Chair of Computational Economics | RWTH AACHEN UNIVERSITY

E.ON Energy Research Center | RWTH AACHEN UNIVERSITY

FCN | Institute for Future Energy Consumer Needs and Behavior
Chair of Energy Economics and Management | Prof. Dr. Reinhard Madlener

Lecture and seminar in "Climate risk management and economics" (WS 2020-21)

Prof. Dr. Thomas Lontzek and Prof. Dr. Reinhard Madlener

Description

This interdisciplinary course deals with the economic aspects of climate change and its risks. The first part of the course consists of thematic presentations by the lecturers and discussions. Students will be introduced to climate change and learn to view this phenomenon from different angles – such as economic, technological, sociological, and ecological ones. In the second part, the course is structured like a seminar and deals with more specific topics related to climate change risks – such as catastrophic events, ecosystem conservation, emission scenarios, political uncertainty, multilateral agreements, resource and energy usage, and technological uncertainty – as well as the economics and possible management actions that can be taken. Students will be assigned a topic to work on for the remainder of the course, and tutorials are offered to learn the required skills and how to make use of the theories, concepts, and models applied in the course. Students are expected to present their findings by giving a seminar talk and by writing a seminar paper in the style of a short review article (in the style of e.g. Nature Reviews).

Organization

The date and venue of lectures and tutorials are available on RWTH online as well as in the section "Academics" on the FCN website (www.fcn.eonerc.rwth-aachen.de). Slides and additional material will be provided via the e-Learning platform (Moodle). The seminar with student presentations will take place in the latter part of the course, while the seminar papers will be due by the end of the semester.

November 5th and 12th – Lectures by Prof. Madlener

November 19th and 26th – Lectures by Prof. Lontzek

December 3rd – Tutorial by assistant of Prof. Lontzek

December 10th – Tutorial by assistant of Prof. Madlener

December 17th – Seminar / student presentations (detailed schedule for Dec / Jan to be provided)

Learning goals

- Getting a sound understanding of definitions and concepts characterizing the economics and management of climate risk;
- Being able to clearly illustrate the economic theories and policies presented during the course with the provision of *ad-hoc* examples;
- Being able to take part in interdisciplinary discussions;
- Being able to screen and use the literature on the economics and management of climate risk for your purposes;
- Being able to apply the knowledge gained during the course to the analysis of important and pressing real-world problems.

Lecture Topics

- Introduction to climate change and its risks and uncertainties
- Renewable energy use (incl. biomass co-firing)
- Land use, land use change and forestry (LULUCF)
- Carbon capture and storage (CCS)
- Discounting of damages from climate change

- The economics of climate change ('The Climate Casino')
- Risk management and real options analysis
- Geoengineering: options and risks
- Integrated assessment models (IAMs) of climate and the economy
- Catastrophic events and major tipping points in the climate system

Tutorials

There will be several tutorial sessions for all participants and, if necessary, also individual (group- or theme-specific) tutorials. The following topics shall be covered:

- Operating programming software, e.g., Matlab, Mathematica, Python
- Portfolio optimization (applied to climate change mitigation asset management)
- Real options analysis (applied to climate change mitigation investments)
- Discounting / Stern Report
- LaTeX for seminar papers and presentations
- Academic writing

Target participants

The course is primarily offered for students in the MSc Specialization "Sustainability and Corporations" (related to the School of Business and Economics Research Area "EME – Energy, Mobility, and Environment").

Enrolment to this course is mainly open to master's degree students in business administration, economics, as well as students with a double-degree in economics, industrial engineering, and related fields. The maximum number of students is 25.

In order to know whether you are allowed to take this seminar, please get in touch with your study advisor.

Prerequisites for attending the course: Basic knowledge of Economics and Quantitative Methods.

Recommended reading materials

[1] Nordhaus, William D. *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World*. Yale University Press, 2013.
[2] Wagner, Gernot, and Martin L. Weitzman. *Climate Shock: The Economic Consequences of a Hotter Planet*. Princeton University Press, 2016.
[3] Dixit, Avinash, Pindyck Robert S. *Investment under Uncertainty*, Princeton University Press, Princeton.
[4] Madlener R., Robledo C., Muys B., Blanco Freja J.T. (2006). A Sustainability Framework for Enhancing the Long-Term Success of LULUCF Projects, *Climatic Change*, 75(1-2): 241-271
[5] Rohlfs W., Madlener R. *Challenges in the Evaluation of Ultra-Long-Lived Projects: Risk Premia for Projects with Eternal Returns or Costs*, FCN Working Papers No. 13/2013
[6] Madlener R. (2012), Portfolio Optimization of Power Generation Assets, Ch. 11 in: Q.P. Zheng, S. Rebennack, P.M. Pardalos, M.V.F. Pereira and N.A. Iliadis (Eds.), Handbook of CO_2 in Power Systems Springer-Verlag, Berlin/Heidelberg/New York, pp.275-296. (ISBN 1867-8998)

In general, the most recent IPCC report and several IPCC special reports provide in-depth coverage of the many relevant topics. Students will also receive references to more specific literature covered during classes.

Further information

For questions concerning topics or if you wish to meet Prof. Lontzek, please write an e-mail to Lontzek@econ.rwth-aachen.de. For general info about the Chair of Computational Economics, visit the website (www.econ.rwth-aachen.de).

If you wish to meet Prof. Madlener, please write an e-mail to RMadlener@eonerc.rwth-aachen.de (and check his weekly regular office hour timetable in his personal website). For general info about the Chair of Energy Economics and Management, kindly visit the FCN Website.