Governance of adaptation to sea-level rise: towards transaction-cost economics framework

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Outline

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Transaction cost economics
TCE of coastal adaptation
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Introduction

Governing adaptation to sea-level rise

Climate change is *very likely* to bringing more frequent coastal flooding, due to SLR (IPCC WGII AR5).

Adaptation in densely populated coastal zones will generally be cost-efficient over mid to long-time scales (Hinkel et al. 2014)

Yet many coastal zones are under-protected (Wong et al. 2014)

Current literature identifies barriers:

- Large up-front investment costs, e.g., global coastal adaptation costs ca. 70 Billion USD annually by 2020.
- Long time horizons of benefits
- Public good characteristics of benefits, e.g collective flood protection measures

Public actors:

- budgets are constrained with high levels of public debt (Europe);
- capacity for infrastrcture investment limited (developing countries)

Governing adaptation to sea-level rise (2)

Governance is the “effort to craft order and thereby mitigate conflicts and realise mutual gains” (Williamson 1996)

Research question:
What governance structures are best ‘fit’ to enable coastal protection investment, overcoming finance costs and revenue risks?

Alternative governance structures are available:
→ Public: Government agencies, state-owned enterprises
→ Public-private partnerships
→ Private: firms, co-operatives

Different theories address their effectiveness:
- Public finance
- Public-Private Partnership literature (Engel 2014)
- Transaction cost economics (TCE) (Williamson 1985);

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Explaining coastal adaptation governance

TCE: Explaining governance

TCE based on the principle of **discriminating alignment**:

Governance structures 'fit' the *properties of transactions* within a given *institutional environment* to economise on transaction costs.

Key transaction properties:
- Asset specificity: redeployability of assets needed for transaction for other uses
- Frequency
- Uncertainty

TCE is has been fruitfully applied to several closely related domains:
- analysis of network infrastructure provision (Levy and Spiller, 1994),
  → high asset specificity
- urban planning and development sector (Alexander, 2001).
- hardly applied to analyse coastal protection

TCE has been developed in industrial organisation:
→ Nature-relation transactions and commons literature provides additional properties
→ Exclubility, rivalry and heterogeneity (Ostrom 1990)
→ Modularity/interconnectivity (Hagedorn 2008)

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Transaction Property	Meaning in coastal protection	Generic / specific	Indication on GS
Asset specificity	Redeployability of coastal protection investments for other uses	G	High favors public
Uncertainty	Knowledge of costs and benefits of coastal protection investments	G	High favors public
Frequency	Occurrences of coastal protection investments over a given time period	S	High favors private
Heterogeneity	Distribution of flood risk exposure amongst coastal communities	S	High favors public
Modularity	Spill-over of coastal protection measure	S	High favors private

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Case

Pevensey Bay (UK): PPP

At Pevensey Bay,
- 9km stretch on the south-east coast of UK
- around 17,000 property owners Ramsar wetland
- are protected from flooding by a shingle bank

PPP contract between Environment Agency and Penvensey Coastal Defence, consortium of 4 construction and dredging companies, to provide coastal protection from 2000 to 2025 with a value 30 Million GBP

The PPP contract requires PCD:
- provide protection against any flood event up to 1 in 400 year return period.
- supply 20,000 m^3 of shingle to beach annually; the total volume of shingle distributed over the 9km of coastline (2M.m3) and minimum width of the shingle bank at its crest (22m).
- The monthly payments of the contract depends on these objectives being met.

Risk allocation of PPP:
- PCD accepts sediment supply risk.
- Considered acceptable because other sources of sediment are available; techniques for accessing sediment are improving; and the PCD main shareholder is a dredging contractor (Sutherland and Thomas 2011)

Case	Transaction properties				Governance structure	Effective-ness
	Frequency	Uncertainty	Modularity	Hetero-geneity		
Peven-sey	-	-	+++	+	PPP	High
…						

+/- indicates influences on governance costs

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Discussion

- TCE provides a materialist-realist framework to understand appropriate governance arrangements
  → modularity (i.e. physical geograpy of coastal protection)
  → Frequency (i.e. type of measure)
  are key in determining appropriate governance structure.

- Need a more detailed refinement of governance arrangments
  → Effectiveness of PPPs depends on competencies of private partners
  → regulated privatisation will be common, particularly in urban development; how to associate transaction costs to policy instruments?

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Conclusions and outlook

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Conclusions

Integrate institutional environment dimension

- Level of private investment depends on institutional endowments of a country (Levy and Spiller 1994):
  - legislative and executive institutions;
  - an independent and functioning judiciary;
  - informal norms and culture;
  - social interests/conflicts including ideology;
  - administrative capacity.

Integrate finance dimension:

- Financing costs differ by entity, e.g. public/private, and modality → how to assess trade-offs between finance costs and transaction costs

Integrate temporal dimension

- different risks through various phases of the development process, e.g. construction risks in early stages, versus revenue risks in late stages

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Outlook

GREEN-WIN: Green growth and win-win strategies for sustainable climate action (H2020)

WP5: Coastal flood risk management

www.green-win-project.eu

twitter: @greenwinproject

Thanks for your attention.

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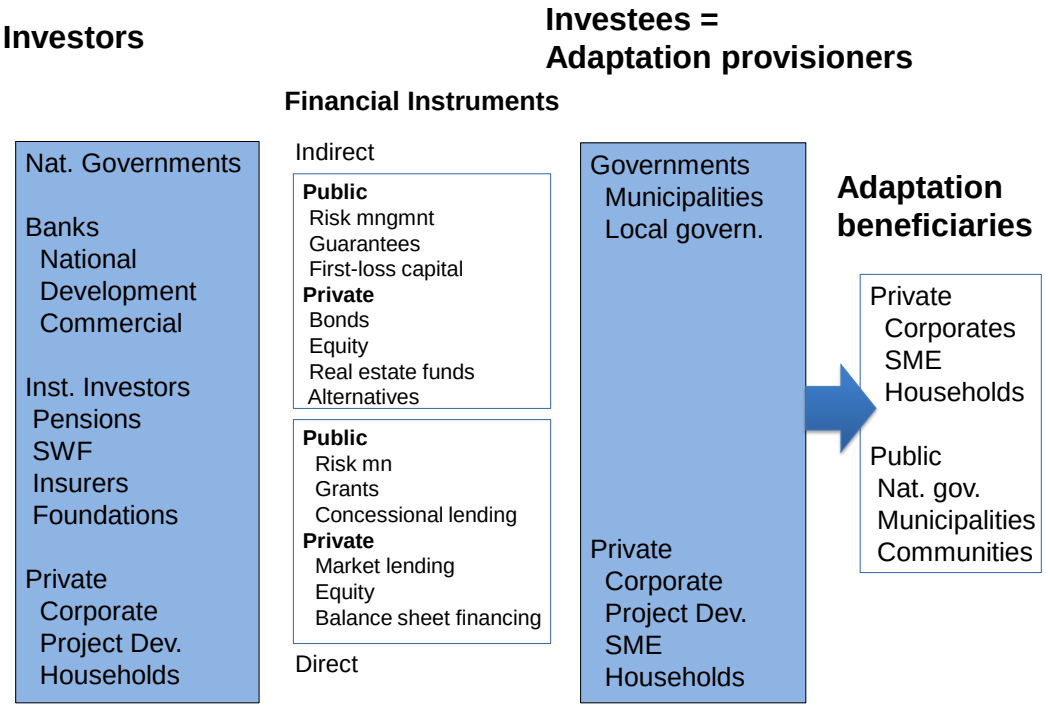

Adaptation finance to date

Current adaptation projects:
- Funded from public sources or sources not seeking significant ROI.
- Largely disaster relief rather than pro-active investment in adaptation/resilience

Examples consist of:
- small scale pilots funded by government grants or specialized multilateral financing mechanisms

Similar to public/philanthropic funded conservation domain, where environmental benefits often externalities for the investors involved:

i) existing projects not set up with same focus on return/impact maximization and replication as traditional business models

ii) monetary and environmental benefits not sufficiently identified or standardised;

→ Presents challenges to attracting private finance (both profit or ESG motivated).

TCE reasoning: explaining the coastal adaptation finance gap

Coastal adaptation often involves large-scale infrastructure, such as, sea-walls or beach nourishment and natural habitat solutions:

- economics of scale: the average unit cost of protection decreases with quantity
- high asset specificity: i.e. assets needed to produce sea-walls cannot be redeployed for other uses
- low excludability of benefits

Asset specificity:

- entails higher debt financing costs because ***non-redeployable collateral is less valuable*** the deployable collateral, all else being equal.
- debt financing preferred when projects are simple and involve assets which are easily redeployed.
- Equity is better suited to projects for which assets have low redeployability.
- Equity entails the establishment of a board for monitoring purposes, which may be cost effective.

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Public-private partnership literature

PPP literature focusing on infrastructure provisioning, e.g. roads, public transit systems

→ distinguishes for key characteristics for determining the appropriateness of PPP for infrastructure provisioning (Engel et al., 2014).

- economies of scale: low
- excludability: high
- fee possibilities: high
- quality contractible: high

How can we apply extended TCE to identify promising opportunities of developing coastal protection PPPs?

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HafenCity: privatisation of coastal protection

Private finance involved:

- through land sales were made to private developers and the proceeds were used to fund infrastructure in the project.
- Second, private developers than invested in building development on land they had purchased. Through regulation private developers were made responsible for building in flood protection for the buildings on the sites they purchased.
- For instance, a developer who has bought the right to build in the Speicherstadt, outside the city dikes, and must raise the structure to 8m above sea-level by plinths made of mounds of compacted fill