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


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

Active vs non-active coasts to SLR

CAT COAST
L ~ 280 km

Accommodation space
Accommodation space & coastal adaptation (Catalan coast)

**Hinterland** provides accommodation space
Adaptation capacity ↑
Shoreline retreat – beach rebuilding

**Hinterland** without accommodation space (human-induced)
Adaptation capacity ↓↓↓
Shoreline rigidization – beach disappears
Future climate projections
Global SLR + subsidence ↑

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

(Jevrejeva et al, 2014)

(IPCC, 2013)
SLR scenarios

RCP 4.5, 8.5 & High End = 1.8 m

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
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)
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
Sand covered paths & vegetation

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)
High End Climate Change Policy Booklet
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