BASE
BOTTOM-UP CLIMATE ADAPTATION STRATEGIES TOWARDS A SUSTAINABLE EUROPE

SEVENTH FRAMEWORK PROGRAMME

UNIVERSITY OF LEEDS

Bottom-up assessment of costs, benefits and effectiveness of adaptation

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Background

To date, economic analysis of adaptation strategies has used a top-down and sectoral approach when generating estimates of the costs and benefits of adaptation. While these studies are of value for national policy makers, they are less useful for local governments, businesses and non-governmental organisations who will deliver adaptation on the ground and will need to plan for it.

Focusing on the vulnerability of a system, bottom-up approaches examine the adaptive capacity and adaptation projects that are needed to improve the robustness of local systems in the context of changing climate.

As part of the BASE project, we outline a bottom-up strategy for assessing adaptation needs and their costs, benefits and effectiveness from the viewpoint of those who will plan for and deliver adaptation.

Analytical cornerstones

Adaptation tipping points

The concept of 'adaptation tipping points' (ATP) focuses on the effectiveness of existing strategies in dealing with extreme weather events and seeks to identify tipping points when alternative strategies are needed (Kwadijk et al., 2010).

A dynamic thinking of adaptation pathways

Traditional scenario-based approaches consider several future years in developing adaptation strategies and assume a static situation which neglects the dynamics from natural variability and interactions between environment and society (Haasnoot et al., 2012). Dynamic adaptation based on transient scenarios could help to identify opportunities, dead ends, as well as timing of the adaptation strategy through learning and experiencing processes.

Costs and benefits of adaptation

Cost-benefit analysis is used to calculate and compare total expected monetary costs and total expected monetary benefits of adaptation measures which consist of avoided losses due to climate change impacts. It uses monetary units adjusted for the time value of money (discount rate). The method can be complemented with other indicators referring to non-monetary criteria and qualitative analysis.

Uncertainty

Uncertainty analysis include identification, quantification and propagation of model inputs and parameter uncertainties. Specific methods will be used in this context to incorporate flexibility in the design of the adaptation measure.

Next steps

- Select local or regional case studies
- Choose scenarios or pathways to work with
- Identify and select social, environmental and economic variables to be quantified
- Select methodologies to assess full costs

What we attempt to achieve

A state of art study on adaptation in New York State used case studies to identify climate risks, vulnerability, adaptation strategies for eight sectors, including water resources, coastal areas, ecosystems, agriculture, energy, transportation, telecommunications and public health (Rosenzweig et al., 2011).

The study estimated damages associated with climate change impacts and costs of adaptation strategies for each of the eight sectors using cost-benefits analysis. It concludes that without adaptation, annual economic losses associated with climate change in the eight sectors would exceed $ 10 billion by 2050s and that they could be reduced significantly if adaptation efforts are taken. Our study seeks to provide similar results for Europe.

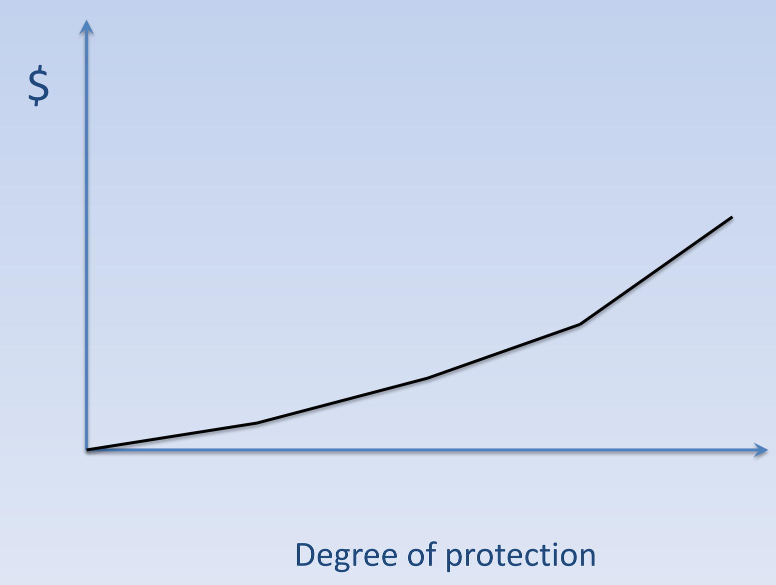
Sector	Component	Cost of annual incremental climate change impacts at mid-century for selected components, without adaptation	Costs and benefits of annual incremental climate change adaptations at mid-century for selected components
Water Resources	Flooding at Coastal Wastewater Treatment	$116-203 million	Costs: $47 million Benefits: $186 million
Coastal Zones	Insured losses	$44-77 million	Costs: $29 million Benefits: $116 million
Ecosystems	Recreation, tourism, and ecosystem service losses	$375-525 million	Costs: $32 million Benefits: $127 million
Agriculture	Dairy and crop losses	$140-289 million	Costs: $78 million Benefits: $347 million
Energy	Outages	$36-73 million	Costs: $19 million Benefits: $76 million
Transportation	Damage from 100 year storm	$100-170 million	Costs: $290 million Benefits: $1.16 billion
Communications	Damage from 100 year storm	$15-30 million	Costs: $12 million Benefits: $47 million
Public Health	Heat mortality and asthma hospitalization	$2.99-6.10 billion	Costs: $6 million Benefits: $1.64 billion

Table 1. Estimated costs and benefits of adaptation in eight sectors in 2050s
Source: Rosenzweig et al. (2011) Annex III, Table 1.1.

Expected Outcomes

Marginal adaptation cost curves

For example, flood risk in region A will increase due to climate change, and create increasing losses. Loss avoidance will be progressively costlier as more flood risk mitigation will be sought when moving to more and more ambitious adaptation pathways over time.



Expectations:
- Find optimal and minimum adaptation investment based on current climate scenarios and adaptation pathways;
- Quantify expected full costs and benefits of adaptation

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