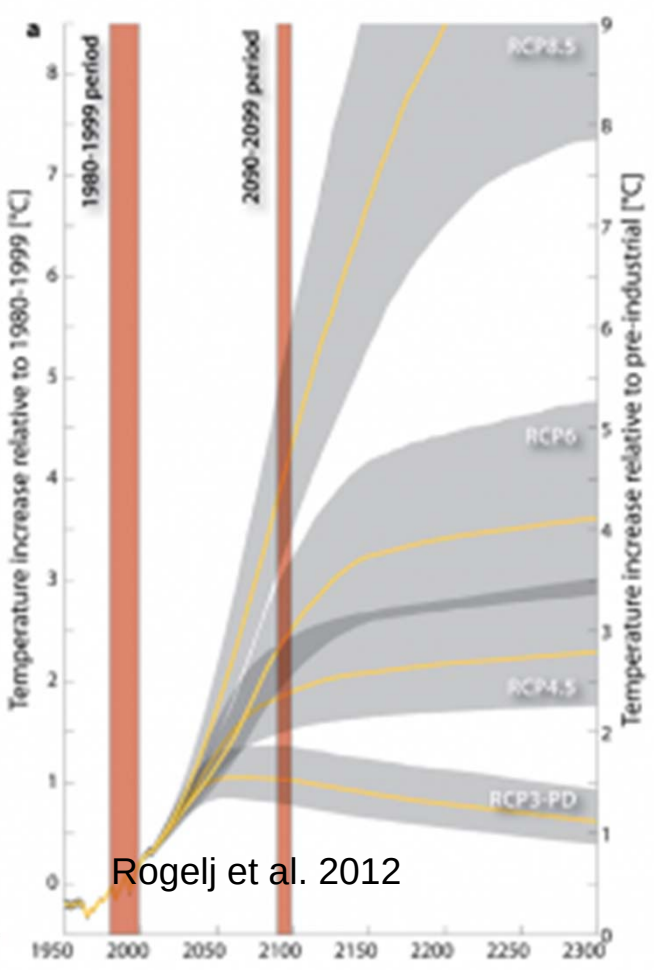
A future with deep uncertainties

- Multiple scenario's and / or Represen-tative Concentration Pathways exist.
- Even worse: projections form different GCMs diverge widely
- Socio-economic developments are uncertain
- Adaptation Pathways (AP) deal with these uncertainties



Rogelj et al. 2012

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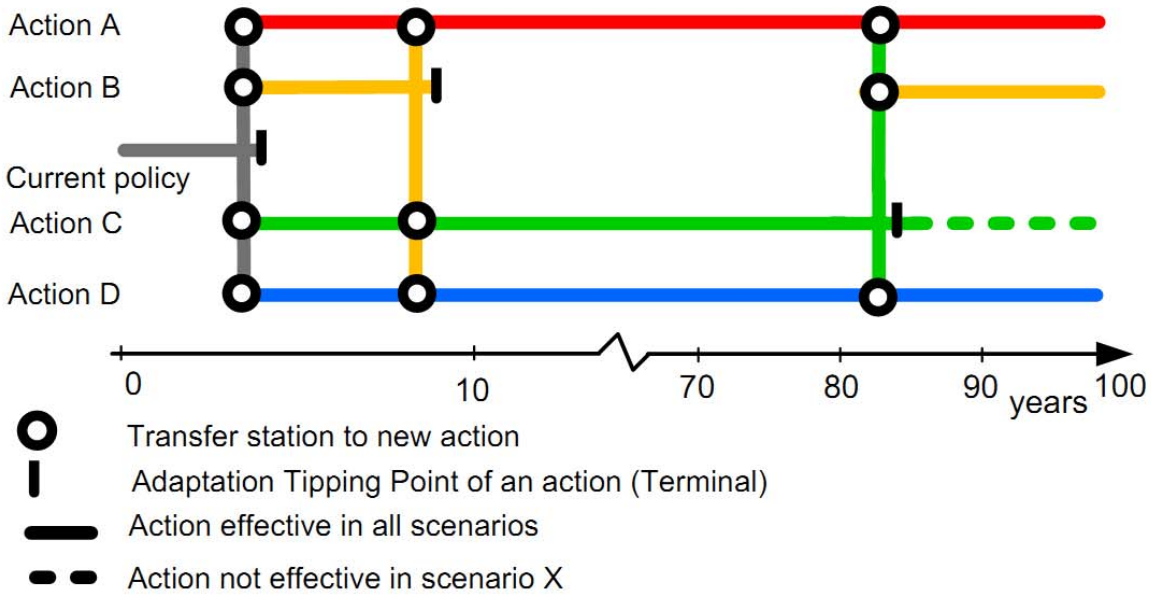


Adaptation Pathways Map

	Path actions	Relative Costs	Target effects	Side effects
1		+++	+	0
2		+++++	0	0
3		+++	0	0
4		+++	0	0
5		0	0	-
6		++++	0	-
7		+++	0	-
8		+	+	- - -
9		++	+	- - -

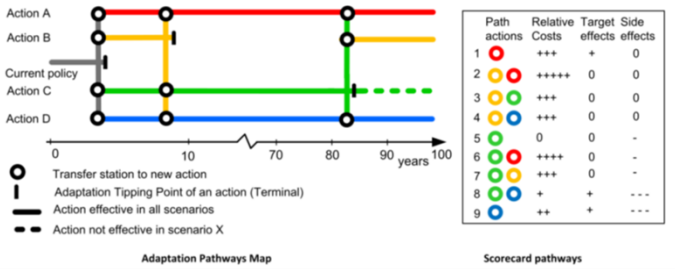
Scorecard pathways

Adaptation **Tipping Points**: conditions at which a policy begins to perform unacceptably

Adaptation **Pathways**: a sequence of policy actions to achieve targets under changing climate conditions

Kwadijk et al. 2010. WIRES Climate change. 10.1002/wcc.64
Haasnoot et al. 2013. Glob. Env. Change. 10.1016/j.gloenvcha.2012.12.006

Key elements



- ✓ The use of critical thresholds
- ✓ Making explicit portfolio of options (measures/strategies/policies) for adaptation
- ✓ Work with time horizons: -2015-2030-2050-2100. Connect short term measures to long term options
- ✓ Consider more than 1 climate and economic growth scenario to express uncertainty in time

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Further advantages

- Paths provide insights in options, lock-ins and path dependencies
- Introduces flexibility to adapt to a multitude of potential future changes
- Strategies can be explored considering different stakeholder perspectives.
- Offering policy not one solution but a set of options

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Upscaling Why?

- Scale difference between problem and policy level
- Gap between top down modeling approaches and local adaptation studies
- Poor range of adaptation measures covered by current IAMs (Watkiss & Hunt, 2012)

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Framework

Evaluation of current adaptation policy

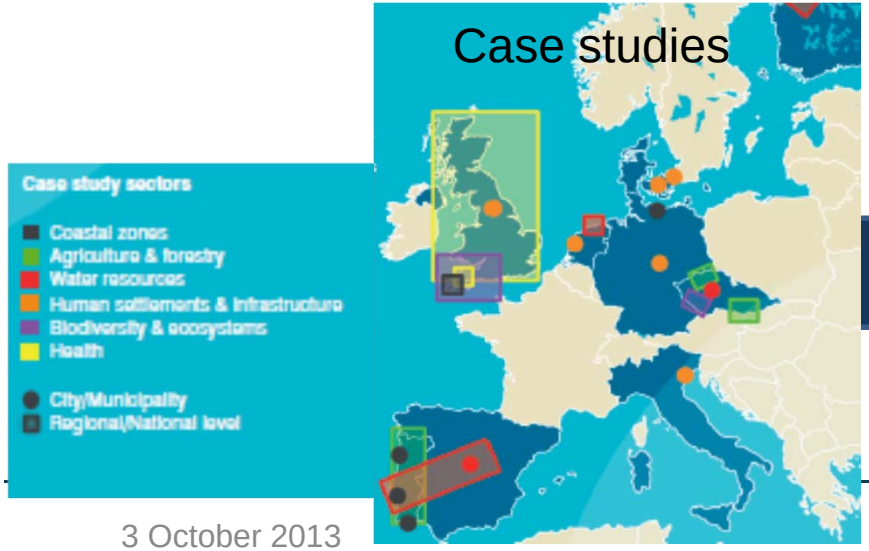
Economy wide models

Floods | Water availability | Cities

Policy implications

Adaptation Pathways

Case studies



Adaptation Pathways

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Upscaling what?

- Adaptation **pathways, Effects**, **Cost** and **benefits** from local to National EU-scale depending on change signal.
- Lessons on implementation and governing adaptation

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Deltares Enabling Delta Life

SEVENTH FRAMEWORK PROGRAMME

Upscaling How?

Adaptation pathways

Case studies:
Actions are defined at the level of
Specific measures

EU-wide models:
Actions are defined at the level of
General measures

EU-level pathways:
Actions are defined at the level of
General strategies/policies

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Hypothetical Example

- Action A- No top down action from EU/national, reaching critical levels (frequency of floods) due to change will cause sequence bottom-up autonomous action.
- Action B – Policy instruments are used to guide adaptation (reward flood proofing,- zoning etc.) with a certain effect but when climate change accelerates other action might be needed.
- Action C – Top down structural investments (on a national level certain safety is ensured by flood defenses).

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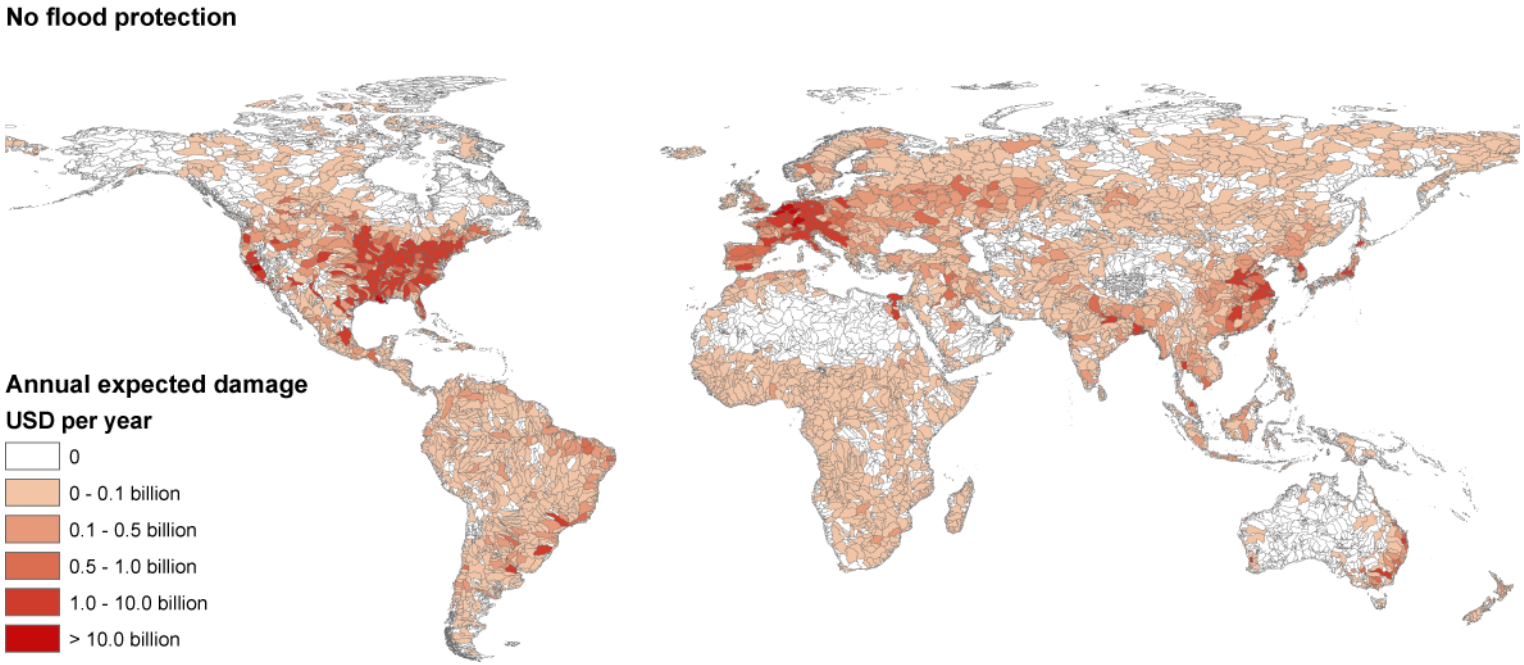
Example modeling: Flood damage reduction with safety level increase



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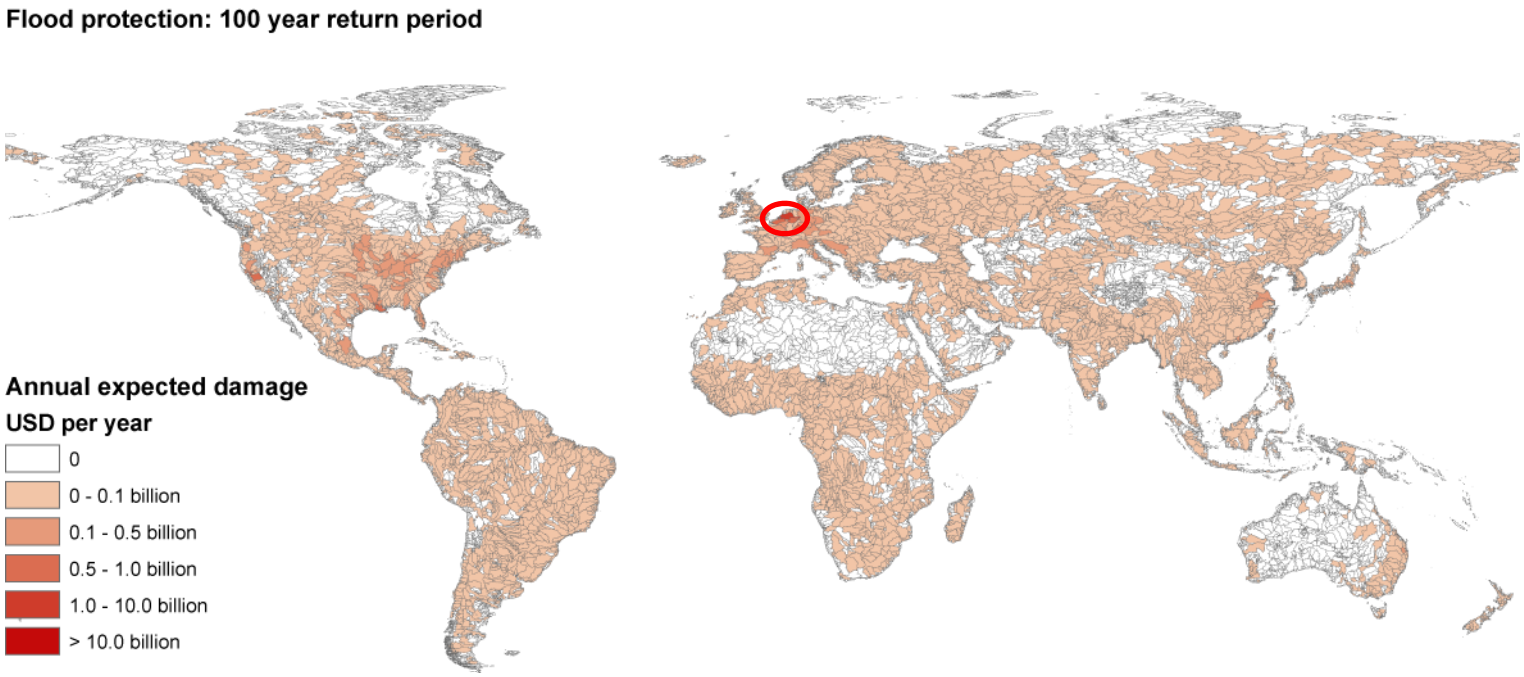
Damage reduction with safety level increase



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Working with a common ‘grid’

- Definitions and framework (adaptation pathways)
- Categories of measures/strategies linked at different scales (generic pathways)
- Use the same set of climate and socio-economic scenarios (RCPs and SSPs)
- Evaluation protocol of impacts, adaptation action:
  - Baseline/reference
  - Efficiency gain from ‘mainstreaming’/’integration’
  - Criteria
- Well organised case study groups with similar approaches

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Main risks (RS)/opportunities (OP)	(Farm-level) adaptation options (autonomous adaptation)	Adaptation options/measures/supports beyond farm scale (mostly at policy level) (planned adaptation)
Expansive spatial shifts in climatic suitability for crop choice and cultivation in the north (OP)	Altering portfolio of land allocation across different crops; changing land use; altering cultivation practices; diversifying crops; introducing new crops and varieties	Stimulation of innovation - technological and biotechnological advancement - including development of new, more productive crop varieties; monitor and control unintended aggregate consequences of farm scale change in production patterns. Create farmer incentives for more environmentally-friendly practises (e.g. for new cultivation methods, new silvicultural practises etc.) if the consequences are negative; provision of information and advice (e.g. through extension services)
Climate regime that potentially favours increase in crop yields and livestock productivity (OP)	Adjusting sowing and planting dates; adjusting time of farm operations; altering the use of external inputs (e.g. fertilizer application in the case of crop production); expanding livestock farming to new areas; increasing stocking rate	Innovation - technological and biotechnological advancement - including development of new, more productive animal breeds; monitor and control unintended aggregate consequences of farm scale change in production patterns. Create farmer incentives for environmentally friendly practises if the consequences are negative (e.g. if more pesticides are being used); provision of information and advice (e.g. through extension services)
Increased hazards associated with increased precipitation (e.g. waterlogging, floods) (RS)	Improving drainage systems; improving soil physical properties management; reducing grazing pressure or increasing intensive rotational grazing; changes in soil management practices (ex: Keyline design, subsoil plowing,	Zoning system; integrated catchment management; development of early warning system; other types of information/advice on the risks and opportunities; installation of hard defences; encourage farmers to become 'custodian' of

Challenges

- Generalisation of casestudy outcomes with respect
  - Actions chosen and options considered
  - (Estimated) effects of actions (tipping points, costs)
- Provide input to sectoral models for validation and representation of main strategies
- Improve the current quantitative estimates with bottom up evidence

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Preliminary thoughts

- Start with main policy questions to define premature generic adaptation pathways
  - ‘Green’ versus structural measures
  - Planned versus autonomous adaptation and policy instruments
  - Mainstreaming climate adaptation
  - Policy instruments
- Try to improve estimates and effects on adaptive capacity

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