

I don't know, are you sure you want to do this?

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² **Abstract.** ...

1. Introduction

2. Sea level projections (PG)

2.1. Limitations of the sea level projections

3. Decision tools (KdB, MD, TT)

3.1. Timing of adaptation measures

We consider adaptation decision making related to the timing of proactive adaptation measures. That is, the goal is to adapt to sea level rise before major damages occur. In a cost-benefit framework, an investment should be delayed as long as the benefits of delay (avoided investment costs) are greater than the associated costs (higher climate change damages) [Fankhauser *et al.*, 1999].

Fankhauser *et al.* [1999] describe a deterministic framework where an adaptation investment of C^0 now (at time $n = 0$) leads to unmitigated damage of d_0^0 in period 0, and a stream of partially mitigated damages d_t^0 in periods $t = 1, 2, \dots$. If r is the discount rate, the net present value damage, D^0 , associated with this investment is

$$D^0 = C^0 + d_0^0 + \frac{d_1^0}{1+r} + \frac{d_2^0}{(1+r)^2} + \dots$$

In comparison, postponing the adaptation investment to time period $n = 1$ would lead to unmitigated damages in periods 0 and 1, and partially mitigated damages, d_t^1 , thereafter. The delay would be preferable if

$$C^0 - \frac{C^1}{(1+r)} > (d_0^1 - d_0^0) + \frac{d_1^1 - d_1^0}{1+r} + \frac{d_2^1 - d_2^0}{(1+r)^2} + \dots$$

Here, the expression on the left describes the benefits of the delay while the expression on the right describes the cost of the delay. In the simplest case, there is no change in investment costs ($C^0 = C^1 = C$) and the delay has no lasting effects beyond period 1 ($d_t^1 = d_t^0$ for $t > 1$). In this case, the comparison is between the expected return r earned on the capital while implementation is delayed and one additional time period of unmitigated damage,

$$rC > d_1^1 - d_1^0.$$

3.2. Limitations of the decision framework

4. Case studies

4.1. Data (PG)

4.2. Timing of adaptation measures (KdB, TT)

A case study focusing on and comparing different cities in Norway.

4.3. Selection of adaptation measures(?) (MD)

A case study focusing on Denmark.

5. Conclusions

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References

- 32 Fankhauser, S., J. B. Smith, and R. S. J. Tol (1999), Weathering climate change: some
33 simple rules to guide adaptation decisions, *Ecological Economics*, *30*, 67–78.
- 34 Robert, C. P., and G. Casella (2004), *Monte Carlo Statistical Methods*, 2nd ed., Springer,
35 New York.
- 36 Rue, H., S. Martino, and N. Chopin (2009), Approximate Bayesian Inference for Latent
37 Gaussian Models Using Integrated Nested Laplace Approximations (with Discussion),
38 *Journal of the Royal Statistical Society, Series B*, *71*, 319–392.