THE UNIVERSITY OF TEXAS AT DALLAS

School of Economic, Political and Policy Sciences

Course syllabus

Economics of Climate Change

January 2024 (subject to updates)

Course overview

Course number:	ECON/PPPE/PSCI 6346
Course title:	Economics of Climate Change
Term:	Spring 2025
Meetings:	Thursdays 07:00 pm – 09:45 pm @ JO 4.502
Professor:	Dr. Elías Cisneros
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Office:	GR 3.230

General course information

Course description: Climate change is the biggest global environmental challenge of our time, posing unparalleled threats to the planet's ecosystems, economies, and the well-being of present and future generations. This course utilizes economic perspectives and methodologies to examine issues related to the effects of climate change, climate mitigation policies, and adoption strategies. It provides an overview of the science of climate change, discusses the theoretical models of climate impacts, and reviews the empirical literature on the impacts of climate change and shocks.

Pre-requisites: There are no prerequisites, but it is desirable to have had at least one undergraduate-level economics course and a general understanding of regression analysis.[1] Furthermore, students may need some mathematical and graphical skills to analyze economic problems, but the level of the analytical components of the course will be determined by the background of the enrolled students.

Learning outcomes and objectives The goal of the lecture is to train the critical analysis of empirical papers in the context of Climate Change Economics and to think about empirical research designs in a structured way.

1. Students will deepen their knowledge on the Economics of Climate Change.
2. Students will develop analytical and research skills to critically evaluate empirical research in the context of Climate Change Economics.
3. Students will be able to think about empirical research designs in a structured way.
4. Students will learn to communicate and present research and results in public effectively.
5. Students will be able to plan and conduct collaborative research on the impacts of Climate Change.

[1] For example, any of the following courses would more than cover the basic needs: (a) EPPS 7313 Descriptive and Inferential Statistics, (b) EPPS 7316 Regression and Multivariate Analysis, (c) PPPE 6342 Research Design II.

Texts & materials This is a reading course on the Economics of Climate Change for graduate students (master's and Ph.D.). Based on recently published empirical papers, it investigates various dimensions along which economic, political, climate, and weather shocks interact. Besides discussing the policy implications of the analyzed empirical results, the course will pay special attention to causal identification.

The lecture contains required readings which will be jointly decided on in the first seesion (see details below). During the course, we will focus on the theoretical contributions and the details of empirical strategies and prioritize analytical depth over breadth.

To level the econometric skills, the lecture plan also includes tutorials that introduce and discuss the main econometric methods of causal identification (RCT, RDD, diff-in-diff, IV). In addition, we encourage you to consult the following online material and books that are well-suited for self-study:

- Introductory videos for beginners: Linear Regression (Correlation and Causation, How to interpret Regression Tables), Instrumental Variables (The Logic of Instrumental Variables, Instrumental Variables series), Regression Discontinuity (Regression Discontinuity series (at least videos 1–3), An intuitive introduction to Regression Discontinuity), Difference in Difference / Fixed effects (Difference in Difference)
- More advanced book *(highly recommended)*: Cunningham, S. (2021): *Causal Inference: The Mixtape*. Yale University Press. ISBN 9780300251685, link.
- Book for beginners: Huntington-Klein, N. (2021): *The Effect: An Introduction to Research Design and Causality*, volume 1. New York: Chapman and Hall/CRC. ISBN 9781003226055, link.
- A more standard book providing a very nice overview of general identification issues: Angrist, J. D. and J.-S. Pischke (2008): *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press. ISBN 0691120358.
- From a policy evaluation perspective: Khandker, S. R., G. B. Koolwal, and H. A. Samad (2010): *Handbook on impact evaluation: quantitative methods and practices*. World Bank Publications, link.
- Abadie, A. and M. D. Cattaneo (2018): Econometric methods for program evaluation. *Annual Review of Economics* 10 (1): 465–503, link.

Coding skills: The course requires students to conduct an data analyses. The course will mainly rely on programming in R. To freshen up these skills, students will be invited to a *DataCamp* Group. The following assigned courses must be completed Introduction to R, Foundations of inference in R, Intermediate Regression in R.

Course grading

Details on what is expected for each assignment will be discussed in class. The document *rw_assignment-guidelines.pdf* (on the Box) provides brief descriptions of the assignments and evaluation rubrics.

1. **Participation (15%)**: Students are expected to actively participate in class each week. Students should come into class able to summarize the relevant arguments in the readings for the week while also providing substantive critiques of the theoretical and empirical strategies of the authors.
2. **Academic paper presentation (20%):** Presentation of assigned research paper on a week's topic and leading a discussion.
3. **Mid-term exam (20%):** The mid-term exam will consist of a paper analysis. The exam will take place online via eLearning.
4. **Main assignment (45%)** The grade consists of submitting an *exposé* (research plan) (20% of the total grade) and a *final paper* (25% of the total grade). In single cases, the exposé submission can be substituted by an in-class presentation.
   (a) Master's students:
      i. **Literature review:** Conduct a literature review on a topic related to the topic of the course.
   (b) Ph.D. students:
      i. **Research design proposal:** Develop an empirical research design related to the topic of the course.

Tentative schedule

W	Date	Topics	Assessment/activity
1	01/23	Introduction & Syllabus	Subscribe to class pres., 23:59 pm
2	01/30	Evaluating impacts of CC	
3	02/06	Adaption to CC	
4	02/13	Agriculture	
5	02/20	Growth & labor	
6	02/27	Human capital	
7	03/06	Violence	
8	03/13	Mid-term exam	
–	03/20	*Spring Break*	
9	03/27	Scientific writing & working on main assignment	
10	04/03	Scientific writing & working on main assignment	
11	04/10	Finance	Submit exposé, 23:59 pm
12	04/17	Policy, Politics, and Beh. Change	
13	04/24	Societal acceptance	
14	05/01	European Emissions Trading System	
15	05/08	TBA	Submit final assignment, 23:59 pm

Course outline

Textbooks

Recommended for additional reading:

- Tol, R. (2023): *Climate Economics: Economic Analysis of Climate, Climate Change and Climate Policy.* Edward Elgar Publishing. ISBN 9781802205442, website.
- Barrage, L. and S. Hsiang (Eds.) (2024): *Handbook of the Economics of Climate Change*, volume 1.

Course topics

The first weeks introduce students to the field of climate change economics and the empirical evaluation methods used to analyze climate change impacts. Two to three weeks are reserved for the collaborative research project, which includes a hands-on analysis of climate change impacts. The topics of the remaining weeks will be jointly chosen between students and the instructor. Potential topics and the relevant literature are listed below.
Papers are marked as follows: † Overview papers, ∗ Good empirical papers, § Modeling-based papers, – Not classified. Compulsory literature to read *before* class is marked with the icon 📖 . The icon 🧑‍🏫 marks the papers that are assigned for the *academic paper presentation* assignment.

1. **Introduction**
   - † Tol (2023), Chapter 1.
   - † Hsiang, S. and R. E. Kopp (2018): An economist's guide to climate change science. *The Journal of Economic Perspectives* 32 (4): 3–32.
2. **Evaluating impacts of Climate change (and other empirical methods)**
   - ∗ Hogan, D. and W. Schlenker (2024): Chapter 2 - empirical approaches to climate change impact quantification. volume 1 of *Handbook of the Economics of Climate Change*, pp. 53–111. North-Holland

* 📖 Dell, M., B. F. Jones, and B. A. Olken (2014): What do we learn from the weather? the new climate-economy literature. *Journal of Economic Literature* 52 (3): 740–798

* Hsiang, S. (2016): Climate econometrics. *Annual Review of Resource Economics* 8 (1): 43–75

† Kolstad, C. D. and F. C. Moore (2020): Estimating the economic impacts of climate change using weather observations. *Review of Environmental Economics and Policy* 14 (1): 1–24

3. **Adaption to climate change: Overview**

† Fankhauser, S. (2017): Adaptation to climate change. *Annual Review of Resource Economics* 9 (1): 209–230

† Kahn, M. E. (2016): The climate change adaptation literature. *Review of Environmental Economics and Policy* 10 (1): 166–178

† Massetti, E. and R. Mendelsohn (2018): Measuring climate adaptation: Methods and evidence. *Review of Environmental Economics and Policy* 12 (2): 324–341

* 📖 Auffhammer, M. (2022): Climate adaptive response estimation: Short and long run impacts of climate change on residential electricity and natural gas consumption. *Journal of Environmental Economics and Management* 114: 102,669

* 📖 Spencer, N. and E. Strobl (2025): Modeling the impact of extreme climate events on household welfare: An empirical framework. *Environmental and Resource Economics*

4. **Impacts of climate change: Agriculture**

† Mendelsohn, R., W. D. Nordhaus, and D. Shaw (1994): The impact of global warming on agriculture: A ricardian analysis. *The American Economic Review* 84 (4): 753–771

* 📖 Aragón, F. M., F. Oteiza, and J. P. Rud (2021): Climate change and agriculture: Subsistence farmers' response to extreme heat. *American Economic Journal: Economic Policy* 13 (1): pp. 1–35

* 📖 Moore, F. C. and D. B. Lobell (2015): The fingerprint of climate trends on european crop yields. *Proceedings of the National Academy of Sciences* 112 (9): 2670–2675

* Deschênes, O. and M. Greenstone (2007): The economic impacts of climate change: Evidence from agricultural output and random fluctuations in weather. *The American Economic Review* 97 (1): 354–385

* Schlenker, W., W. M. Hanemann, and A. C. Fisher (2006): The impact of global warming on u.s. agriculture: An econometric analysis of optimal growing conditions. *Review of Economics and Statistics* 88 (1): 113–125

* Schlenker, W., W. M. Hanemann, and A. C. Fisher (2005): Will u.s. agriculture really benefit from global warming? accounting for irrigation in the hedonic approach. *American Economic Review* 95 (1): 395–406

5. **Growth & Labor**

(a) **Impacts of climate change: Economic growth**

* 📖 Hsiang, S. M. and A. S. Jina (2014): The causal effect of environmental catastrophe on long-run economic growth: Evidence from 6,700 cyclones. Working Paper 20352, National Bureau of Economic Research

* Cavallo, E., S. Galiani, I. Noy, and J. Pantano (2013): Catastrophic Natural Disasters and Economic Growth. *The Review of Economics and Statistics* 95 (5): 1549–1561

* Dell, M., B. F. Jones, and B. A. Olken (2012): Temperature shocks and economic growth: Evidence from the last half century. *American Economic Journal: Macroeconomics* 4 (3): 66–95

* Das, S. and S. C. Smith (2012): Awareness as an adaptation strategy for reducing mortality from heat waves: Evidence from a disaster risk management program in india. *Climate Change Economics* 3 (2): 1–29
* Deschênes, O. and M. Greenstone (2011): Climate change, mortality, and adaptation: Evidence from annual fluctuations in weather in the us. *American Economic Journal: Applied Economics* 3 (4): 152–185

(b) **Impacts of climate change: Labor productivity**

* 📖 Almås, I., M. Auffhammer, T. Bold, I. Bolliger, A. Dembo, S. M. Hsiang, S. Kitamura, E. Miguel, and R. Pickmans (2019): Destructive behavior, judgment, and economic decision-making under thermal stress. Working Paper 25785, National Bureau of Economic Research
* Zhang, P., O. Deschenes, K. Meng, and J. Zhang (2018): Temperature effects on productivity and factor reallocation: Evidence from a half million chinese manufacturing plants. *Journal of Environmental Economics and Management* 88: 1–17

6. **Human capital**

(a) **Impacts of climate change: Learning**

* 📖 Park, R. J., J. Goodman, M. Hurwitz, and J. Smith (2020): Heat and learning. *American Economic Journal: Economic Policy* 12 (2): pp. 306–339
* Wen, J. and M. Burke (2022): Lower test scores from wildfire smoke exposure. *Nature Sustainability* 5 (11): 947–955
§ Park, R. J., J. Goodman, M. Hurwitz, and J. Smith (2022): Learning is inhibited by heat exposure, both internationally and within the united states. *Nature Human Behaviour* 6 (7): 972–982
§ Park, R. J. (2020): Hot temperature and high stakes performance. *Journal of Human Resources* 55 (4): 1429–1456

(b) **Impacts of climate change: Health and Mortality**

† Barreca, A., K. Clay, O. Deschenes, M. Greenstone, and J. S. Shapiro (2016): Adapting to climate change: The remarkable decline in the us temperature-mortality relationship over the twentieth century. *Journal of Political Economy* 124 (1): 105–159
* Young, R. and S. Hsiang (2024): Mortality caused by tropical cyclones in the united states. *Nature*
* 📖 Carleton, T., A. Jina, M. Delgado, M. Greenstone, T. Houser, S. Hsiang, A. Hultgren, R. E. Kopp, K. E. McCusker, I. Nath, J. Rising, A. Rode, H. K. Seo, A. Viaene, J. Yuan, and A. T. Zhang (2022): Valuing the global mortality consequences of climate change accounting for adaptation costs and benefits. *The Quarterly Journal of Economics* 137 (4): 2037–2105
* Barreca, A., K. Clay, O. Deschênes, M. Greenstone, and J. S. Shapiro (2015): Convergence in adaptation to climate change: Evidence from high temperatures and mortality, 1900-2004. *The American Economic Review* 105 (5): 247–251
* Deschênes, O. and E. Moretti (2009): Extreme weather events, mortality, and migration. *The Review of Economics and Statistics* 91 (4): 659–681
* Deschênes, O. and M. Greenstone (2011): Climate change, mortality, and adaptation: Evidence from annual fluctuations in weather in the us. *American Economic Journal: Applied Economics* 3 (4): 152–185
* Deschênes, O. and E. Moretti (2009): Extreme weather events, mortality, and migration. *The Review of Economics and Statistics* 91 (4): 659–681
* Deschênes, O., M. Greenstone, and J. Guryan (2009): Climate change and birth weight. *The American Economic Review* 99 (2): 211–217

7. **Violence**

(a) **Impacts of climate change: Conflict**

† Burke, M., J. Ferguson, S. M. Hsiang, and E. Miguel (2024b): New evidence on the economics of climate and conflict. Working Paper 33040, National Bureau of Economic Research

* Burke, M., S. M. Hsiang, and E. Miguel (2015a): Climate and conflict. *Annual Review of Economics* 7: 577–617

* Eberle, U. J., D. Rohner, and M. Thoenig (2020): Heat and hate: Climate security and farmer-herder conflicts in africa. Technical report

* 📖 Mcguirk, E. F. and N. Nunn (2020): Transhumant pastoralism, climate change, and conflict in africa. Working Paper 28243, National Bureau of Economic Research

* Hsiang, S. M., K. C. Meng, and M. A. Cane (2011): Civil conflicts are associated with the global climate. *Nature* 476 (7361): 438–441

* Miguel, E., S. Satyanath, and E. Sergenti (2004): Economic shocks and civil conflict: An instrumental variables approach. *Journal of Political Economy* 112 (4): 725–753

* Burke, M., J. Ferguson, S. Hsiang, and E. Miguel (2024a): Will wealth weaken weather wars? *AEA Papers and Proceedings* 114: 65–69

(b) **Impact of climate change: Crime**

* Behrer, A. P. and V. Bolotnyy (2022): Heat, crime, and punishment. techreport 9909, World Bank, Washington DC. Policy Research Working Paper

* Blakeslee, D. S. and R. Fishman (2017): Weather shocks, agriculture, and crime: Evidence from india. *Journal of Human Resources* 53 (3): 750–782

* 📖 Ranson, M. (2014): Crime, weather, and climate change. *Journal of Environmental Economics and Management* 67 (3): 274–302

8. **Mid-term exam**

– ***Spring break***

9. **Collaborative research project**

10. **Research project presentations**

11. **Impacts of climate change: Finance**

* 📖 Brei, M., P. Mohan, A. Perez Barahona, and E. Strobl (2024): Transmission of natural disasters to the banking sector: Evidence from thirty years of tropical storms in the caribbean. *Journal of International Money and Finance* 141: 103,008

* 📖 De Marco, F. and N. Limodio (2022): The financial transmission of a climate shock: El niño and us banks. *SSRN Electronic Journal*

– https://doi.org/10.1016/j.jeem.2023.102890

12. **Reducing CO2 emissions through management and EVs**

(a) **Climate change mitigation: Behavioral change**

* 📖 Gosnell, G. K., J. A. List, and R. D. Metcalfe (2020): The impact of management practices on employee productivity: A field experiment with airline captains. *Journal of Political Economy* 128 (4): 1195–1233

* Dietz, T., G. T. Gardner, J. Gilligan, P. C. Stern, and M. P. Vandenbergh (2009): Household actions can provide a behavioral wedge to rapidly reduce us carbon emissions. *Proceedings of the National Academy of Sciences* 106 (44): 18,452–18,456

(b) **Electric Vehicles**

† Rapson, D. S. and E. Muehlegger (2023): The economics of electric vehicles. *Review of Environmental Economics and Policy* 17 (2): 274–294

† Sheldon, T. L. (2022): Evaluating electric vehicle policy effectiveness and equity. *Annual Review of Resource Economics* 14 (1): 669–688

* 📖 Linn, J. (2020): Is there a trade-off between equity and effectiveness for electric vehicle subsidies? Technical report, Resources for the future, link

§ Addicott, E. T., E. P. Fenichel, and M. J. Kotchen (2020): Even the representative agent must die: Using demographics to inform long-term social discount rates. *Journal of the Association of Environmental and Resource Economists* 7 (2): 379–415

§ Holland, S. P., E. T. Mansur, N. Z. Muller, and A. J. Yates (2016): Are there environmental benefits from driving electric vehicles? the importance of local factors. *American Economic Review* 106 (12): 3700–3729

13. **Politics & Societal acceptance**

(a) **Impacts of climate change: Policy and Politics**

* Hoffmann, R., R. Muttarak, J. Peisker, and P. Stanig (2022): Climate change experiences raise environmental concerns and promote green voting. *Nature Climate Change* 12 (2): 148–155

* Cotofan, M., K. Kuralbayeva, and K. Matakos (2024): Global warming cools voters down: How climate concerns affect policy preferences. CEP Discussion Papers dp1991, Centre for Economic Performance, LSE

* 📖 Gagliarducci, S., M. D. Paserman, and E. Patacchini (2019): Hurricanes, climate change policies and electoral accountability. Working Paper 25835, National Bureau of Economic Research

* Herrnstadt, E. and E. Muehlegger (2014): Weather, salience of climate change and congressional voting. *Journal of Environmental Economics and Management* 68 (3): 435–448 Stokes, L. C. (2015): Electoral backlash against climate policy: A natural experiment on retrospective voting and local resistance to public policy. *American Journal of Political Science* 60 (4): 958–974

(b) **Climate policy design: Societal acceptance of climate policy**

† Carattini, S., M. Carvalho, and S. Fankhauser (2018): Overcoming public resistance to carbon taxes. *WIREs Climate Change* 9 (5)

† Drews, S. and J. C. van den Bergh (2015): What explains public support for climate policies? a review of empirical and experimental studies. *Climate Policy* 16 (7): 855–876

† Kotchen, M. J., Z. M. Turk, and A. A. Leiserowitz (2017): Public willingness to pay for a us carbon tax and preferences for spending the revenue. *Environmental Research Letters* 12 (9): 094,012

* 📖 Sommer, S., L. Mattauch, and M. Pahle (2022): Supporting carbon taxes: The role of fairness. *Ecological Economics* 195: 107,359

14. **European Emissions Trading System**

(a) **Climate policy design: The development of the European Emissions Trading System**

† Ellerman, A. D., C. Marcantonini, and A. Zaklan (2016): The european union emissions trading system: Ten years and counting. *Review of Environmental Economics and Policy* 10 (1): 89–107

† Hintermann, B., S. Peterson, and W. Rickels (2016): Price and market behavior in phase ii of the eu ets: A review of the literature. *Review of Environmental Economics and Policy* 10 (1): 108–128

† Fuss, S., C. Flachsland, N. Koch, U. Kornek, B. Knopf, and O. Edenhofer (2018): A framework for assessing the performance of cap-and-trade systems: Insights from the european union emissions trading system. *Review of Environmental Economics and Policy* 12 (2): 220–241

* 📖 Bayer, P. and M. Aklin (2020): The european union emissions trading system reduced co 2 emissions despite low prices. *Proceedings of the National Academy of Sciences* 117 (16): 8804–8812

(b) **Climate policy design: Effectiveness of carbon taxes**

* Abrell, J., M. Kosch, and S. Rausch (2019): How effective was the uk carbon tax? - a machine learning approach to policy evaluation. *SSRN Electronic Journal*
*  Andersson, J. J. (2019): Carbon taxes and co2 emissions: Sweden as a case study. *American Economic Journal: Economic Policy* 11 (4): 1–30
* Pretis, F. (2022): Does a carbon tax reduce co2 emissions? evidence from british columbia. *Environmental and Resource Economics* 83 (1): 115–144

15. **TBA**

Remaining potential topics

1. **Impacts of climate change: Firms and employment**
   - Jia, R., X. Ma, and V. W. Xie (2022): Expecting floods: Firm entry, employment, and aggregate implications. Working Paper 30250, National Bureau of Economic Research
2. **Impacts of climate change: Economic damages**
   - † Auffhammer, M. (2018): Quantifying economic damages from climate change. *The Journal of Economic Perspectives* 32 (4): 33–52
   - † Tol, R. S. J. (2009): The economic effects of climate change. *Journal of Economic Perspectives* 23 (2): 29–51
   - * Burke, M., S. M. Hsiang, and E. Miguel (2015b): Global non-linear effect of temperature on economic production. *Nature* 527 (7577): 235–239
   - * Howard, P. H. and T. Sterner (2017): Few and not so far between: A meta-analysis of climate damage estimates. *Environmental and Resource Economics* 68 (1): 197–225
3. **Impacts of climate change: Migration**
   - * Bohra-Mishra, P., M. Oppenheimer, and S. M. Hsiang (2014): Nonlinear permanent migration response to climatic variations but minimal response to disasters. *Proceedings of the National Academy of Sciences* 111 (27): 9780–9785
   - * Jessoe, K., D. T. Manning, and J. E. Taylor (2017): Climate change and labour allocation in rural mexico: Evidence from annual fluctuations in weather. *The Economic Journal* 128 (608): 230–261
   - § Henderson, J. V., B. Y. Jang, A. Storeygard, and D. N. Weil (2024): Climate change, population growth, and population pressure. Working Paper 32145, National Bureau of Economic Research
   - † Hoffmann, R., A. Dimitrova, R. Muttarak, J. Crespo Cuaresma, and J. Peisker (2020): A meta-analysis of country-level studies on environmental change and migration. *Nature Climate Change* 10 (10): 904–912
   - § Burzyński, M., C. Deuster, F. Docquier, and J. de Melo (2021): Climate change, inequality, and human migration. *Journal of the European Economic Association* 20 (3): 1145–1197
   - * Brottrager, M., J. Crespo Cuaresma, D. Kniveton, and S. H. Ali (2023): Natural resources modulate the nexus between environmental shocks and human mobility. *Nature Communications* 14 (1)
   - * Ronco, M., J. M. Tárraga, J. Muñoz, M. Piles, E. S. Marco, Q. Wang, M. T. M. Espinosa, S. Ponserre, and G. Camps-Valls (2023): Exploring interactions between socioeconomic context and natural hazards on human population displacement. *Nature Communications* 14 (1)
   - * Gröger, A. and Y. Zylberberg (2016): Internal labor migration as a shock coping strategy: Evidence from a typhoon. *American Economic Journal: Applied Economics* 8 (2): 123–53
   - † Hoffmann, R., B. Šedová, and K. Vinke (2021): Improving the evidence base: A methodological review of the quantitative climate migration literature. *Global Environmental Change* 71: 102,367
   - † Kaczan, D. J. and J. Orgill-Meyer (2019): The impact of climate change on migration: a synthesis of recent empirical insights. *Climatic Change* 158 (3–4): 281–300
4. **Impacts of climate change: Urbanization**
   - * Henderson, J. V., A. Storeygard, and U. Deichmann (2017): Has climate change driven urbanization in africa? *Journal of Development Economics* 124: 60–82
   - * Kocornik-Mina, A., T. K. J. McDermott, G. Michaels, and F. Rauch (2020): Flooded cities. *American Economic Journal: Applied Economics* 12 (2): 35–66
5. **Adaptation to climate change: Agriculture**

* Annan, F. and W. Schlenker (2015): Federal crop insurance and the disincentive to adapt to extreme heat. *American Economic Review* 105 (5): 262–66

* Burke, M. and K. Emerick (1994): Adaptation to climate change: Evidence from us agriculture. *American Economic Journal: Economic Policy* 8 (3): 753–771

* Moore, F. C. and D. B. Lobell (2014): Adaptation potential of european agriculture in response to climate change. *Nature Climate Change* 4 (7): 610–614.

6. **Climate change mitigation: Technologies and their costs**

† Gillingham, K. and J. H. Stock (): The cost of reducing greenhouse gas emissions. *Journal of Economic Perspectives* 32 (4): 53–72

† Kuramochi, T., N. Höhne, M. Schaeffer, J. Cantzler, B. Hare, Y. Deng, S. Sterl, M. Hagemann, M. Rocha, P. A. Yanguas-Parra, G.-U.-R. Mir, L. Wong, T. El-Laboudy, K. Wouters, D. Deryng, and K. Blok (2017): Ten key short-term sectoral benchmarks to limit warming to 1.5°c. *Climate Policy* 18 (3): 287–305

* Meng, K. C. (2017): Using a free permit rule to forecast the marginal abatement cost of proposed climate policy. *American Economic Review* 107 (3): 748–84

§ Vogt-Schilb, A., G. Meunier, and S. Hallegatte (2018): When starting with the most expensive option makes sense: Optimal timing, cost and sectoral allocation of abatement investment. *Journal of Environmental Economics and Management* 88: 210–233

7. **Climate change mitigation: Climate engineering**

† Barrett, S. (2014): Solar geoengineering's brave new world: Thoughts on the governance of an unprecedented technology. *Review of Environmental Economics and Policy* 8 (2): 249–269

– Barrett, S., T. M. Lenton, A. Millner, A. Tavoni, S. Carpenter, J. M. Anderies, F. S. Chapin, A.-S. Crépin, G. Daily, P. Ehrlich, C. Folke, V. Galaz, T. Hughes, N. Kautsky, E. F. Lambin, R. Naylor, K. Nyborg, S. Polasky, M. Scheffer, J. Wilen, A. Xepapadeas, and A. de Zeeuw (2014): Climate engineering reconsidered. *Nature Climate Change* 4 (7): 527–529

† Klepper, G. and W. Rickels (2014): Climate engineering: Economic considerations and research challenges. *Review of Environmental Economics and Policy* 8 (2): 270–289

* Rickels, W., M. F. Quaas, K. Ricke, J. Quaas, J. Moreno-Cruz, and S. Smulders (2020): Who turns the global thermostat and by how much? *Energy Economics* 91: 104,852

8. **Climate policy design: Competitiveness effects of unilateral climate policies**

* Aldy, J. E. and W. A. Pizer (2015): The competitiveness impacts of climate change mitigation policies. *Journal of the Association of Environmental and Resource Economists* 2 (4): 565–595

† Carbone, J. C. and N. Rivers (2017): The impacts of unilateral climate policy on competitiveness: Evidence from computable general equilibrium models. *Review of Environmental Economics and Policy* 11 (1): 24–42

† Dechezleprêtre, A. and M. Sato (2017): The impacts of environmental regulations on competitiveness. *Review of Environmental Economics and Policy* 11 (2): 183–206

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9. **Natural climate solutions**

§ Griscom, B. W., J. Adams, P. W. Ellis, R. A. Houghton, G. Lomax, D. A. Miteva, W. H. Schlesinger, D. Shoch, J. V. Siikamäki, P. Smith, P. Woodbury, C. Zganjar, A. Blackman, J. Campari, R. T. Conant, C. Delgado, P. Elias, T. Gopalakrishna, M. R. Hamsik, M. Herrero, J. Kiesecker, E. Landis, L. Laestadius, S. M. Leavitt, S. Minnemeyer, S. Polasky, P. Potapov, F. E. Putz, J. Sanderman, M. Silvius, E. Wollenberg, and J. Fargione (2017): Natural climate solutions. *Proceedings of the National Academy of Sciences* 114 (44): 11,645–11,650

§ West, T. A. P., S. Wunder, E. O. Sills, J. Börner, S. W. Rifai, A. N. Neidermeier, G. P. Frey, and A. Kontoleon (2023): Action needed to make carbon offsets from forest conservation work for climate change mitigation. *Science* 381 (6660): 873–877

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Course Policies

Class Materials The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Attendance The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected regardless of modality. Students who fail to attend class regularly are inviting scholastic difficulty.
Regular class participation is expected regardless of course modality. Participation includes in-person attendance, and engaging in group or other activities during class that solicit your feedback on homework assignments, readings, or materials covered in the lectures. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Participation Regular class participation is expected regardless of course modality. Students who fail to participate in class regularly are inviting scholastic difficulty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Class Recordings The instructor may record meetings of this course. Any recordings will be available to all students registered for this class as they are intended to supplement the classroom experience. Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those, not in the class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Academic Dishonesty Policy Cheating and plagiarism will not be tolerated. I strongly encourage you to review the University's policies regarding academic honesty: UT Dallas Syllabus Policies and Procedures, Academic Dishonesty.
The emergence of generative AI tools[2] (such as ChatGPT and DALL-E) has sparked large interest among many students and researchers. The use of these tools for brainstorming ideas, exploring possible responses to questions or problems, and creative engagement with the materials may be useful for you as you craft responses to class assignments. While there is no substitute for working directly with your instructor, the potential for generative AI tools to provide automatic feedback, assistive technology and language assistance is clearly developing. Course assignments may use Generative AI tools if indicated in the syllabus. AI-generated content can only be presented as *your own work* with the instructor's *written permission*. Include an acknowledgment of how generative AI has been used after your reference or Works Cited page. TurnItIn or other methods may be used to detect the use of AI. Under UTD rules about due process, referrals may be made to the Office of Community Standards and Conduct (OCSC). Inappropriate use of AI may result in penalties, including a 0 on an assignment.

[2] "Generative AI is a broad term that refers to a type of artificial intelligence (AI) application that is designed to use a variety of machine learning algorithms to create new content (text, images, video, music, artwork, synthetic data, etc.) based on user input that was not explicitly programmed into the AI application. Generative AI systems are "trained" by using complex algorithms to learn from an existing large corpus of datasets (often consisting of millions of examples) and to analyze patterns, rules and statistical structures from the sample data to be used in generating new content that is similar in style and characteristics to the original training datasets." (ASU, 2023, https://provost.asu.edu/generative-ai)

Disabilities Policy Please find the disability policy here: https://go.utdallas.edu/syllabus-policies. It is the policy and practice of The University of Texas at Dallas to make reasonable accommodations for students with properly documented disabilities. However, written notification from the AccessAbility Resource Center (ARC) is required. If you are eligible to receive an accommodation and would like to request it for this course, please discuss it with me and allow one-week advance notice. Students who have questions about receiving accommodations, or those who have, or think they may have, a disability (mobility, sensory, health, psychological, learning, etc.) are invited to contact ARC for a confidential discussion. ARC is located in the Administration Building, AD 2.224. They can be reached by phone at 972-883-2098, or by email at studentaccess@utdallas.edu.

Resources for student success UTD has a constellation of resources aimed at helping students. Please find them here: https://go.utdallas.edu/academic-support-resources or see the UTD Student Resource Guide 2023 on eLearning. One example is the Graduation Help Desk which supports undergraduate students, faculty and staff to develop solutions to complex academic *and* non-academic issues (online appointments or write to graduationhelpdesk@utdallas.edu). Have a look at the Comet Cupboard which is a UT Dallas food pantry initiative dedicated to helping students in need. Also, take notice of the Student Counselling Center (972-883-2575).

Further UT Dallas Syllabus Policies and Procedures The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.