BASE BOTTOM-UP CLIMATE ADAPTATION STRATEGIES TOWARDS A SUSTAINABLE EUROPE

SEVENTH FRAMEWORK PROGRAMME

BASE economic evaluation insights and main conclusions

Alves, Filipe M.; Jeuken, Ad*; Meyer, Volker**; Gebhardt, Oliver**

CE3C - Lisbon University, Portugal

*Deltares, The Netherlands

** Helmholtz Centre for Environmental Research - UFZ, Germany

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ECONADAPT Policy workshop

The Dominican Hotel, Brussels

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

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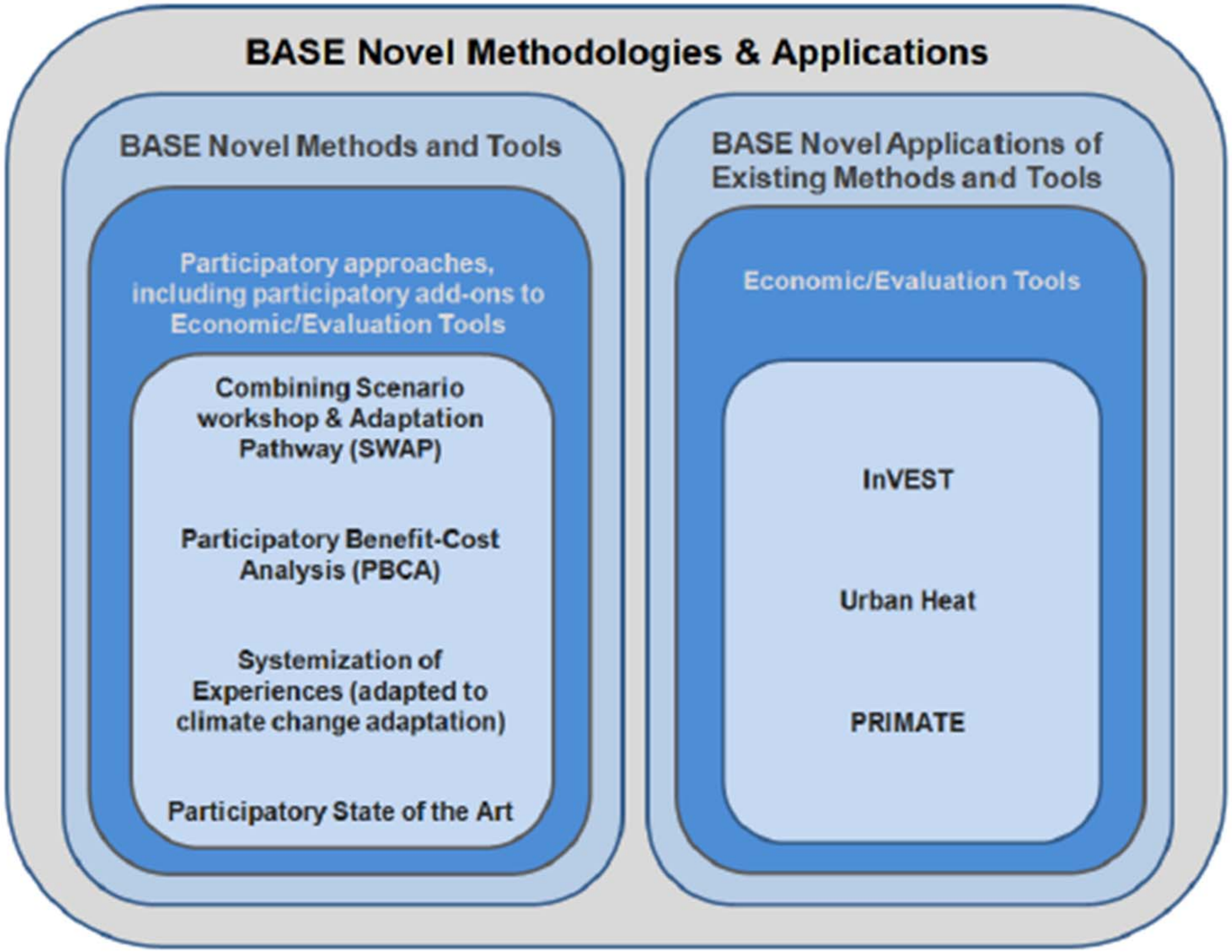

Figure 2-5 Novel approaches & applications of existing tools developed through BASE: Novel methods and tools for participatory approaches, including participatory add-ons to economic/evaluation; and BASE novel applications of existing methods and tools for economic/evaluation.

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Task and Deliverable 5.2: Economic evaluation of adaptation options

Lead authors: Volker Meyer, Oliver Gebhardt, Filipe Moreira Alves
Delivery date: 9/9/2015
Available in: http://base-adaptation.eu/sites/default/files/Deliverable_5_2_FINAL.pdf

Task and Deliverable 6.3: EU- wide economic evaluation of adaptation to Climate change

Lead authors: Ad Jeuken, Laurens Bouwer, Andreas Burzel, Francesco Bosello, Enrica Decian, Luis Garote, Ana Iglesias, Marianne Zandersen, Timothy Taylor, Aline Chiabai, Sebastien Foudi, David Mendoza Tinoco, Dabo Guan, Zuzana Harmackova, Alessio Capriolo
Delivery date: 15/03/2016
Available in: http://base-adaptation.eu/sites/default/files/D.6.3_final.pdf

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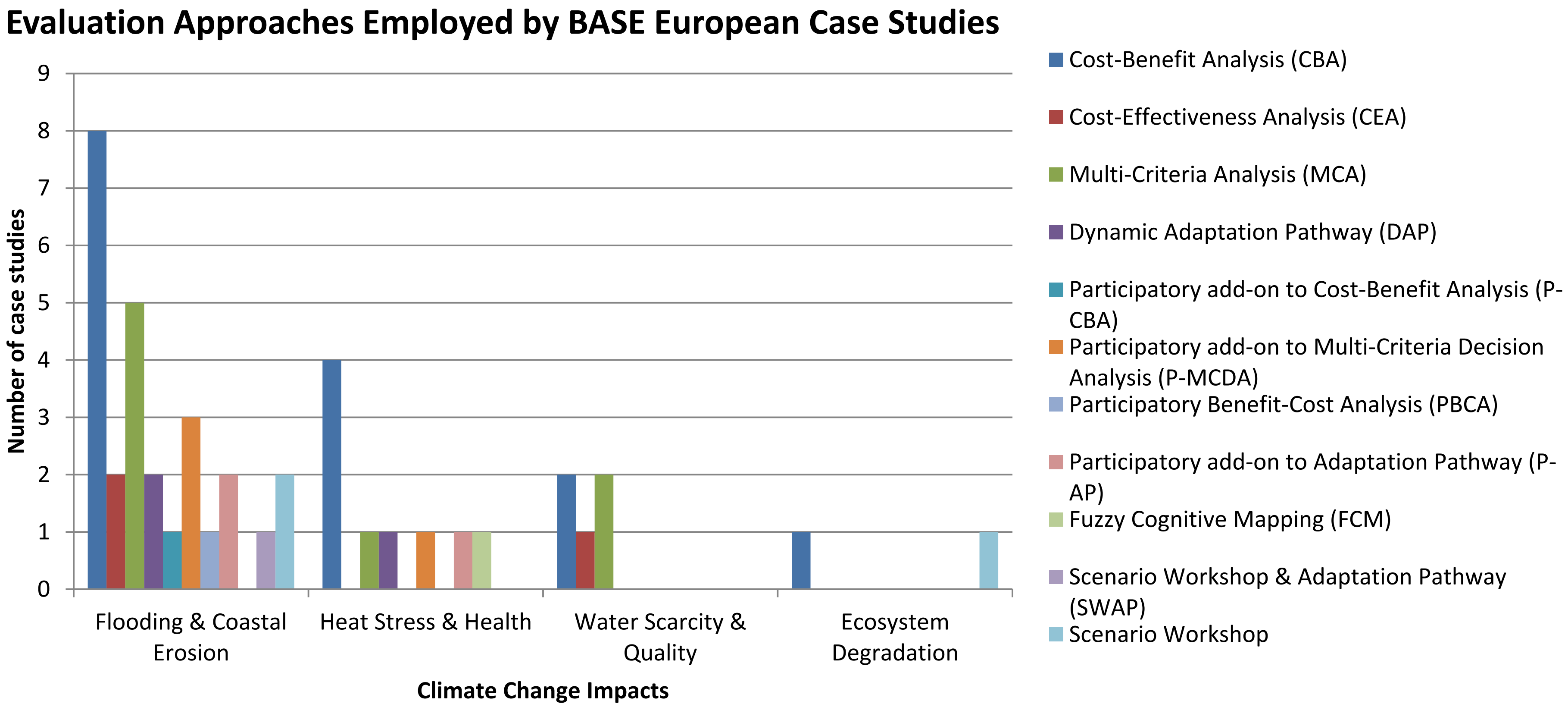
	Cost-Benefit Analysis	Cost-Effectiveness Analysis	Multi-criteria Analysis	Participatory Benefit-cost Analysis
Flooding & Coastal erosion	Kalajoki Copenhagen Rotterdam Aveiro Coast South Devon Coast Leeds Timmendorfer Strand Prague	Cascais Holstebro	Kalajoki Copenhagen Rotterdam Aveiro Coast Cascais	Cascais
Heat stress & Health	Jena Madrid		Jena	
Water scarcity	Alentejo Doñana		Doñana	Alentejo
Water quality		Kalajoki		
Ecosystem degradation	Green roof			

D5.2: Economic evaluation of adaptation options



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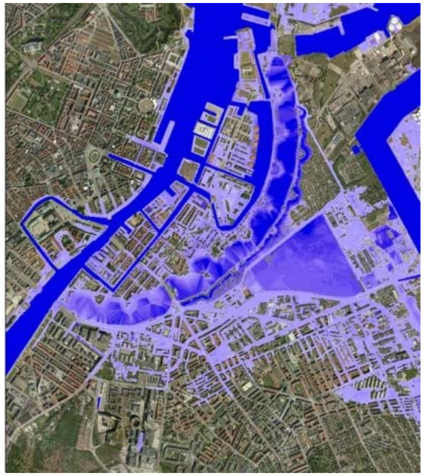
D5.2: Economic evaluation of adaptation options

Primary risks	Type of measure	Specific Adaptation measures	Case study	Costs	Benefits	NPV, BCR	Comments
Floods (coastal, fluvial, pluvial)	Structural protection measure	Dike reinforcement	Rotterdam	Total costs (costs of the measure & residual damage): 3,042 – 3,574 m EUR (rest and steam scenario)	(Dike reinforcement is set here as the baseline, therefore PVB is 0)	(Dike reinforcement is set here as the baseline, therefore NPV is 0)	Year of implementation: 2030 DR 5.5% (Dike reinforcement is set here as the baseline, therefore NPV is 0)
		Full closure with dams and sluices	Rotterdam	Total costs (costs of the measure & residual damage): 3,811 – 4,282 m EUR (rest and steam scenario)	.	Year of implementation: 2030 DR: 5.5%: NPV: -769 – -708	Results compared to the baseline option: dike reinforcement, rest and steam scenario
		Strengthening sea defences	South Devon (Coast)	.	.	NPV: -430 – -359 m EUR (1% and 5% discount rate)	Results compared to the baseline option: Maintaining existing sea defences, conducting repairs to damage to the rail infrastructure, cliffs and sea wall from storm events
		Installation of sluice gates up stream to hold back flood water	South Devon (Fluvial)	.	.	DR 1%: NPV: 1.64 m EUR DR 5%: NPV: 0.97 m EUR	Results compared to the baseline option: No intervention to protect the 50 at risk properties
	Retention & room for the river measures	Room for the River Small 1 (new and existing channels, land excavation, but in combination with dike reinforcement)	Rotterdam	Total costs (costs of the measure & residual damage): 3,033 – 3,562 m EUR (rest and steam scenario)	.	Year of implementation: 2030 DR 5.5%: NPV: 9 – 8 m EUR BCR: 1.4 – 1.6	Results compared to the baseline option: only dike reinforcement, rest and steam scenario

Selected case studies´ evaluation results



Floods:

In large cities, large structural flood risk adaptation measures (dikes etc.) highly efficient (Copenhagen, Leeds, Prague)…also in combination with room-for-river measures (Rotterdam).

Heat stress:

Conflicting results e.g. for roof greening:
efficient in Jena (well-established producers & favourable framework conditions) not efficient In Madrid (higher costs & incentives missing).

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Remarks/Conclusions:

1. **Harmonization** of economic analysis between different case studies **is limited** and single-recipy prescriptions for economic evaluations across Europe is not recommend;
2. **Transferability** of results/methods/processes among case studies is also **limited and should be used with care**;
3. Scaling up of local case-study specific results to National or European scales is limited and might bring unacceptable levels of uncertainty;
4. The choice of the best (efficient, effective, accepted) economic evaluation method and/or tool to apply in each case depends on several factors…
5. **Complementarity between different tools** but also the increasing use of **participatory methodologies** is fundamental when dealing with uncertainty, with complexity, with growing demand for transparency in public decision-making processes and the need to engage local communities in adaptation (see BASE Task 5.3).

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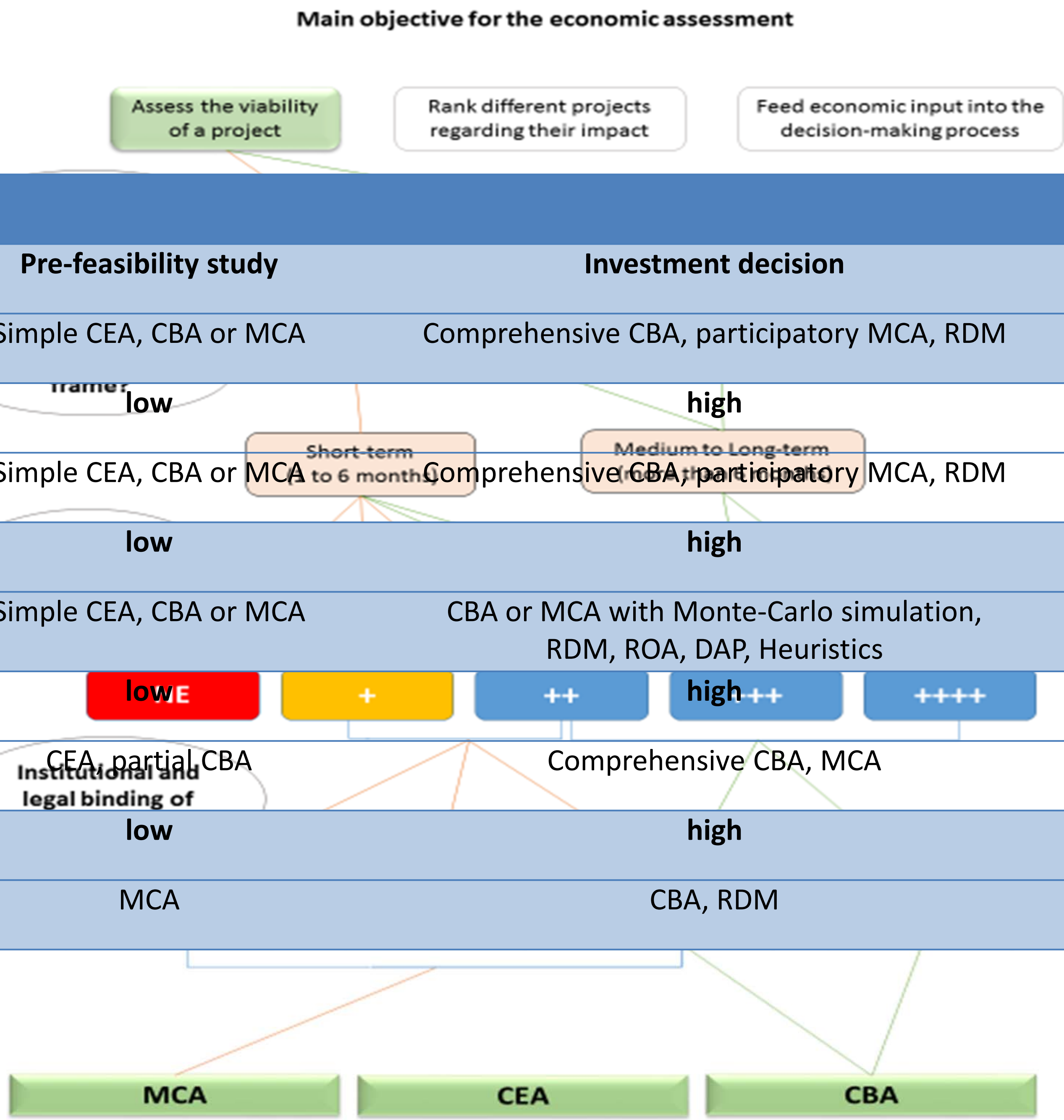
Factor		
Objective	**Pre-feasibility study**	**Investment decision**
	Simple CEA, CBA or MCA	Comprehensive CBA, participatory MCA, RDM
Investment costs	low	high
	Simple CEA, CBA or MCA	Comprehensive CBA, participatory MCA, RDM
Uncertainties	low	high
	Simple CEA, CBA or MCA	CBA or MCA with Monte-Carlo simulation, RDM, ROA, DAP, Heuristics
Number of evaluation criteria	low	high
	CEA, partial CBA	Comprehensive CBA, MCA
Data availability	low	high
	MCA	CBA, RDM



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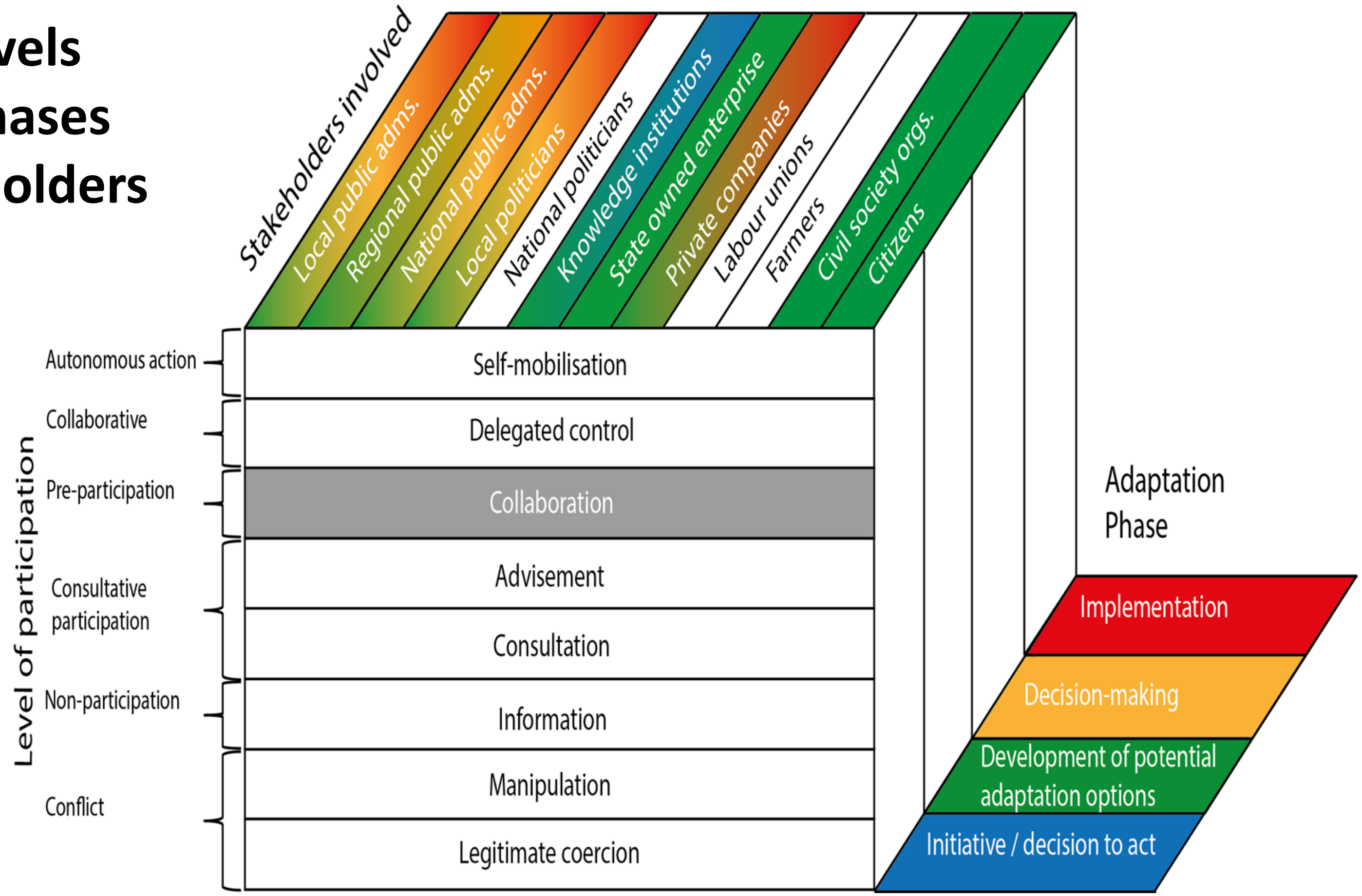
- ❑ **8 adaptation levels**
- ❑ **4 adaptation phases**
- ❑ **Multiple stakeholders**



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SEVENTH FRAMEWORK PROGRAMME

PBCA – Participatory Benefit-Cost Analysis

The use of participatory methodologies for economic analysis in Cascais, Portugal

Alves F. M., Vizinho A., Campos I., Penha-Lopes G.,

Objective and concept

The **Participatory Benefit-Cost Analysis** (PBCA) is a hybrid methodology designed under FP7 project BASE by CCIAM for the participatory economic assessment of the costs and benefits of different adaptation measures. It was tested and used in the analysis of the Strategic Plan for Climate Change of Cascais.

It is a simple-to-use, resource efficient, solutions focused, pro-active, democratic tool for decision-makers.

The PBCA aims to combine the advantages and strengths of multi-criteria analysis (MCA) with the rationality of Cost-benefit Analysis (CBA), evolving from the simplicity of the Simplified Participatory Cost-Benefit Analysis (SPCBA) to deliver an all-in-one procedure for action-researchers working in climate adaptation.

Methodology

5-Step procedure

1. • Stakeholder grouping (5-7 participants)
2. • PCBA Matrix for one adaptation measure
3. • Introducing discounting
4. • Debate and selection of the discount rate
5. • Final present value presentation by each group
   • Final present value comparisons and debate

Example of a PBCA Matrix: *"Green corridors"*

	ENV			SOCIAL			ECONOMIC				
	Effect Description	Short-term (2014/6)	Long-term (2050)	Effect Description	Short-term (2014/6)	Long-term (2050)	Effect Description	Short-term (2014/6)	Long-term (2050)	Short-term (2014/6)	Long-term (2050)
BENEFITS	Biodiversity hubs and channels	1	4	Shadow, heat-relief spaces	1	3	Real-estate valorization	1	4	4,5	8,5
	Flood control; Erosion control	1	2	Meeting point	1	2	Job creation	4	2		
		1	3		1	2,5		2,5	3		
COSTS	Negative impacts in fauna dynamics	3	1	Social resistancedue to traffic changes	4	1	Investment	5	1	9,5	4
	-			Social resistance due to biodiversity increase	2	1	Maintenance	2	3		
		3	1		3	1		3,5	2		
Rácio B/C		0,67	3		0,17	2,5		0,71	1,5	0,47	2,13
							FINAL NET PRESENT VALUE			1,762	

-5%	-1%	0%	1%	5%
6,3379	1,4359	1	0,6989	0,1726

Time frame: 36 years

Results

8 Adaptation measures analysed

Adaptation measure	CB Short term	CB Long term	Discount rate	Final present value (original 2013-2050)	Final present value (3,5% 2050)
Green corridors	0.5	2.25	-1%	1.8653875	0.575125
Reforestation of the Sintra-Cascais Park	0.8	6.5	-5%	20.998175	1.33925
Action plan to manage invasive species	0.79	3	-5%	9.90185	0.8285
Eliminate water pollution points	2	2.42	1%	1.84579	1.34969
Raising awareness in households regarding good sanitation practices	2.25	3.5	1%	2.34825	1.63075
Legislation towards bioclimatic construction norms	5.25	4.5	1%	4.19775	3.27525
Vector surveillance system in the municipality	3.5	5.5	1%	3.67225	2.54475
Awareness raising campaigns for heat waves and heat stress	1.25	2.2	1%	1.3939	0.9429

Conclusions

- **It's more about the process than the result itself;**
- **It can lead to counter-literature**, but intuitive, **results**, such as the selection of negative discount rates for some particular adaptation measures in some groups;
- **Simple to use and understand,** mainly if there is good facilitation/focalization
- The introduction of the time-factor and the inherent use of a **discount rate enriches the debate** and contributes significantly to the usefulness and maturation of the tool;
- **Inexpensive to use and implement** as it can be applied in the context of an existing workshop and represent a 1-hour add-on to the program with minimum marginal costs
- It allows stakeholders **to point in the right direction** regarding the most important effects of an action if deeper CBA is needed for quantitative valuation as well as identify expert shadow areas

BASE has been funded with the assisstance of the European Union. The contents of this poster are the sole responsibility of BASE and can in no way be taken to reflect the views of the European Union.

Contacts
Filipe Moreira Alves: fmalves@fc.ul.pt

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Mind Map

Stakeholders Financing CC Adaptation

Tourism Sector

- Turismo Centro de Portugal
  - Regional Strategy and National Strategy (PENT)
  - Dr. Pedro Vieira Machado
- Comunidade Intermunicipal da Região de Aveiro
  - CIRA
- POLIS Litoral - Ria de Aveiro
  - Operational Programme for Territorial Development
- Local Business
  - Camping site
  - Vaga Splash
  - EcoRIA
  - RiaActiva

Energy Companies

- ERSE Regulatory Agency
- EDP Foundation
  - Research investment needed and funded by EDP
- Uni Aveiro VS EDP on 'responsability issues
- Possible Tax on Hydropower profits
- Ministry of Environment and Territorial Planning bringing accountability to EDP (?)
- Media pressing for EDP responsibility and evolving DECO (responsible consumers association)

TAXES & Incentives

- Water Resources Tax Portuguese Environmental Agency (APA)
- Green Tax Reform inclusion (Public Discussion the new work from the Gov.)
- Tax Harmonization and simplification
- New rules for the IMI (Municipal Property Tax)
- CSR Fund for Climate Change Adaptation from local Firms
- Taxing Parking Places next to the beach (user-pay condition)

Regional FUND for CC Adaptation

- Crowdfunding
  - Two Portuguese platforms: Massivemov and PPL
- Contribution from BIG BUSINESS (private companies)
  - Ex. INDUSTRIES like SECIL; CIMPOR; PORTUCEL
- Regionally managed by CIRA
- Part also coming from Local/Regional TAXES

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Task and Deliverable 6.3: EU- wide economic evaluation of adaptation to Climate change

This deliverable 6.3 of BASE is reporting in particular on the results of the **modelling exercises** executed within the project. Costs and benefits are explored for present and future climates, for different socio-economic developments paths and different adaptation strategies. For all models the SSP (Shared Socio-economic Pathways) 2 ('middle of the road'), 3 ('fragmented world') and 5 ('market driven development') have been explored as well as the climate scenarios according to RCP (Remote concentration pathway) 4.5 (average climate change) and 8.5 (high climate change) for 2050.

Floods **Agriculture** **Health**

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The main methodological advances that have been made with respect to the modelling approaches applied for this deliverable are:

1. The more detailed sectorial studies on Floods, Agriculture and Health were used to recalibrate and parameterize AD-WITCH damage, adaptation cost, and adaptation effectiveness.

2. Crop patterns, land use, hydrological and agricultural production models have been combined to obtain new insights in effective adaptation.

3. New cost estimates on flood protection and adapted building were applied in the European scale flood model.

4. An improved IO-model has been applied to city flooding cases allowing for better insight in the variety, size and cause of indirect damages.

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Aggregated results for floods

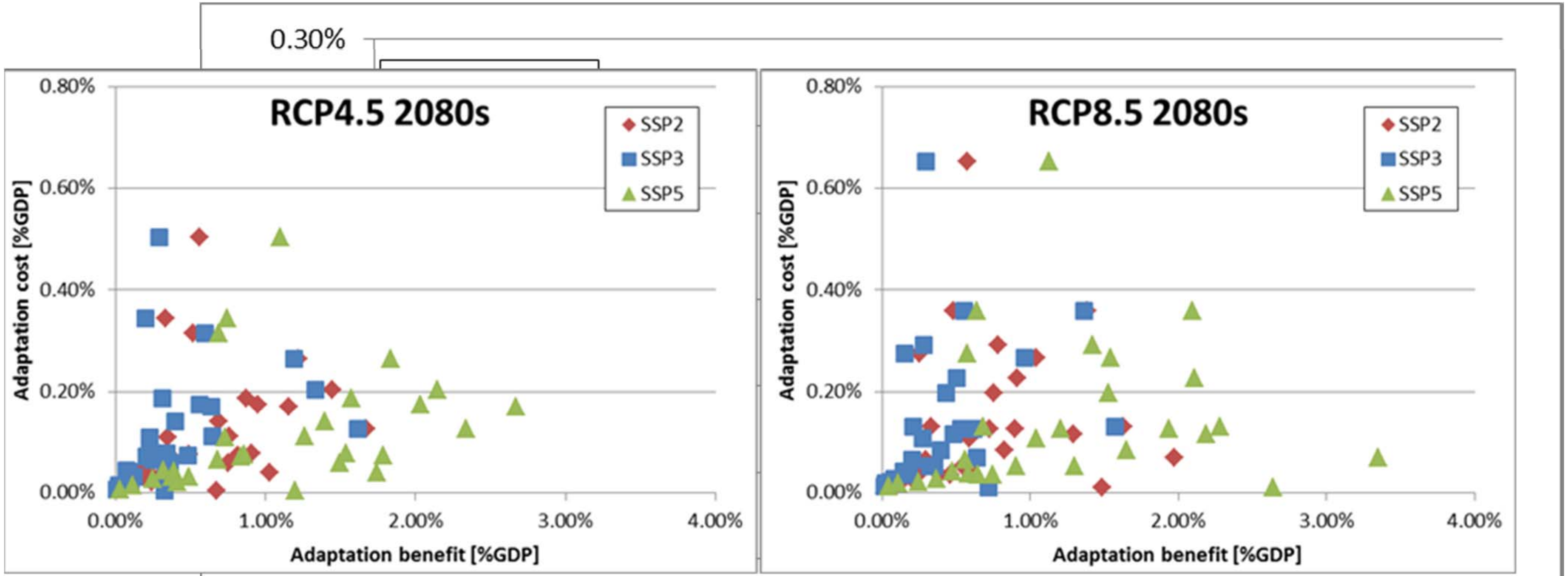

Figure 1 Annual adaptation costs and benefits of flood protection for individual countries, expressed as percentage of current GDP (undiscounted), under RCP climate scenarios 4.5 and 8.5, and including SSP2, 3 and 5 scenarios

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Aggregated results for floods

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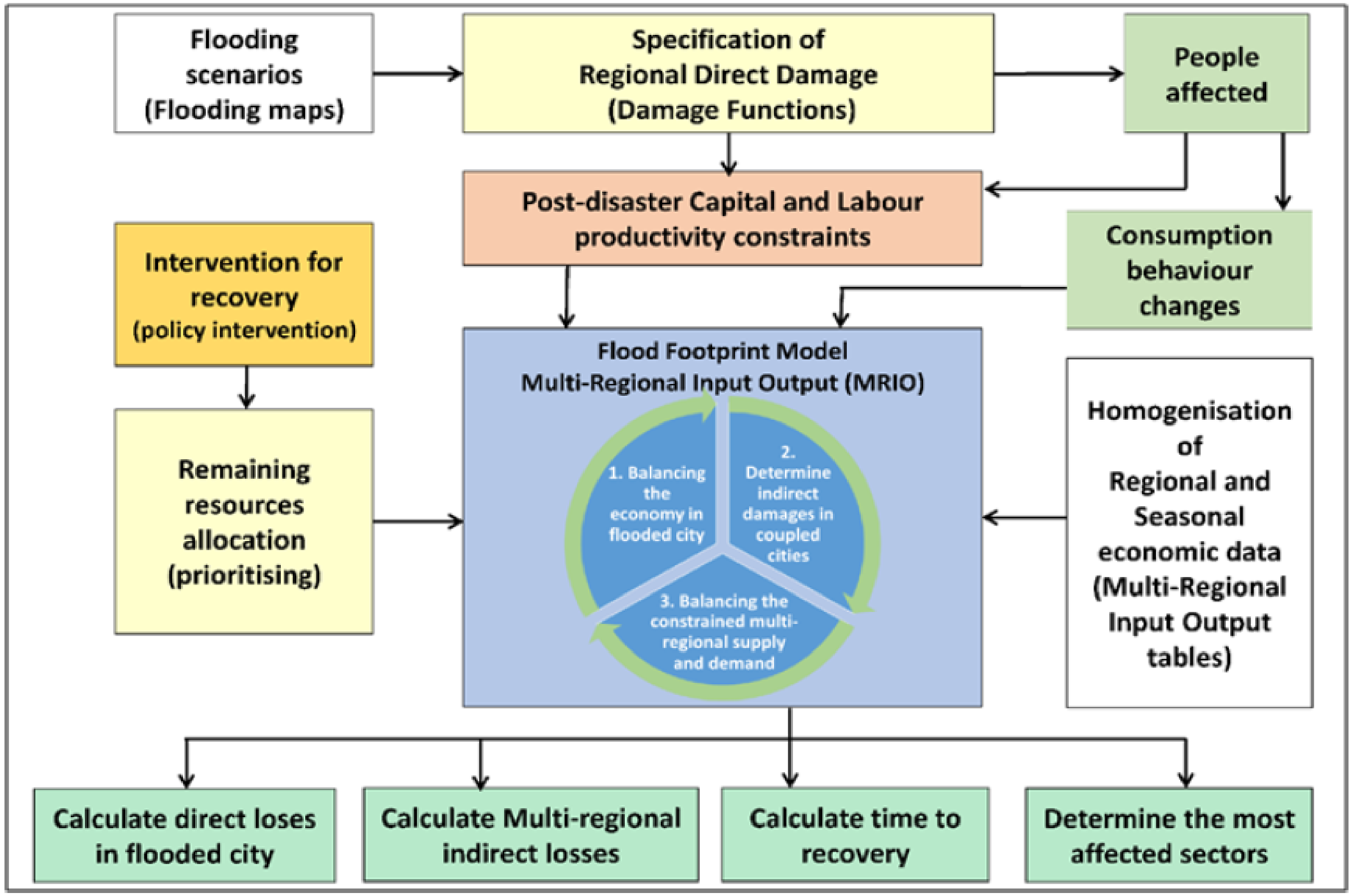
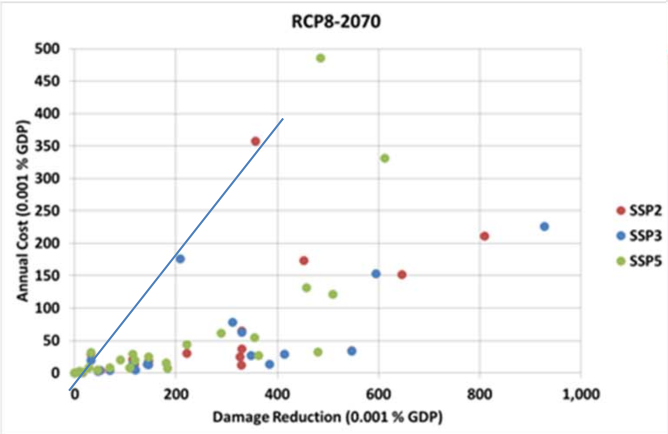
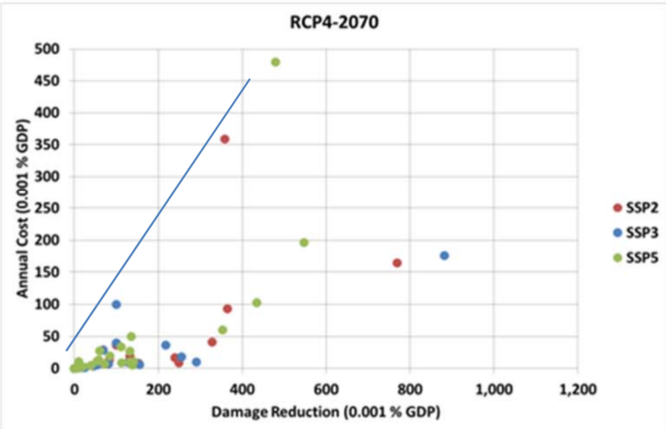


Figure 11 The structure of food footprint model based on multi-regional input output (MRIO) model

The research leading to thes
under Grant Agreement No.

Agricultural production





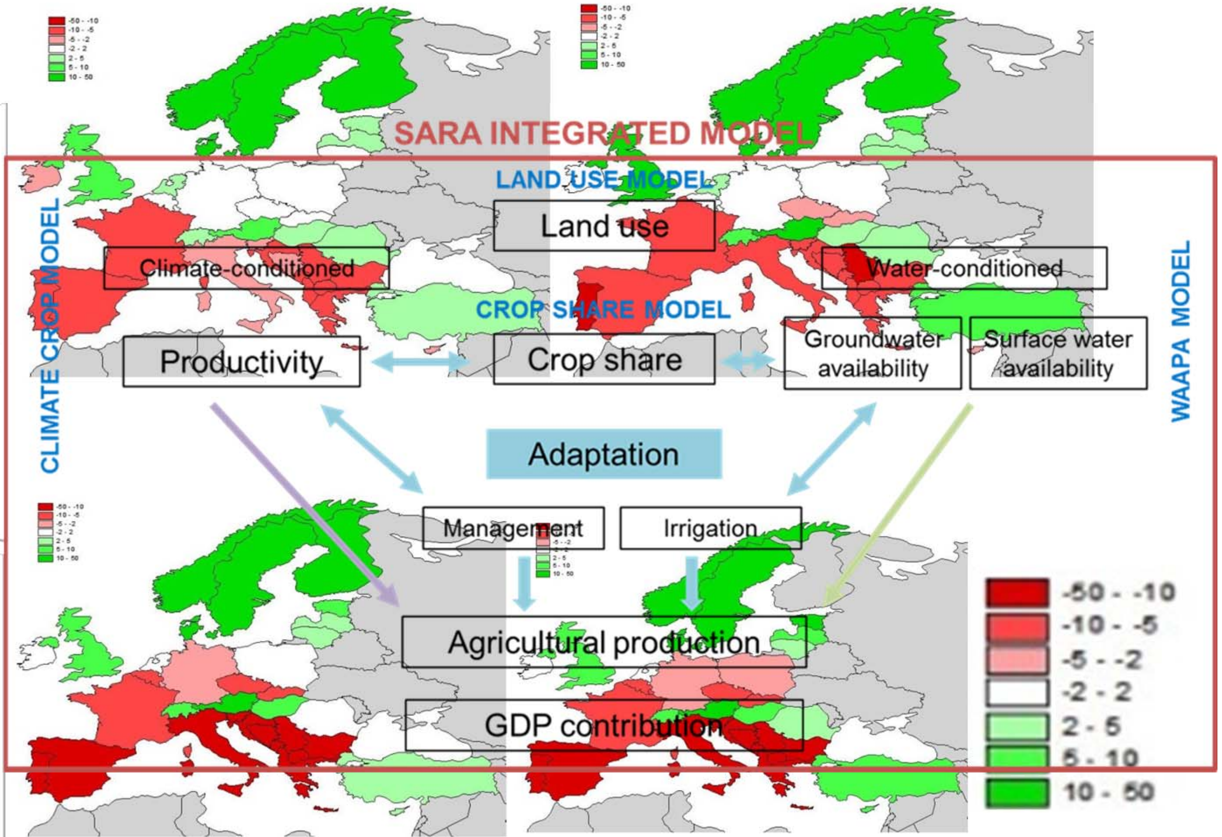


FIGURE 1 AVERAGE RESULTS BY COUNTRY OF CHANGES (%) IN AGRICULTURAL PRODUCTIVITY. EMISSION SCENARIOS RCP4 (TOP) AND RCP8 (BOTTOM), IN SHORT TERM (LEFT) AND LONG TERM (RIGHT) TIME SLICES.

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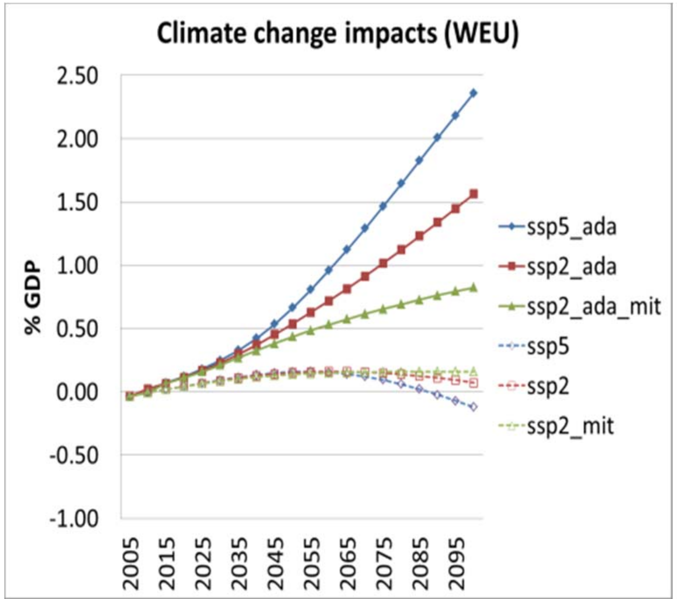
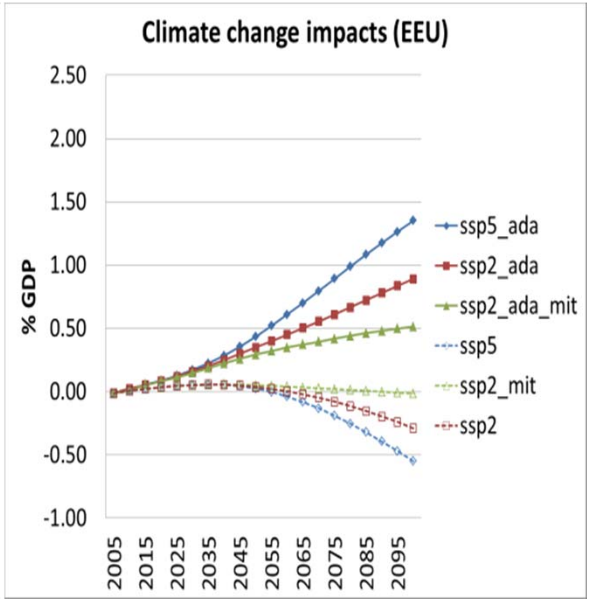
Recalibration of the top-down AD-WITCH model with BASE findings - overall results for Western and Easter EU in the figures below:





1) Building flood protection up to a level of 1/100 year results in BCR > 1 for most countries and SSPs

2) Improving water efficiency management of agriculture results in BCR > 1 for all countries and scenarios

3) Introducing mitigation and adaptation into a global economic assessment results in positive effects on GDP in both Western and Eastern Europe (damage < 0% of GDP).

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Take away messages:

1. **Harmonization** of economic analysis between different case studies **is limited** and single-recipy prescriptions for economic evaluations across Europe is not recommend. **A tree-choice model can and should be developed**;
2. **Transferability** of results/methods/processes among case studies is also **limited and should be used with care.** Does not apply necessarily to models and methods which can be easily adapted;
3. **Using case specific data to calibrate and improve sectoral models can be key to reduce uncertainties**. However it demands close and early stage alingment among researchers/practioners/local stakeholders;
4. **Complementarity between different tools** but also the increasing use of **participatory methodologies** is fundamental when dealing with uncertainty, with complexity, with growing demand for transparency in public decision-making processes and the need to engage local communities in adaptation.

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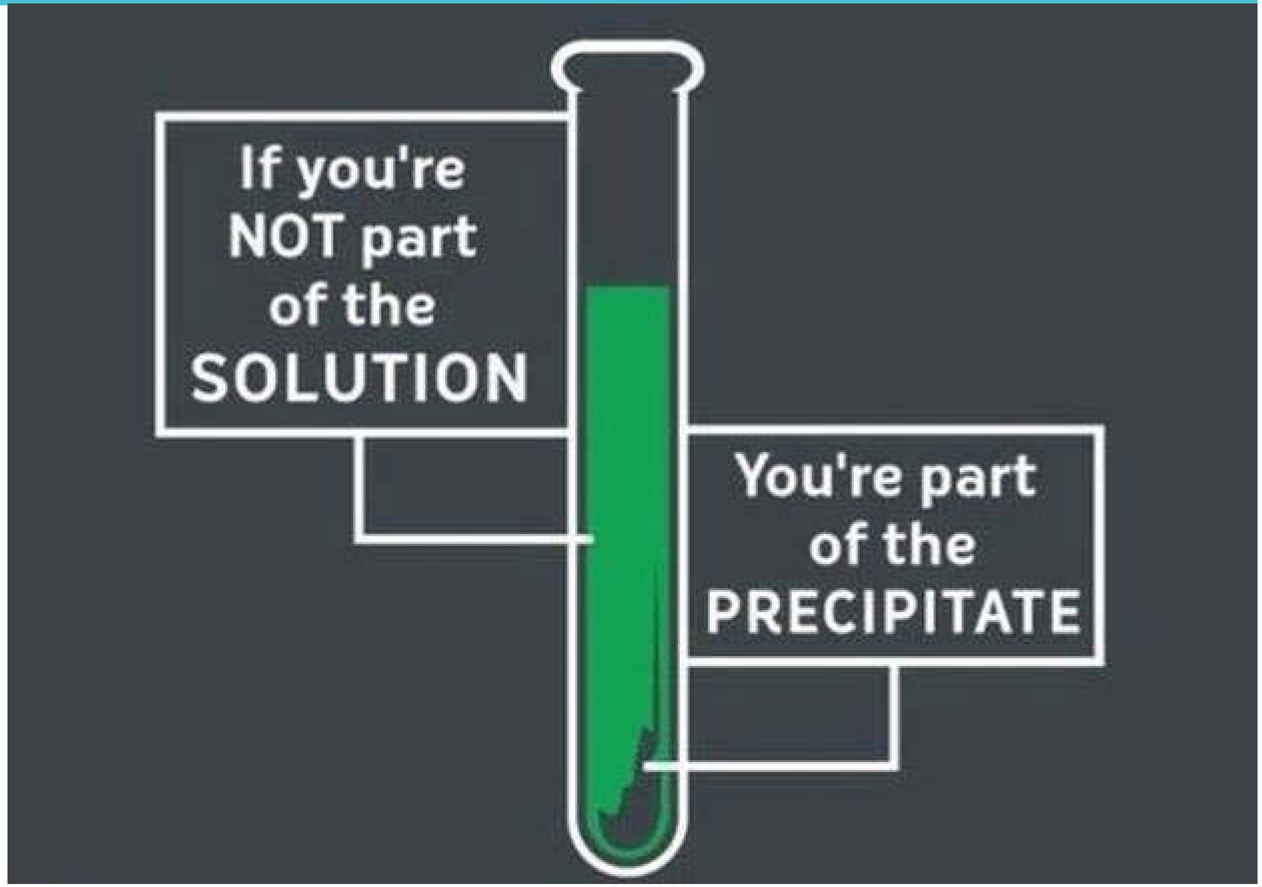
Thank you!



Filipe Moreira Alves

fmalves@fc.ul.pt

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