

Societal view and adaptation

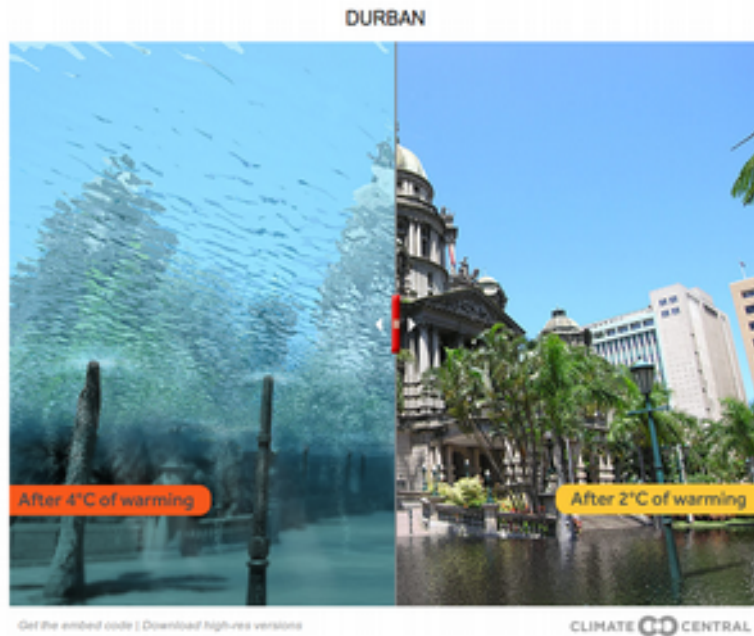
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Global Climate Forum (GCF), Berlin

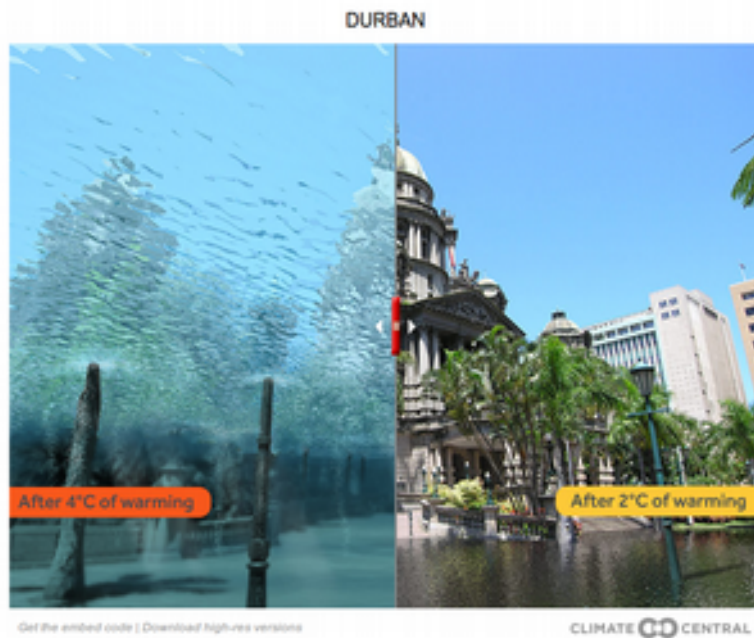
Division of Resource Economics and
Berlin Workshop in Institutional Analysis of Social-Ecological Systems
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**European Climate Research Alliance
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Can societies adapt to
21st century sea-level rise?



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RISES-AM-
EU Research Project



**GREEN
WIN**

What constrains adaptation?

- Technological limit
 - No adaptation options are available today to reach a given adaptation goal.
- Economic barrier
 - Adaptation constitutes a net monetary loss (Net present value of all options <0).
- Financing barrier
 - It is difficult or impossible to access financial resources (e.g., public finance, concessional loans, capital market).
- Social conflict
 - Stakeholders' conflicting interest impede or exacerbate adaptation.

Maldives

Malé

1.5m above mean sea-levels



Hulhumalé

2.1m above mean sea-levels

1997



2002



2004



2013

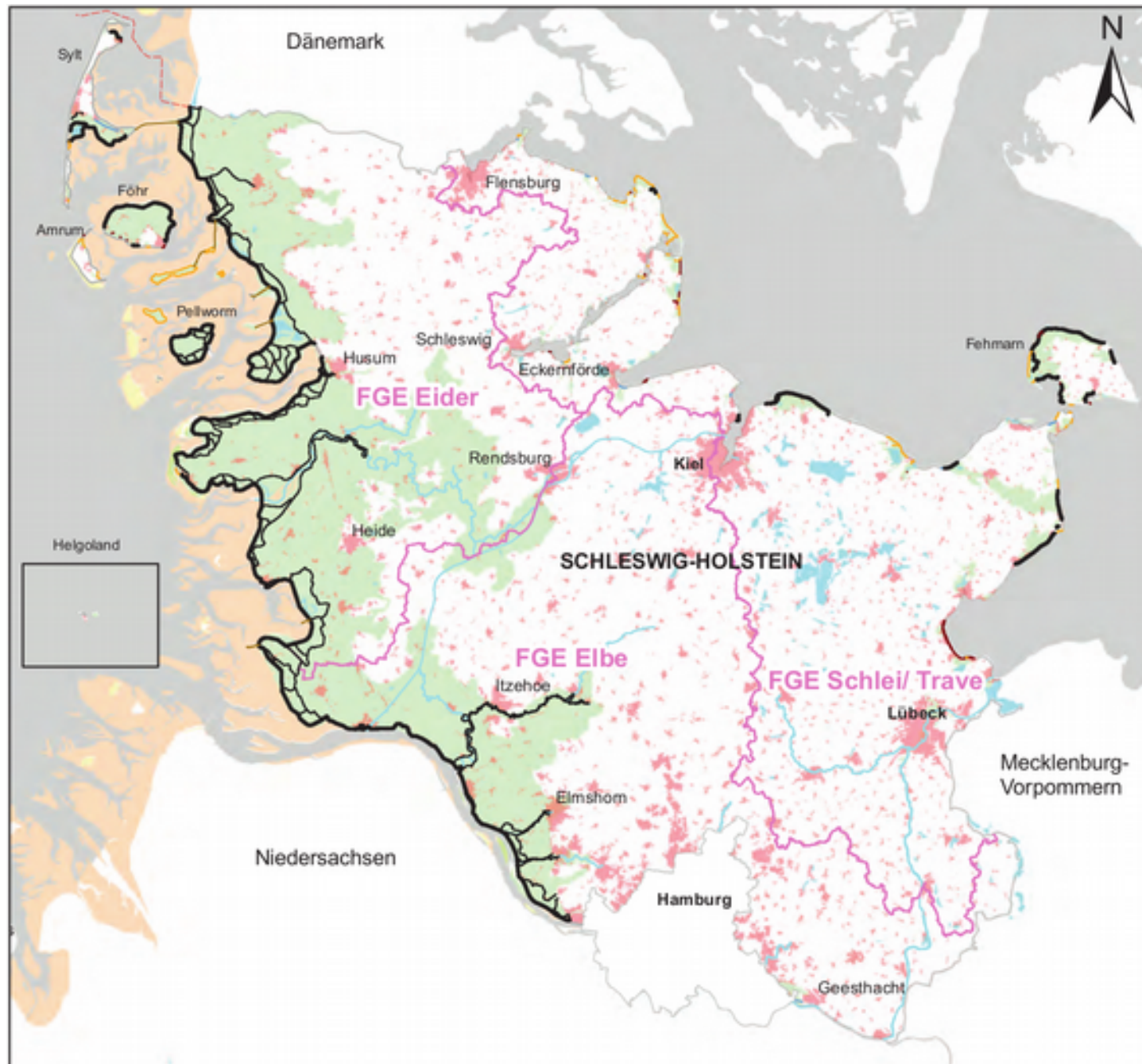


Limits and barriers

- Technological limits: None
- Economic barriers: None
 - Costs: Land claim about US\$ 30 per m²
 - Costs: Infrastructure about US\$ 100 per m²
 - Benefits: Real-estate prices are about US\$ 2,000 per m²
- Financing barriers: None
 - Booming economy, GDP growth averages around 10% since the 80ies
- Social conflict: centre versus periphery
 - Centre aims at concentrating population (National population consolidation policy and safer island strategy)

Baltic-coast of Schleswig-Holstein

Schleswig-Holstein



State dikes
(State of
Schleswig-Holstein)

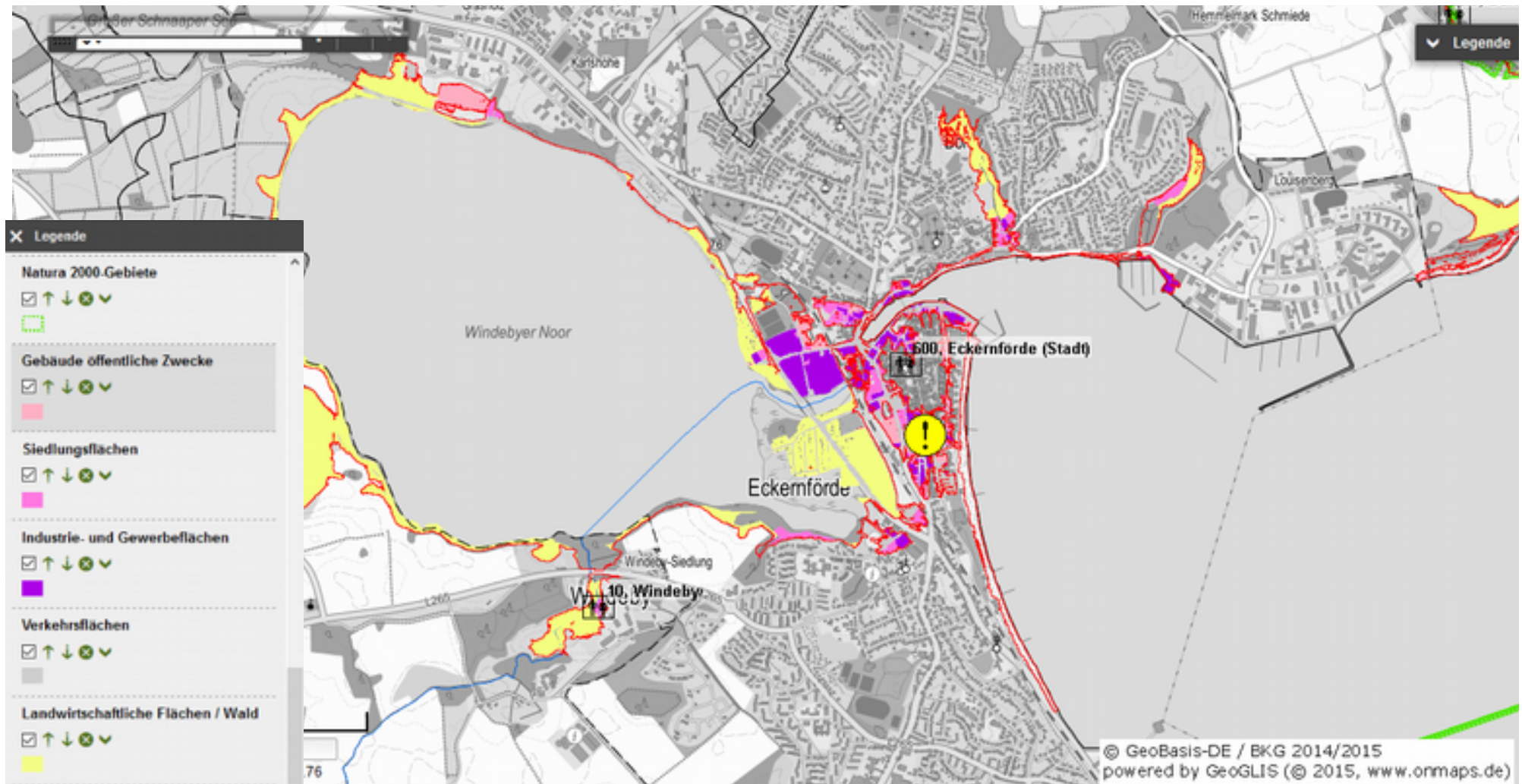


Regional dikes
(Water & soil
associations)



MELUR (2012). Generalplan
Küstenschutz des Landes
Schleswig-Holstein

Eckernförde



Limits and barriers

- Technological limits: None
- Economic barriers: Some
 - Engineering challenges due to specific coastal settings
 - Protecting agricultural land is not economically viable.
- Financing barriers
 - Municipalities can not self-finance dike construction & upgrades
 - Rely on state support
- Social conflicts
 - Conflicting local interest: tourism and harbour access

Other cases

Other cases

Case	Adaptation goal	Options considered	Technological limits	Economic barriers	Financing barriers	Social conflicts
Liverpool/Mersey	Reduce flood risk <i>in situ</i>	Tidal barrage, tidal lagoons	No	Yes	No	Yes
Danube delta	Maintain wetlands	Planting reeds, artificial reefs	No	Some	Yes	Yes
Catalan coast	Maintain beaches and tourism	Beach nourishment	No	No	No	No
	Reduce erosion damage to land	Beach nourishment, artificial dunes, protection structures, managed retreat	No	Yes	Yes	Yes
	Reduce sea-level rise damage to ports	Break waters, covered with vegetation	No	No	Yes	Yes
Ebro delta	Maintain rice production	Dikes, land raising, segmentation of drainage and irrigation networks	No	Yes	Yes	Some
Hamburg	Reduce flood risk <i>in situ</i>	Dikes, sea-walls, retention areas	No	N/a	No	Yes
Maldives (Hulhumale)	Reduce flood risk <i>in situ</i>	Flood warning system, beach nourishment, sea-walls, pumps & drainage, land raising	No	No	Yes	Some
Ho Chi Min City	Reduce flood risk <i>in situ</i>	Dike rings, land raising and flood-proofing buildings	No	No	Yes	Yes
Croatia	Reduce flood risk	Dikes, set-back zones	No	Some	Yes	Yes
Aveiro (Portugal)	Maintain land threatened by erosion	Nourishment	No	Yes	Yes	No
The Netherlands	Maintain land threatened by erosion	Nourishment	No	No	No	No
Global flood risk	Reduce flood risk	Dikes, managed retreat	No	No	Some	Yes
Mediterranean	Reduce flood risk	Dikes, set-back zones, flood-proofing buildings	No	No	Some	Yes
European Union flood risk	Reduce flood risk	Dikes	No	No	Some	Yes

Hinkel et al., forthcoming

Conclusion

Can societies adapt to 21st century sea-level rise?

- Coastal adaptation is generally not constrained by a lack of technology.
- For the major part of the global population, coastal adaptation is not constrained economically.
 - 85% according to the global analysis, confirmed by the cases
- Coastal adaptation is frequently constrained by inaccessible finance, even when benefit-cost ratios are high.
 - High up-front investment, long-term stochastic benefits
- Social conflicts are present in almost all cases.
 - Coastal adaptation projects and sea-level rise massively redistribute risks and benefits: There are winners & losers!

Bifurcation of coastal futures

- Urban rich areas
 - Fully engineered coasts, following the model of The Netherlands
 - Cities behind higher and higher dikes, with possible catastrophic consequences in the case of dike failure
- Rural poor areas
 - Retreat: managed, unmanaged or even catastrophic form
 - Massive social conflict: Compensation? Or protect & support via transfer payments? Who is going to pay?

Research needs (1)

- Need for empirical social science research
 - Most barriers to adaptation are of social nature
- Not “end of pipe” social science
 - “We need the social science to bring the results of biophysical sciences to decision makers”
- Not vulnerability assessments
 - “Vulnerability as a link between science and society”
- Specific questions
 - How do actors perceive and construct environmental issues?
 - How are collective decisions/policies made? What are the motivations, power structures and interests involved?
 - Biophysical science results may or may not play a role in this.

Research needs (2)

- Research on the equity dimension of coastal impacts and adaptation
- Research on overcoming social conflicts
 - What kind of governance arrangements can help to solve coastal conflicts?
 - Which kind of financial arrangements can bridge the gap between high up-front costs and stochastic benefits in the far future?
 - E.g., green bonds, PPPs, etc.

Many Thanks!

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- Hinkel, J., C. C. Jaeger, R. J. Nicholls, J. Lowe, O. Renn, and S. Peijun (2015). **Sea-level rise scenarios and coastal risk management**. In: **Nature Climate Change** 5.
- Hinkel, J., D. Lincke, A. T. Vafeidis, M. Perrette, R. J. Nicholls, R. S. J. Tol, B. Marzeion, X. Fettweis, C. Ionescu, and A. Levermann (2014a). **Coastal flood damage and adaptation cost under 21st century sea-level rise**. In: **PNAS** 111.9, 3292—3297.
- Bisaro, A. and J. Hinkel (forthcoming). **Financial arrangements for coastal adaptation**.
- Hinkel et al. (forthcoming). **Limits and barriers to coastal adaptation**.