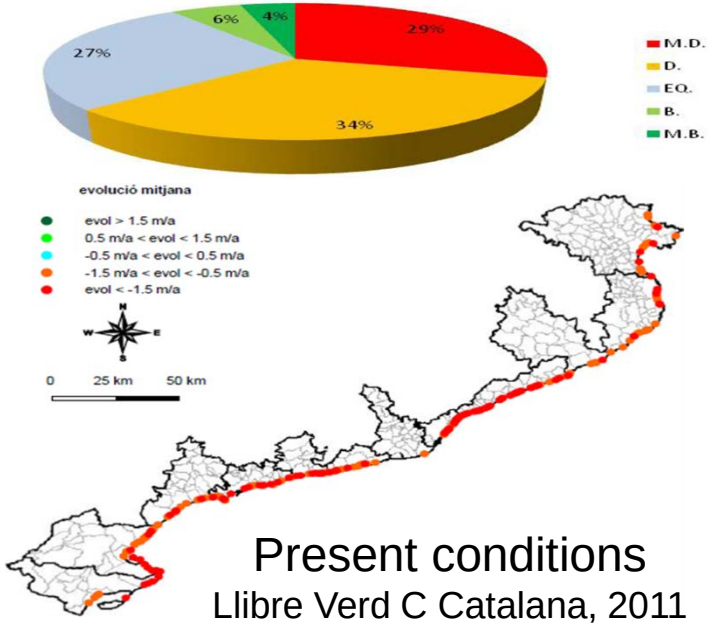
Sea-level rise impacts in the Med. The Catalan coast case

A. Sánchez-Arcilla, J. Jimenez, S. Samitier, G. Borràs, X. Quintana, J. Montaner, J. Solà

ESA S3 data, 2016



Present conditions
Llibre Verd C Catalana, 2011

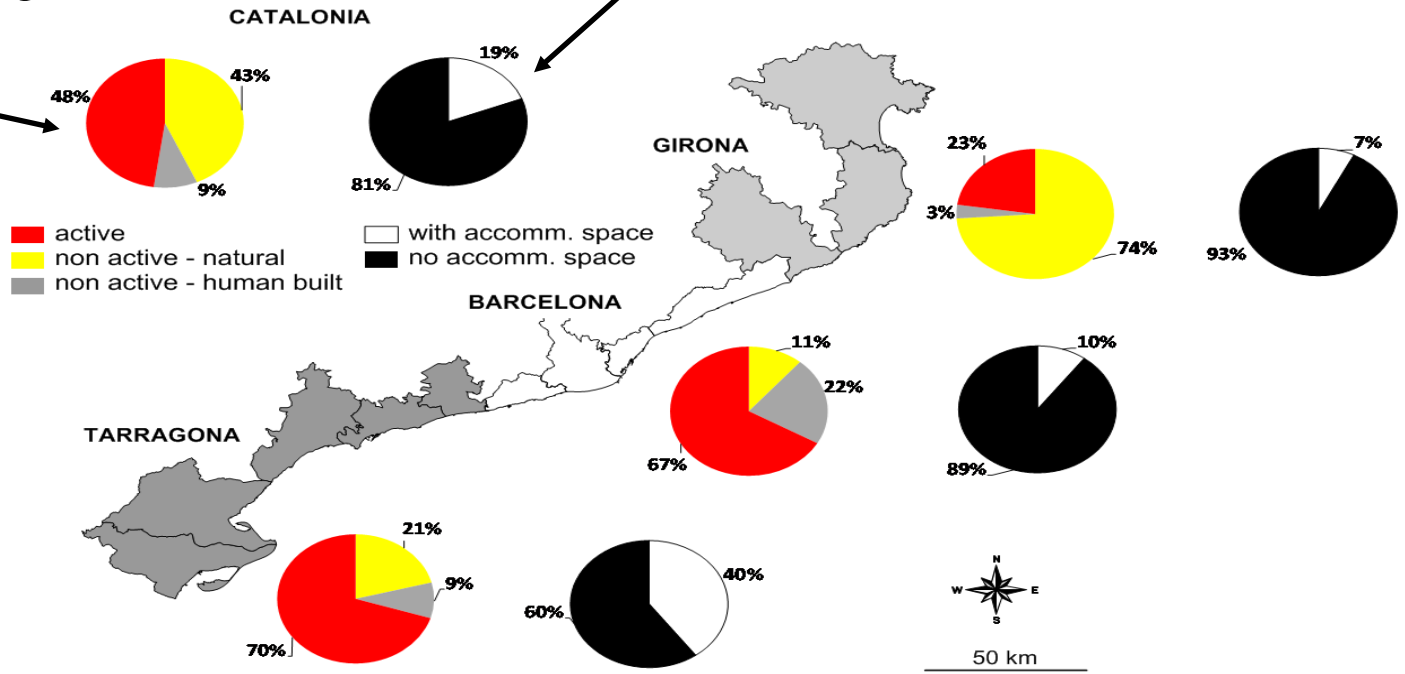
Highest vulnerability (SLR) stretches: tourism and protection functions

Active coasts – dynamically react to SLR (≈ sedimentary)
Non-active coasts – no reaction, just passive inundation

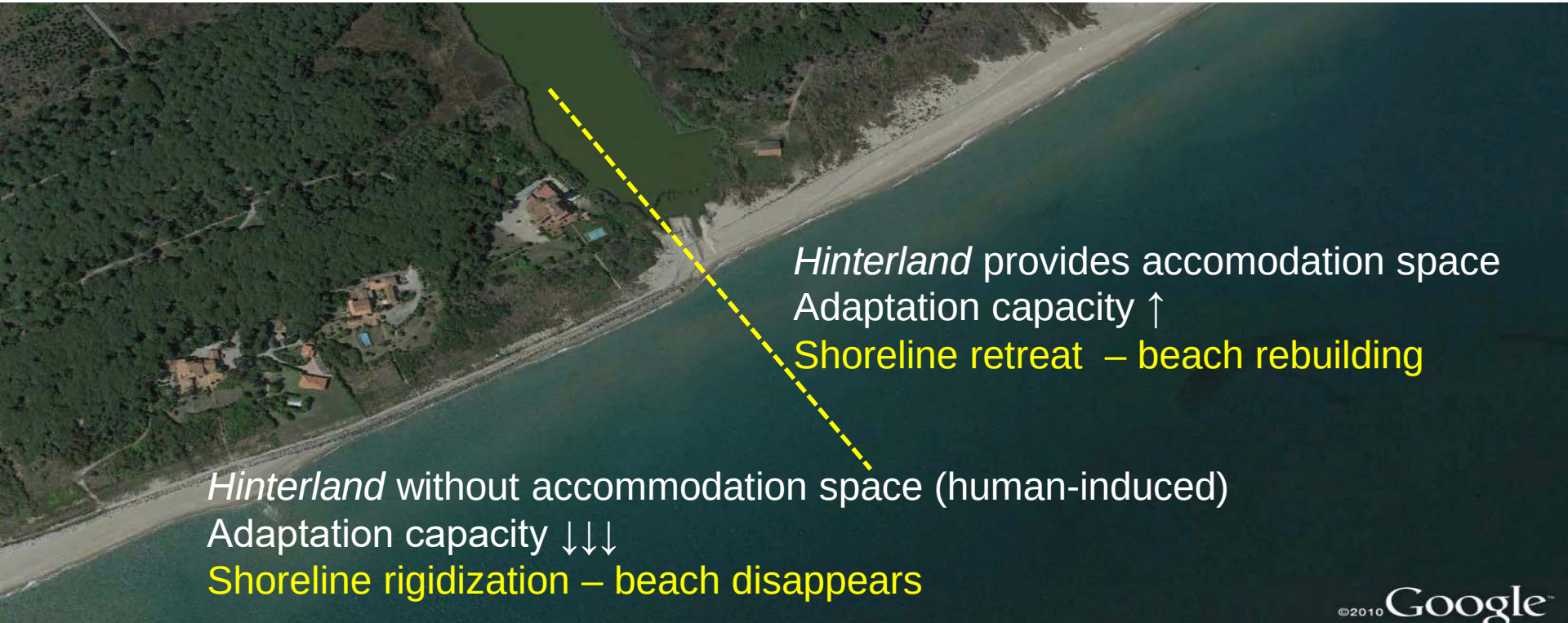
CAT COAST
L ~ 280 km

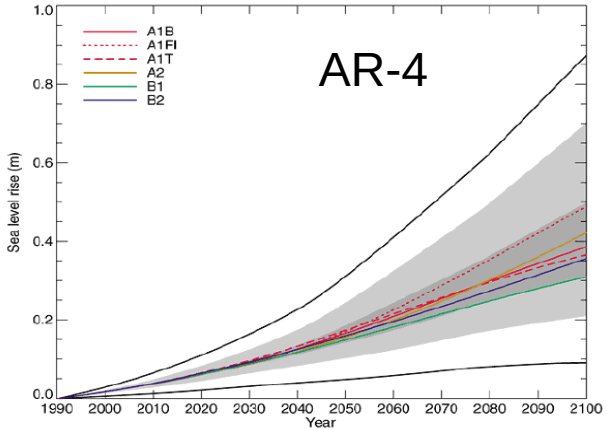
Active *vs* non-active coasts to SLR

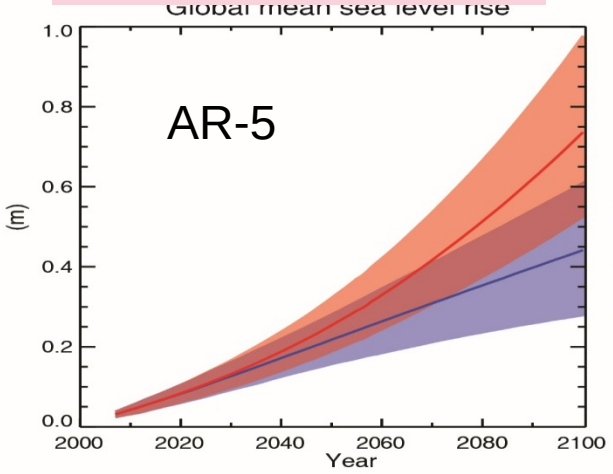
Accommodation space

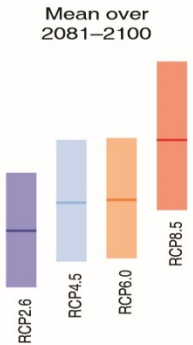


Accommodation space & coastal adaptation **(Catalan coast)**



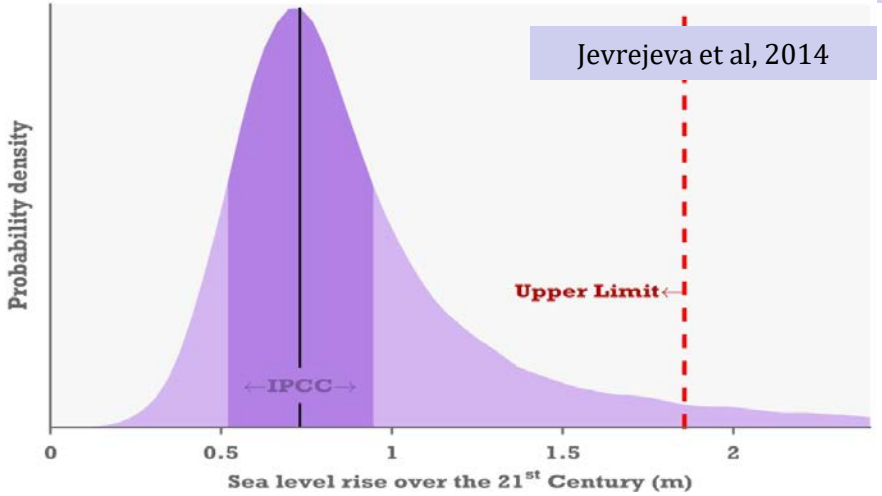




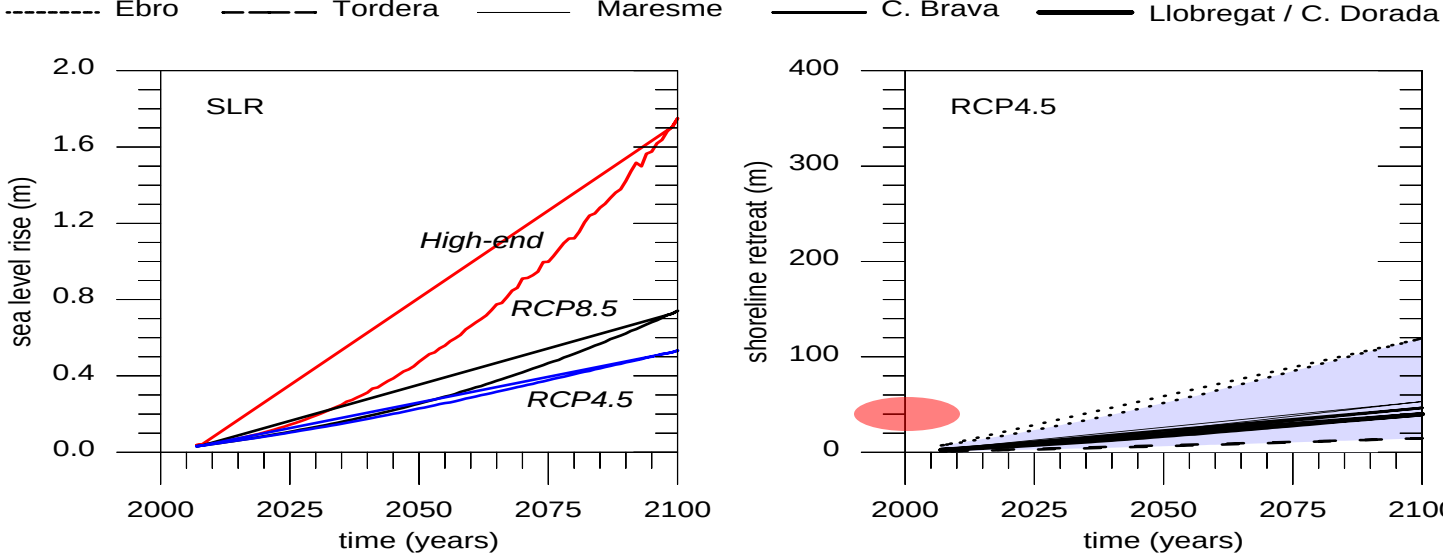


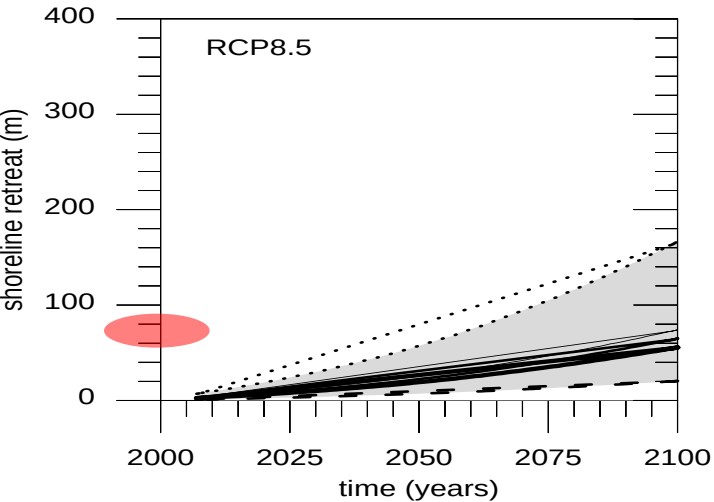
Future climate projections
Global SLR + subsidence ↑

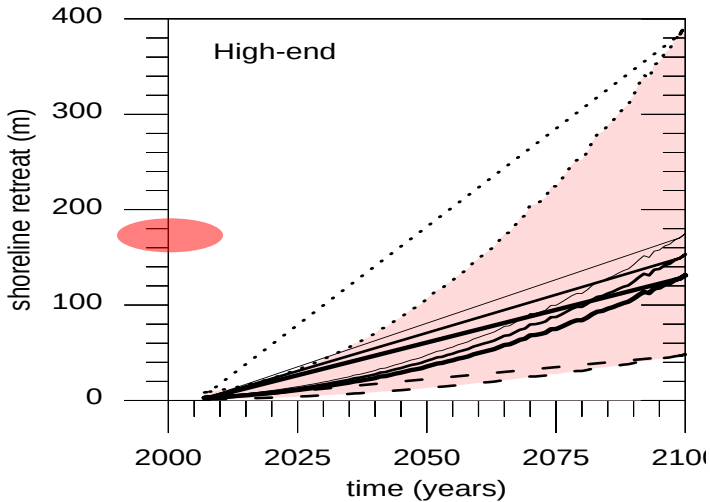
Upper limit (95%, RCP8.5), 1.8m



(IPCC, 2013)







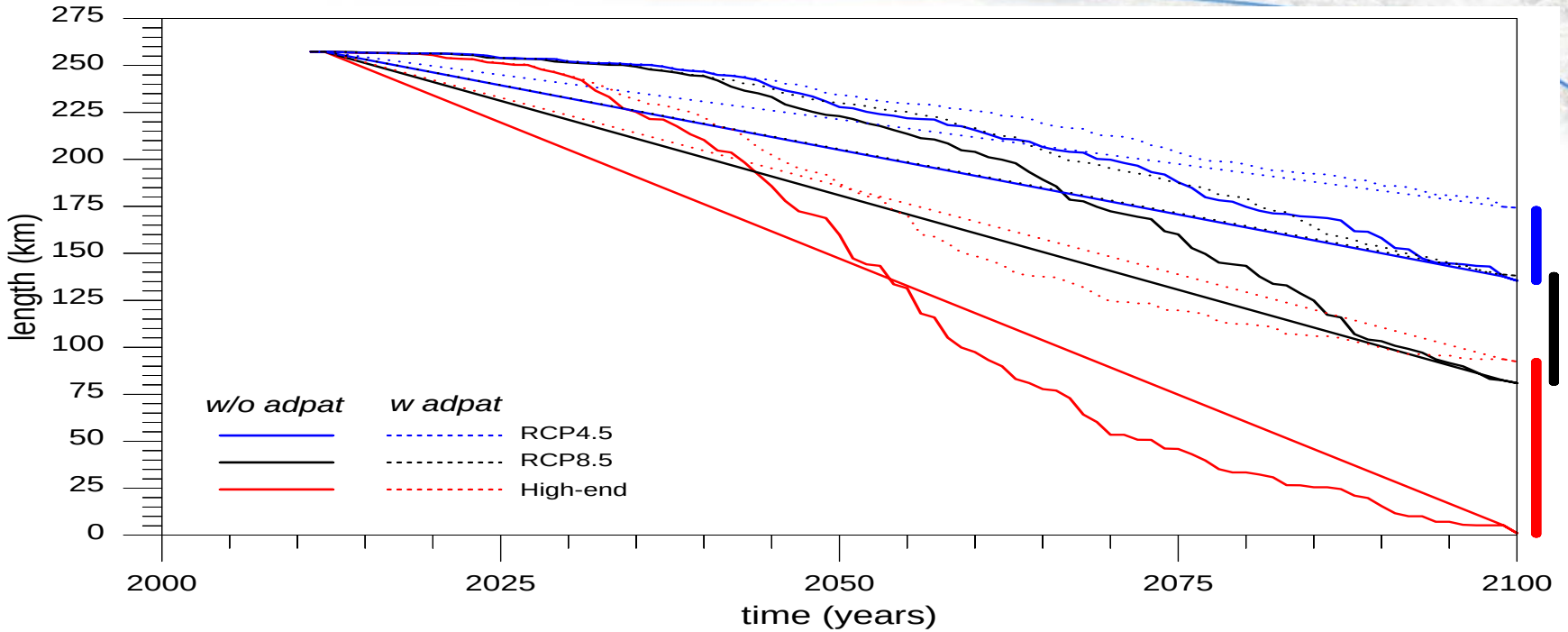
RISES-AM-
EU Research Project

SLR scenarios

RCP 4.5, 8.5 &
High End= 1.8m

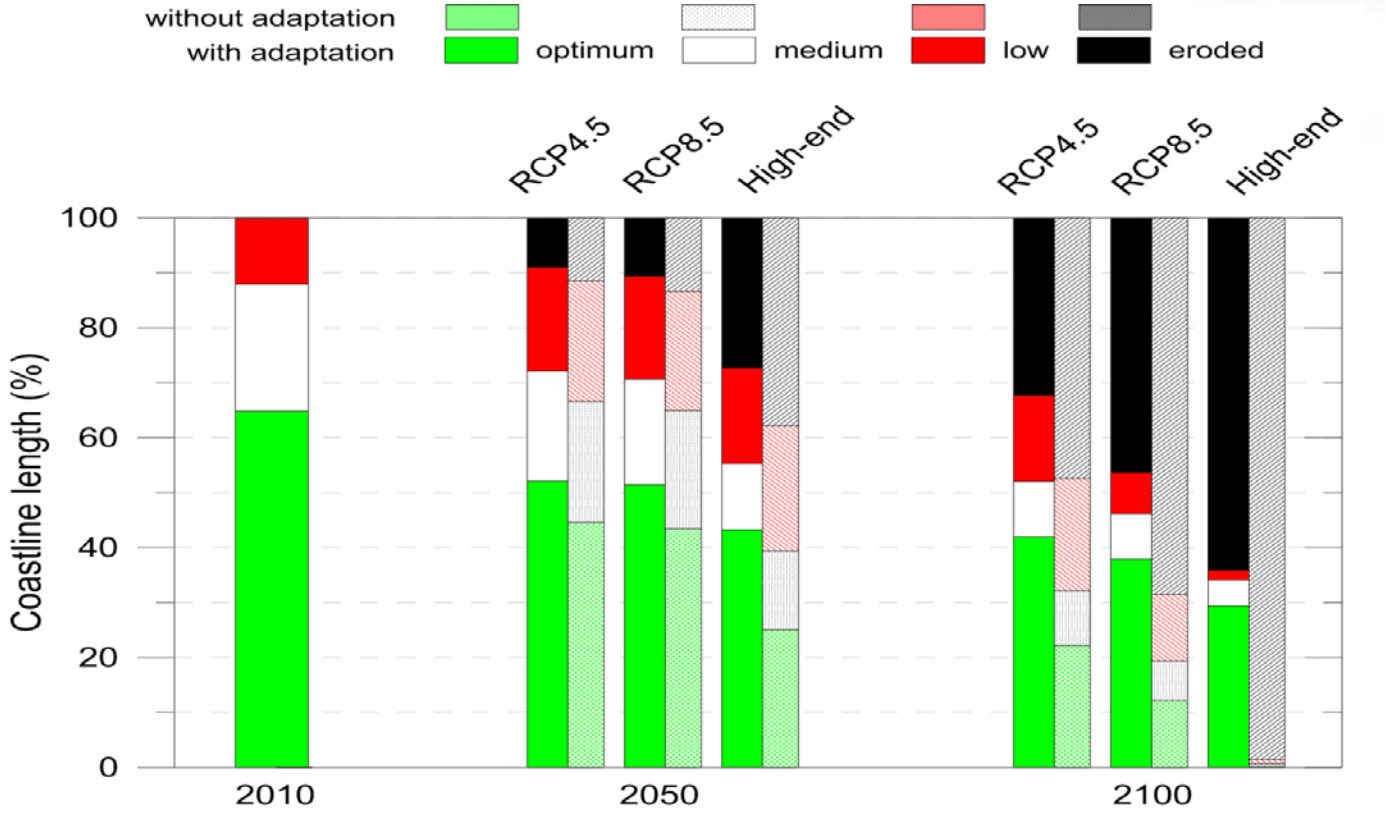
RSLR shoreline retreat

- Cat coast sectors (Ebro delta)
- Bruun's rule (o-o-m for RSLR with adapt. space)
- No variation in river Q_{solid} (≈ 0 now Cat rivers)



Catalan coast **total beach length**: **decreases** with t due to **SLR** scenarios
With/out availability of accommodation space

Jiménez et al. 2017. *Regional Env Change*, 17, 593–603



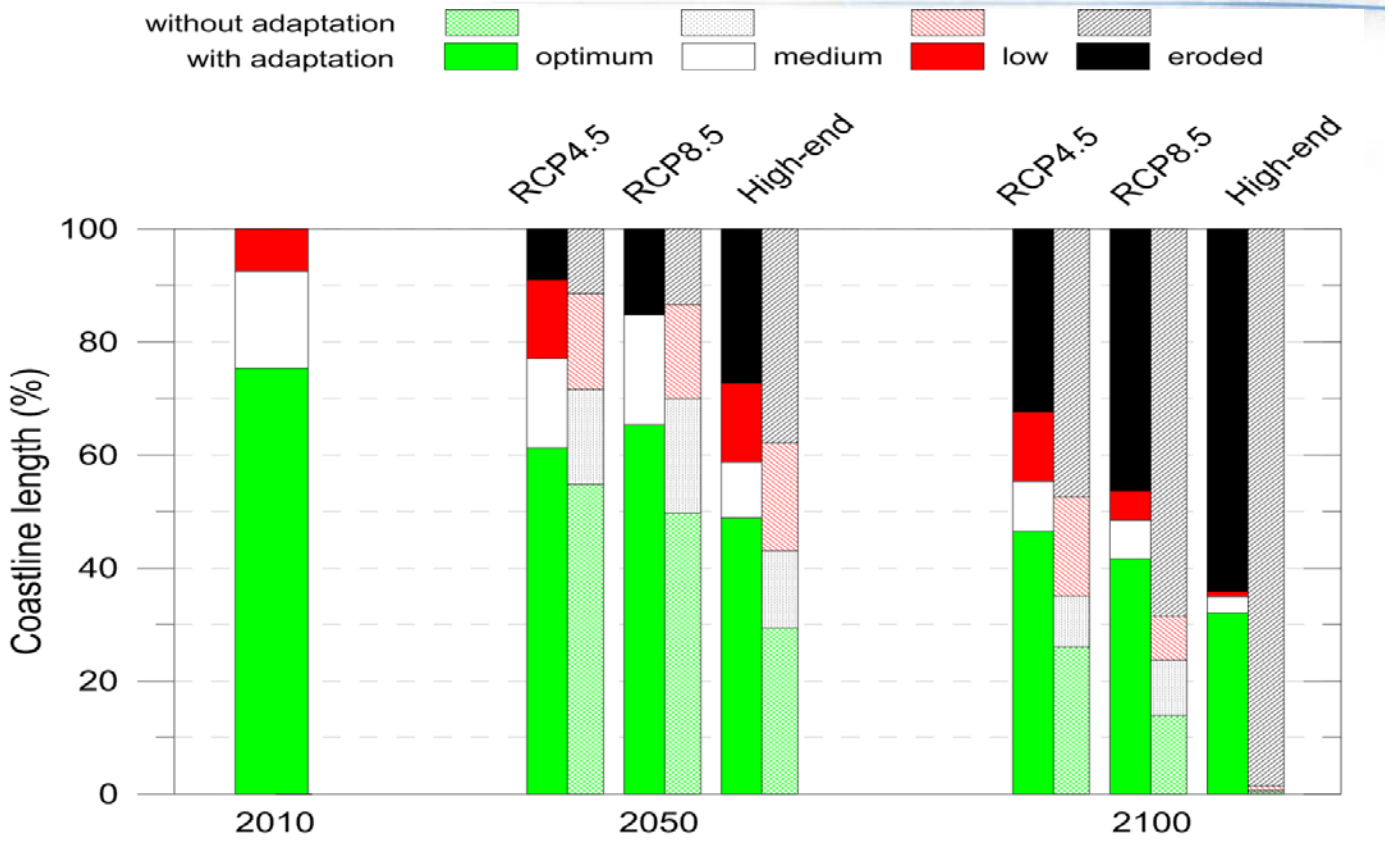
Evolution of beach **recreation** function

Length (%) vs

- Quality level
- RCP scenario
- Time

(eroded: % of beach length disappeared)

Jiménez et al. 2017. *Regional Env Change*



Evolution of beach **protection** function

Length (%) vs

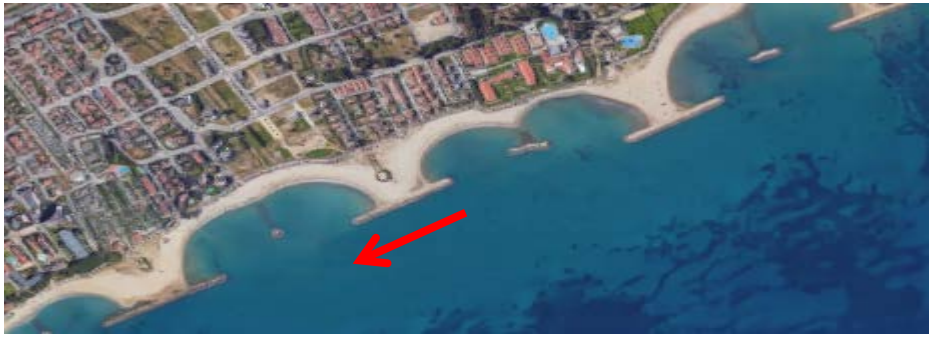
- Quality level
- RCP scenario
- Time

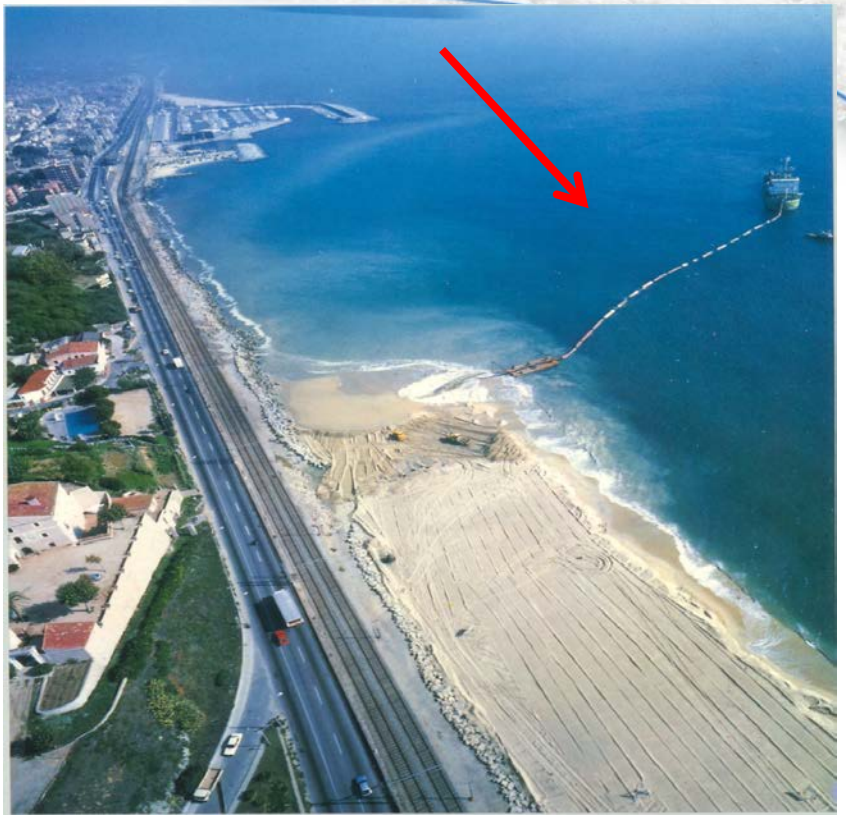
(eroded: % of beach length disappeared)

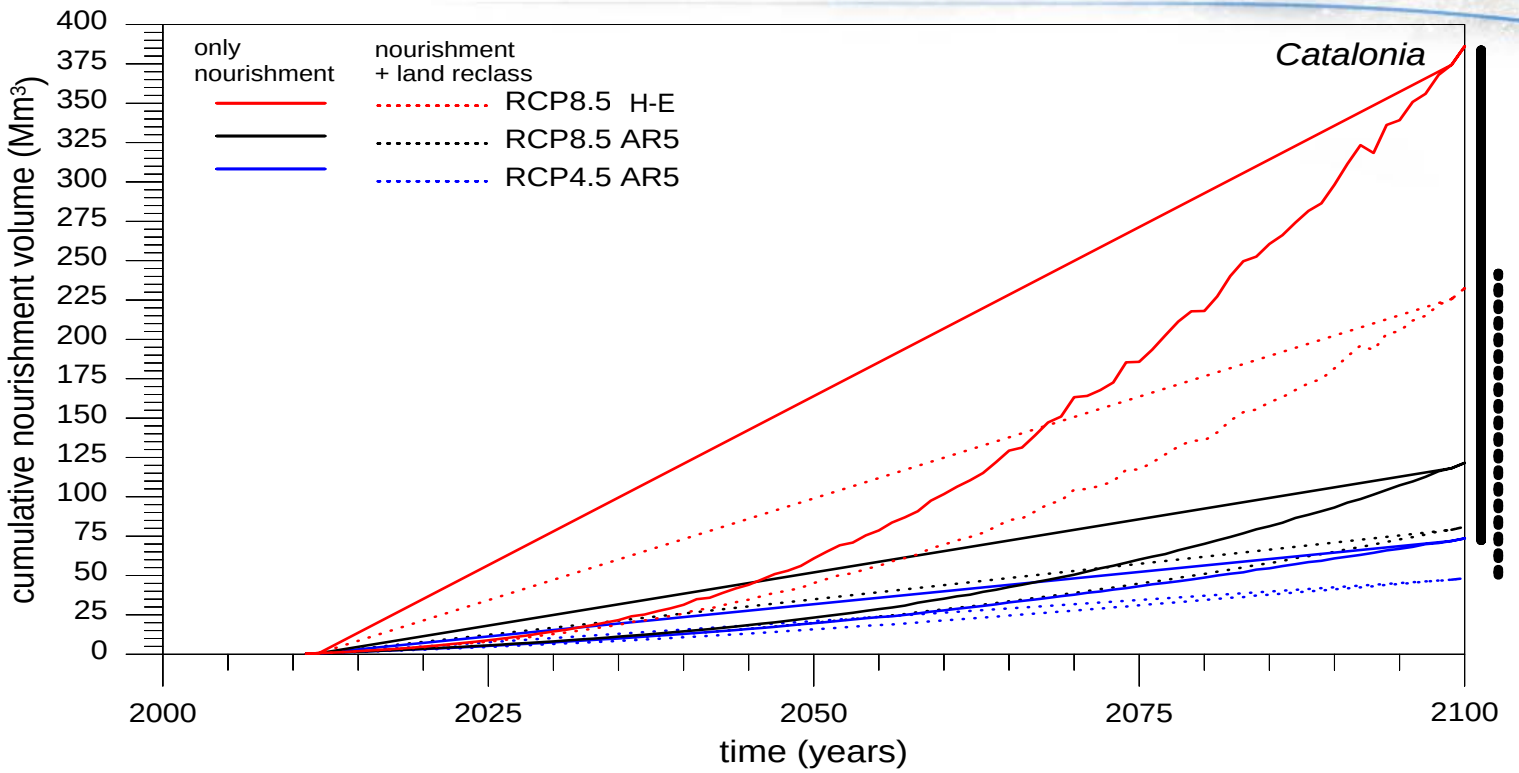
Jiménez et al. 2017. *Regional Env Change*

Fan of current measures

- **Beach nourishment**
- **Coastal structures**
- Setback zones
- Spatial planning
- Relocation







Sand volume to compensate SLR-erosion (Cat coast)

vs

Time / Scenario (CC)

W/o accom. Space (managed retreat)

Accommodation space results in less nourished volume

Fan of future measures

- Beach nourishment / Coastal structures / Setback zones (public domain)
- **Land planning** (relocation) / Recovering **flexibility (novel interventions)**

Recovering flexibility: deconstruction of urban area into salt marshes (Pletera)
Illustrating flooding (January 2017) that provides sediment inputs

2014 (before)

2017 (after)

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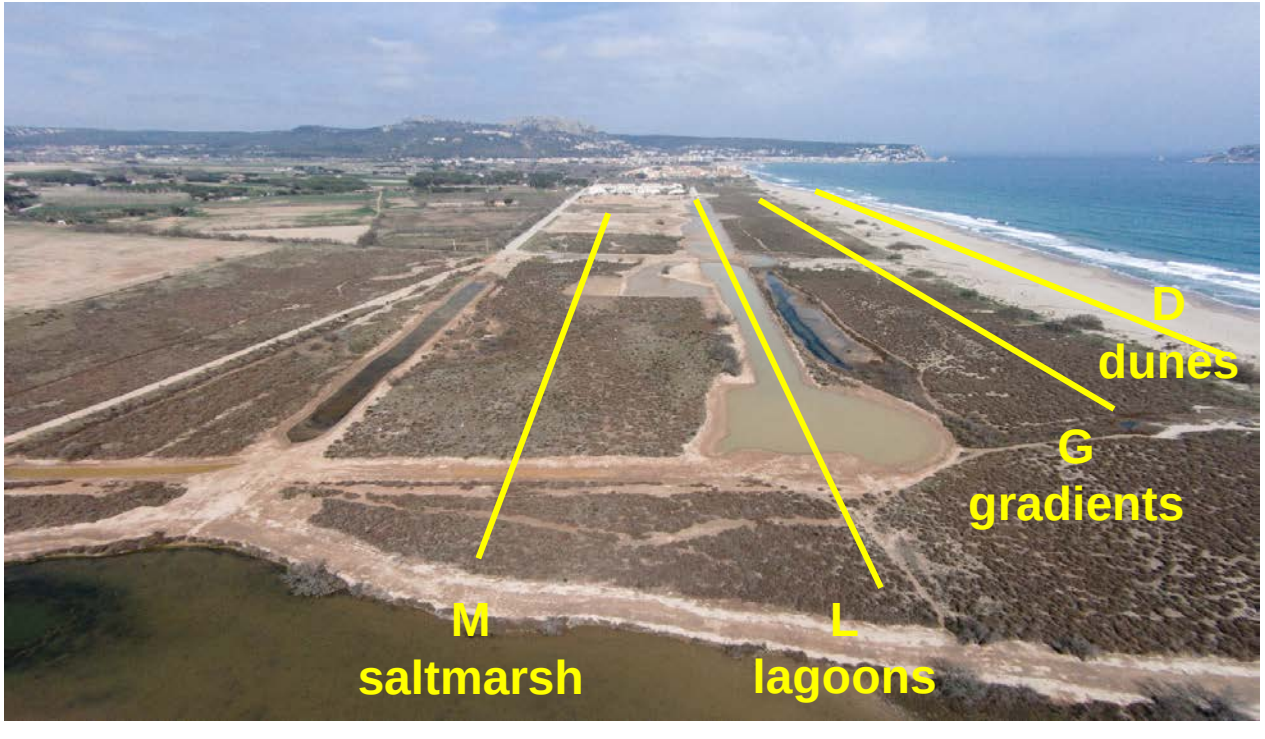
Natural sand overwash due to storm event December 2008

Sand covered paths & vegetation

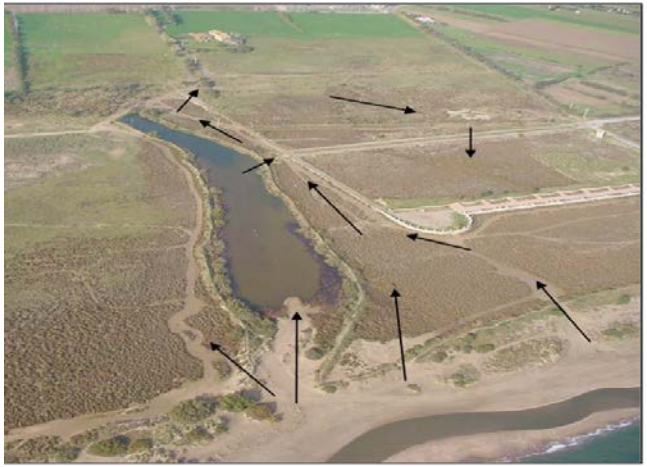
Natura 2000 area to be rigidized

Saltmarsh **rewilding**: recovery of natural functions
Design based on shore parallel bands
(Nature based pattern due to relict water courses/dunes)

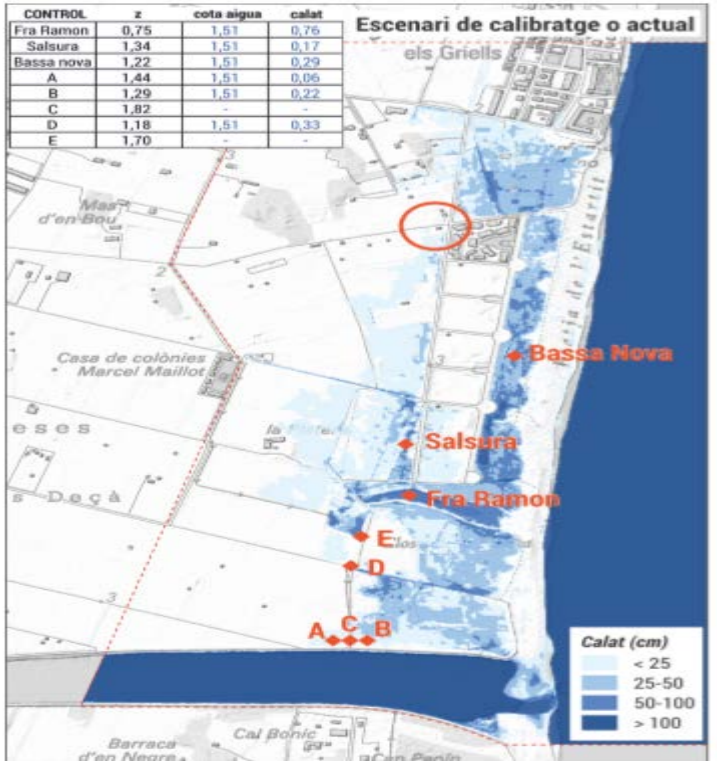


Distributed fluxes after **rewilding**

- 0.25m reduction of flood level
- 250m reduction of overwash penetration inland



Concentrated fluxes for urbanised area (before)



Modelling of sea inundation after deconstruction of La Pletera (after)

Conclusions

- Accommodation space reduces vulnerability
- Benefits of maintaining active coasts
- Assessment with recreation / protection functions
- Higher risks for rigidized coasts
- Feasibility of rewilding / ↑ sustainability
- Policy implications (POLICY BOOKLET)

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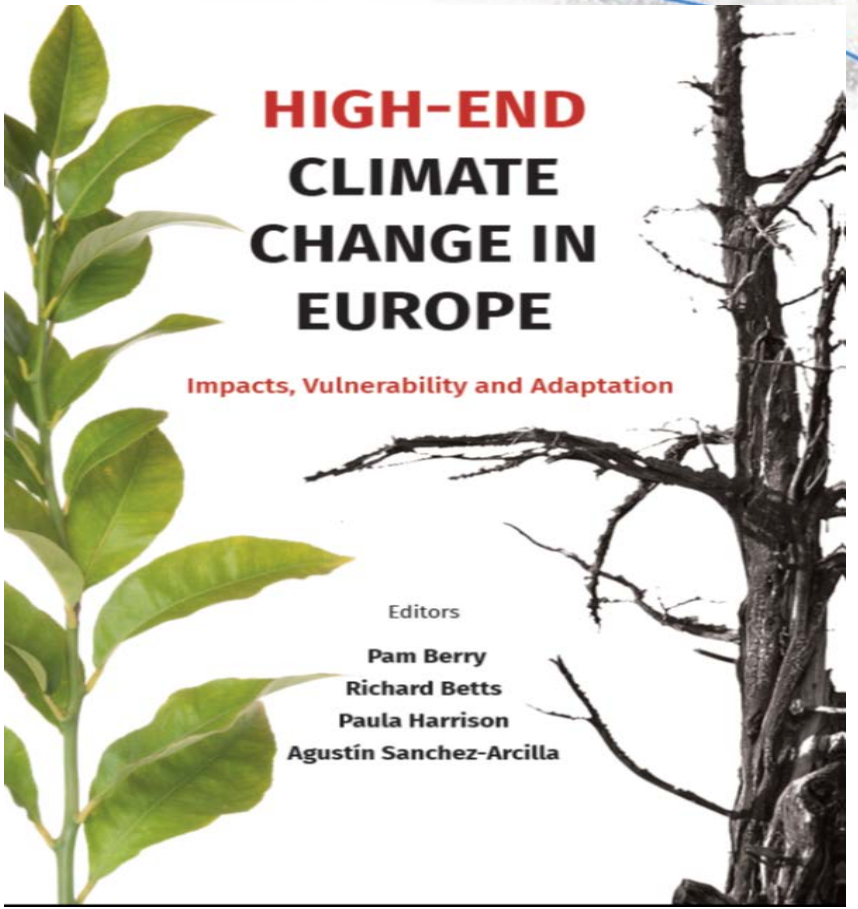
High End Climate Change Policy Booklet



IMPRESSIONS
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