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# The role of discounting in socio-economic analysis and CO2 damage cost estimation

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This paper analyses how the theory on discounting and valuation of CO2 damage costs can be made operational and be implemented in the socioeconomic assessment of energy projects.

Three central problems in discounting are identified:

- Problem 1: Intergenerational and geographic inequality
- Problem 2: Non-substitutability of natural capital
- Problem 3: Uncertainty

Using a literature survey (Stern (2007), Azar (1999), Johansson-Stenman (2005), Sterner og Persson (2008), Cropper and Laibson (1999), Fisher and Narain, (2003), Dietz (2006) and others), the impact of these issues on the CO2 damage costs are quantified. We find that CO2 damage costs can be 5-8 times higher than the current market price for CO2-quotas; however, the damage is possibly still underestimated, since no study takes account of all three problems, but only takes account of one problem at a time.

Furthermore, the discount rate used for discounting when making cost benefit analyses of entire energy projects (the "outside" discount rate) is less significant than the discount rate used when defining the CO2 damage costs entering the cost-benefit analysis (the "inside" discount rate).

Research is still needed to combine the three central problems in one CO2 damage cost estimate.

## References:

Azar C. (1999). *Weight Factors in Cost-Benefit Analysis of Climate Change*. Environmental and Resource Economics 13, 249–268

Cropper, M. & Laibson, D. (1999). *The implications of hyperbolic discounting for project evaluation*. in: Portney P. R. and Weyant J. P. *Discounting and intergenerational equity*. Washington, D.C.: Resources for the Future.

Dietz, S. et al. (2006). *On Discounting Non-Marginal Policy Decisions and Cost-Benefit Analysis of Climate-Change Policy*.

Fisher A. & Narain, U. (2003). *Global warming, endogenous risk, and irreversibility*.

Environmental and Resource Economics 25, 395-416.

Johansson-Stenman, O. (2005). *Distributional Weights in Cost-Benefit Analysis—Should We Forget about Them?* Land Economics 81 (3), 337-352

Stern, N. (2007). *The Economics of Climate Change : The Stern Review*. Cambridge University Press.

Stern, T. & Persson, U. M. (2008). *An even sterner review: Introducing relative prices into the discounting debate*. Review of Environmental Economics and Policy 2(1), 61-76.

Tol, R.S.J. (2005). *The marginal damage costs of carbon-dioxide emissions*. Energy Policy 33, 2064-2074.