

Sabine Fuss

Mercator Research Institute
on Global Commons and
Climate Change
Torgauer Str. 12 – 15
10829 Berlin, Germany
fuss@mcc-berlin.net
+49 (0) 30 338 5537 246



Employment History

Head of working group "Resources & International Trade"

Mercator Research Institute on Global Commons and Climate Change, Berlin
April 2013 - current

The mission of MCC is to advance research on the opportunities and challenges of sustainable economic growth in a resource and carbon-constrained world, with a particular focus on avoiding dangerous climate change. By conducting topical assessment reports in close cooperation with international partner institutions, the MCC aims to promote deliberative communication and decision-making at the interface between science, policy and society.

Research Scholar at the Ecosystems Services and Management Program

International Institute for Applied Systems Analysis, Laxenburg, Austria
September 2007 – April 2013

Founded in 1972, the International Institute for Applied Systems Analysis (IIASA) conducts policy-oriented research into problems of a global nature that are too large or too complex to be solved by a single country or academic discipline. Responsibilities at the ESM Program included build-up and leadership of a research group focusing on economic modeling and uncertainty analysis, raising funding (national, international, EU) and networking, project management (Principal Investigator of 9 projects by 2013), student supervision (7 PhD students during duration of employment), service on committees and conference/workshop organization.

Key Achievements:

- Building up a research group and conducting research in economic modeling/uncertainty analysis leading to more than 25 peer-reviewed publications.
- Successful supervision of 7 students
- Successful in acquiring and managing projects, mostly under the 7th Framework Program

Research Scholar at the Forestry Program

International Institute for Applied Systems Analysis, Laxenburg, Austria
November 2006 – December 2006

See above for institute description. Responsibilities were research-focused. The project was supposed to develop an integrated framework combining the strengths of real options theory and portfolio selection and apply it to investment in the context of energy-generating capacity.

Education

Key Achievements:

- Publication of a working paper and later a peer-reviewed article, see list of selected publications.

Junior Researcher (Assistant in Onderzoek) at the Economics Faculty

University of Maastricht, Maastricht, The Netherlands

September 2003 – September 2007

The section of the Department of Economics at the University of Maastricht worked at focuses on topics in Macroeconomics, Monetary Economics, Labor Economics, Education, International Economics, Innovation and Growth, and Economic Policy. Responsibilities were both in research and teaching, where teaching involved tutoring methods based on small-scale groups and intensive learning.

Key Achievements:

- Research: decision-making under uncertainty with special focus on applications of tools from finance (option pricing, portfolio selection, etc.) to optimal investment planning in the electricity sector.
- Teaching: undergraduate and graduate courses in macroeconomics and microeconomics (economic growth, international trade and international relations).

PhD Defense

University of Maastricht, Maastricht, The Netherlands

April 2008

Young Scientist Summer Program

International Institute for Applied Systems Analysis, Laxenburg, Austria

June – August 2006

Ph.D. candidate

Thesis topic: 'Sustainable Energy Development under Uncertainty'

University of Maastricht /UNU-MERIT, The Netherlands

September 2003 – September 2007

M.Sc. in Economics

Thesis topic: 'Technical Change in the Electricity Sector: Optimum Portfolios in a Vintage Framework'

University of Maastricht, The Netherlands

August 2003

Education Abroad Program

University of California, Santa Barbara

Fall/winter 2002

Doctoral Education

- 09/2003-09/2007 - NAKE diploma (Network of General and Quantitative Economics, see www.nake.nl)
- 08/2005 - METEOR (Maastricht Research School of Economics of Technology and Organizations) PhD training with macroeconomics, microeconomics and econometrics courses (special courses in Bayesian modeling, overlapping generations models, economic growth, environmental economics and evolutionary economics).

Computer Skills

- MS Office, Matlab, GAMS, Mathematica, LATEX

Languages

- German (native)
- English (fluent)
- Dutch (good)
- French (good)
- Spanish (good)

Research Interests

- Natural resource management, energy and agricultural economics (bioenergy, land use implications)
- Decision-making under uncertainty: portfolio selection, real options theory, stochastic optimization, robustness.
- Integrated assessment with focus on climate change mitigation and adaptation (also the role of: international trade, negative emission options, other technologies)
- Reconciling top-down and bottom-up assessments, science-policy nexus
- Mechanisms for carbon management, climate-compatible development, architecture of climate agreements
- Socio-economic benefit assessment (e.g. of Earth Observation, value of information)

Selected Publications

Swart, R., Fuss, S., Obersteiner, M., Ruti, P., Teichmann, C., Vautard, R. (2013). Beyond vulnerability assessment. *Nature Climate Change* 3:942–943.

Sanders, M., Fuss, S., Engelen, P.J. (2013). Mobilizing private funds for carbon capture and storage: An exploratory field study in the Netherlands. *International Journal of Greenhouse Gas Control* [in press]: <http://dx.doi.org/10.1016/j.ijggc.2013.09.015>.

Kraxner, F., Nordström, E., Havlík, P., Gusti, M., Mosnier, A., Frank, S., Valin, H., Fritz, S., Fuss, S., Kindermann, G., McCallum, I., Khabarov, N., Böttcher, H., See, L., Aoki, K., Schmid, E., Máthe, L., Obersteiner, M. (2013). Global bioenergy scenarios - Future forest development, land-use implications, and trade-offs. *Biomass and Bioenergy*, dx.doi.org/10.1016/j.biombioe.2013.02.003 [in press].

Svadlenak-Gomez, K., Walzer, C., Badura, M., Kraxner, F., Fuss, S. (2013). Valuing Alpine ecosystems: the recharge.green project will help decision-makers to reconcile renewable energy production and biodiversity conservation in the Alps; *Journal on Protected Mountain Areas Research* 05/2013; DOI:10.1553/ecomont-5-1s59.

Fuss S, Reuter WH, Szolgayova J, Obersteiner M. (2013). Optimal mitigation strategies with negative emission technologies and carbon sinks under uncertainty, *Climatic Change* [in press] ([Published online 25 January 2013](#)), DOI:10.1007/s10584-012-0676-1.

Absar, S.M., Fuss, S., Reuter, W.H. (2012). Investment in Water-Saving Irrigation Options under Uncertainties - A Comparative Analysis. IIASA Interim Report IR-12-017, International Institute for Applied Systems Analysis, Laxenburg, Austria.

Kraxner F, Aoki K, Leduc S, Kindermann G, Fuss S, Yang J, Yamagata Y, Tak K, Obersteiner M (2012). BECCS in South Korea - Analyzing the negative emissions potential of bioenergy as a mitigation tool, *Renewable Energy* [in

press] ([Published online 25 December 2012](#)).

- Heumesser C, Fuss S, Szolgayova J, Strauss F, Schmid E (2012). Investment in irrigation systems under precipitation uncertainty, *Water Resources Management*, 26(11):3113-3137.
- Seebach L, McCallum I, Fritz S, Kindermann G, Leduc S, Bottcher H, Fuss S (2012). Choice of forest map has implications for policy analysis: A case study on the EU biofuel target, *Environmental Science & Policy*, 22:13-24.
- Lemoine DM, Fuss S, Szolgayova J, Obersteiner M, Kammen DM (2012). The influence of negative emission technologies and technology policies on the optimal climate mitigation portfolio, *Climatic Change*, 113(2):141-162.
- Reuter WH, Szolgayova J, Fuss S, Obersteiner M (2012). Renewable energy investment: Policy and market impacts, *Applied Energy*, 97:249-254.
- Reuter WH, Fuss S, Szolgayova J, Obersteiner M (2012). Investment in wind power and pumped storage in a real options model, *Renewable and Sustainable Energy Reviews*, 16(4):2242-2248.
- Szolgayova J, Fuss S, Khabarov N, Obersteiner M (2012). Robust energy portfolios under climate policy and socioeconomic uncertainty, *Environmental Modeling and Assessment*, 17(1-2):39-49.
- Fuss S, Szolgayova J, Khabarov N, Obersteiner M (2012). Renewables and climate change mitigation: Irreversible energy investment under uncertainty and portfolio effects, *Energy Policy*, 40:59-68.
- Fritz S, Fuss S, Havlik P, Szolgayova J, McCallum I, Obersteiner M, See L (2012). The value of determining global land cover for assessing climate change mitigation options, In: *The Value of Information: Methodological Frontiers and New Applications in Environment and Health*, R Laxminarayan, MK Macauley (eds) Springer, Dordrecht, Netherlands pp.193-230.
- Strauss F, Heumesser C, Fuss S, Szolgayova J, Schmid E (2011). Optimal irrigation management strategies under weather uncertainty and risk, *Journal of the Austrian Society of Agricultural Economics*, 20(2):45-54.
- Szolgayova J, Fuss S, Khabarov N, Obersteiner M (2011). A dynamic CVaR-portfolio approach using real options: An application to energy investments, *European Transactions on Electrical Power*, 21(6):1825-1841.
- Fuss S, Szolgayova J, Golub A, Obersteiner M (2011). Options on low-cost abatement and investment in the energy sector: New perspectives on REDD, *Environment and Development Economics*, 16(4):507-525.
- Kuik O, Fuss S (2011). Renewables in the energy market: A financial-technological analysis considering risk and policy options, In: *Financial Aspects in Energy: A European Perspective*, A Dorsman, W Westerman, MB Karan, O Arslan (eds) Springer, Heidelberg, Germany pp.33-50.
- Fuss S (2011). The value of information: Applications in the field of land-use, In: *Socio-Economic Benefits from the Use of Earth Observation: Report from the international workshop*, M.T. Borzacchiello, M. Craglia (eds) 11-13 July 2011, JRC - Joint Research Centre, Ispra, Italy.
- Fuss S, Gusti M, Kraxner F, Aoki K, Szolgayova J (2011). Boreal forests as a carbon sink: A real options perspective, In: *Boreal Forests in a Changing World: Challenges and Needs for Action. Proceedings of the international conference IBFRA*, Sukachev Institute of Forest SB RAS, 15-21 August 2011, Krasnoyarsk, Russia.
- Fuss S, Havlik P, Szolgayova J, Obersteiner M (2011). A stochastic analysis of biofuel policies, In: *Energy Solutions for a Sustainable World - Proceedings of the Third International Conference on Applied Energy (ICEA2011)*, U. Desideri, J. Yan (eds) 16-18 May 2011, Perugia, Italy.
- Reuter W-H, Szolgayova J, Fuss S, Obersteiner M (2011). Renewable energy investment: Policy and market impacts, In: *Energy Solutions for a Sustainable World - Proceedings of the Third International Conference on Applied Energy (ICAE2011)*, U. Desideri, J. Yan (eds) 16-18 May 2011, Perugia, Italy.

- Reuter W-H, Fuss S, Szolgayova J, Obersteiner M (2011). Investment in wind power & pumped storage in a Real Options Model - A policy analysis, In: *Proceedings of the World Renewable Energy Congress 2011 - Sweden*, 8-13 May 2011, Linköping, Sweden (3 November 2011).
- Fuss S, Szolgayova J (2010). Fuel price and technological uncertainty in a real options model for electricity planning, *Applied Energy*, 87(9):2938-2944.
- Zhou W, Zhu B, Fuss S, Szolgayova J, Obersteiner M, Fei W (2010). Uncertainty modeling of CCS investment strategy in China's power sector, *Applied Energy*, 87(7):2392-2400.
- Fuss S (2010). Forestry carbon sequestration: Alternative perspective, In: *Smart Solutions to Climate Change: Comparing Costs and Benefits*, B. Lomborg (ed.) Cambridge University Press, Cambridge, UK pp.133-141.
- Ortiz-Moctezuma MB, Pivovarchuk D, Szolgayova J, Fuss S (2010). Development of transportation infrastructure in the context of economic growth, In: *Dynamic Systems, Economic Growth, and the Environment*, J. Crespo Cuaresma, T. Palokangas, A. Tarasyev (eds) Springer-Verlag, Heidelberg, Germany pp.259-289.
- McCallum I, Fritz S, Khabarov N, Fuss S, Szolgayova J, Rydzak F, Havlik P, Kraxner F, Obersteiner M, Aoki K et al. (2010). Identifying and quantifying the benefits Of GEOSS, *Earthzine*, posted on 12 July 2010 in Articles, Earth Observation, Economy, GEOSS/ICEO News.
- Szolgayova J, Fuss S, Khabarov N, Obersteiner M (2010). Robust long-term energy portfolios - A climate mitigation analysis, *Proceedings of the International Conference on Applied Energy (ICAE 2010)*, 21-23 April 2010, Singapore, pp.782-793.
- Lemoine DM, Fuss S, Szolgayova J, Obersteiner M (2010). Abatement, R&D policies, and negative emission technology in climate mitigation strategies, In: *Proceedings of the 3rd International Workshop on Uncertainty in Greenhouse Gas Inventories*, 22-24 September 2010, Lviv, Ukraine pp.149-158.
- Fuss S, Johansson DJA, Szolgayova J, Obersteiner M (2009). Impact of climate policy uncertainty on the adoption of electricity generating technologies, *Energy Policy*, 37(2):733-743.
- Fuss S, Khabarov N, Szolgayova J, Obersteiner M (2009). The effects of climate policy on the energy technology mix: An integrated CVaR and Real Options Approach. In: *Modeling Environment - Improving Technological Innovations under Uncertainty*, A. Golub and A. Markandya (eds) Routledge, London, UK.
- Fuss S (2009). [A Perspective Paper on Forestry Carbon Sequestration as a Response to Climate Change](#), Copenhagen Consensus Center, Frederiksberg, Denmark.
- Szolgayova J, Fuss S, Khabarov N, Obersteiner M (2009). A dynamic CVaR-portfolio approach using real options: An application to energy investments, In: *Proceedings of the 6th International Conference on the European Energy Market (EEM 2009)*, 27-29 May 2009, Leuven, Belgium.
- Fuss S, Khabarov N, Szolgayova J, Obersteiner M (2009). Valuing climate change uncertainty reductions for robust energy portfolios, *Proceedings from the 33rd International Symposium on Remote Sensing of Environment (ISRSE-33) "Sustaining the Millennium Development Goals"*, 4-8 May 2009, Stresa, Italy.
- Szolgayova J, Obersteiner M, Fuss S (2009). Optimal forest management with stochastic prices & endogenous fire risk, *Proceedings from the 33rd International Symposium on Remote Sensing of Environment (ISRSE-33) "Sustaining the Millennium Development Goals"*, 4-8 May 2009, Stresa, Italy.
- Fuss S, Szolgayova J, Obersteiner M (2008). A real options approach to satellite mission planning, *Space Policy*, 24(4):199-207.
- Szolgayova J, Fuss S, Obersteiner M (2008). Assessing the effects of CO2 price caps on electricity investments - A real options analysis, *Energy Policy*,

36(10):3974-3981 .

Fortin I, Fuss S, Hlouskova J, Khabarov N, Obersteiner M, Szolgayova J (2008). An integrated CVaR and real options approach to investments in the energy sector, *The Journal of Energy Markets*, 1(2):61-85.

Fuss S, Szolgayova J, Obersteiner M, Gusti M (2008). Investment under market and climate policy uncertainty, *Applied Energy*, 85(8):708-721.

van Zon A, Fuss S (2008). Risk, embodied technical change and irreversible investment decisions in UK electricity production: An optimum technology portfolio approach, In: *Analytical Methods for Energy Diversity and Security*, M. Bazilian, F. Roques (eds) Elsevier BV, Amsterdam, Netherlands pp.275-302.

Ortiz-Moctezuma MB, Pivovarchuk D, Szolgayova J, Fuss S (2008). Development of Transportation Infrastructure in the Context of Economic Growth, IIASA Interim Report IR-08-045.

Fortin I, Fuss S, Hlouskova J, Khabarov N, Obersteiner M, Szolgayova J (2007). An Integrated CVaR and Real Options Approach to Investments in the Energy Sector, In: *Economic Series #209*, Institute for Higher Studies, Vienna, Austria.

Recent Selected Presentations

19 June 2013 "A geographically explicit analysis of BECCS potential in Indonesia" at the International Energy Workshop, International Energy Agency, Paris, France, 19-20 June 2013.

13 June 2013 "Negative Emissions Potential for BECCS" at the IIASA-IEA-USP Workshop on Bio-energy & CCS (BECCS): Options for Brazil, University of São Paulo, Brazil, 13-14 June 2013.

28 May 2013 "Forests in the mitigation portfolio of a changing world" at the Global Forest Carbon Working Group's Workshop "Future of Global Forests", IIASA, Laxenburg, Austria, 27-29 May 2013.

18 March 2013 "Bioenergy Combined with Carbon Capture and Storage – Joining Top-Down and Bottom-Up Research to Address Policy Questions" at *NIES-IGES-IIASA Workshop*, National Institute for Environmental Studies, Tsukuba, Japan.

13-14 March 2013 "Urban Growth Strategies Under Uncertainty" at *Global Carbon Project Workshop on Linking Climate Compatible Urban Development Resilience*, hosted by Asian Institute of Technology, Bangkok, Thailand.

04 December 2012 "[REDD+BECCS: Challenges, Opportunities, Co-Benefits](#)" at *Side Event by IIASA, IEA and Indonesia's REDD+ Task Force, COP18*, Doha, Qatar.

24 October 2012 "[Food Security in an Uncertain World](#)" at *IIASA's 40th Anniversary Conference*, International Institute for Applied Systems Analysis, Vienna Hofburg, Austria.

21-24 September 2012 "BECCS Status & Gaps" at *Bioenergy, CCS and BECCS: Options for Indonesia Workshop*, Jakarta, Indonesia.

18-21 June 2012 "Bioenergy in mitigation portfolios: the role of uncertainty" at *International Energy Workshop*, University of Cape Town, South Africa.

25-29 March 2012 "Design of Bioenergy Mandates under Food Security Constraints" at *Planet under Pressure*, London, UK.

23-24 February 2012 "Agricultural Price Volatility under Climate Change The Impact of Multiple Objectives on Commodity Prices" at *123rd EAAE Seminar*, Dublin, Ireland.

24-27 January 2012 "Introduction to the Value of Information & Portfolio

Applications to Mitigation Strategies” at *Final EUROGEOSS Conference 2012*, at CSCI, Madrid, Spain.

29-31 August 2011 “Large-Scale Modeling of Global Food Security under Crop Yield Uncertainty” at *EAAE 2011 Congress*, ETH Zurich, Switzerland.

15-21 August 2011 “Boreal Forests as a Carbon Sink: a Real Options Perspective” at *IBFRA Conference*, Krasnoyarsk, Siberia.

11-13 July 2011 “The Value of Information: Applications in the Field of Land-Use” at *Socio-Economic Benefits from the use of Earth Observation Workshop*, Joint Research Centre, Ispra, Italy.

5-9 July 2011 “Large-scale Modeling of Bioenergy Mandates under Volatile Crop Yields” at *International Energy Workshop*, Stanford University, USA.

16-18 May 2011 “Renewable energy investment: Policy and market impacts” at *the Third International Conference on Applied Energy (ICAE2011)*, Perugia, Italy.

8-13 May 2011 “Investment in wind power & pumped storage in a Real Options Model - A policy analysis” at *World Renewable Energy Congress 2011*, Linköping, Sweden.