PP5163
The Economics and Governance of Climate Change
Elective
First Semester 2016-2017

Instructor

Dr Sonia Akter, Assistant Professor
Email: Sonia.akter@nus.edu.sg
Office: 03-01K, Wing B, Level 3, OTH
Consultation Hours: Tuesdays, 10:00–12:00, and by appointment
Class Hours: Tuesdays, 14:00–17.00
Venue: MM SR2–3

Module Description

This module provides a basic understanding of global climate change issues with a special focus on the economics and governance aspects. It begins with an introduction to climate science and discusses its history, economics, politics, the policy debates, international treaties, adaptation and mitigation policies and their limitations. The course uses a multi-disciplinary framework which draws on theories and evidence from economics, sociology, human geography and political science.

Core Learning Objectives

Upon completion of this module students are expected to:

- have a better understanding of the impacts of climate change;
- be familiar with the adaptation and mitigation strategies and available policy options;
- have a better understanding of the historical, political and ethical contexts that shape the climate change debates;
- have a better understanding of the taxonomy of climate change scepticism;
- summarize and discuss scientific publications in the field of climate change.

Modes of Teaching and Learning

Lectures, interactive sessions such as debates, discussions, critical evaluation of scientific and policy documents, case studies, media/scientific stories and research paper.

Assessment

Class Participation (15%)

In the syllabus, you will find readings that are categorized as "Readings for presentation and in-class discussions". Students are expected to analytically and critically discuss the readings in a 15–20 minutes presentation. A sign-up sheet will be provided on the second week for students to sign up for the reading that they would like to present. The number of presentations each student is expected make will depend on the class size and thus will be announced later.

Group Assignments (20%)

There will be two group assignments, each of which will contain 10% of the total grade. The assignments will involve preparing a group presentation on an assigned topic. Group size will depend on class size. Students will be randomly assigned to a group. The topic will be announced one week prior to the presentation.

Mid-term (30%)

A midterm exam will take place after the recess break. The midterm will cover all material presented in lecture prior to the exam and will count for 30% of the total grade.

Research Paper (25%)

Students are expected to write a research paper (3,000 words including reference, tables, graphs) on a topic relevant to economics and governance of climate change. For those who are interested in quantitative work, secondary data can be obtained from the following sources:

1. Emission Database for Global Atmospheric Research (Url: http://edgar.jrc.ec.europa.eu/overview.php?v=CO2ts1990-2013)
2. Open Data Resources for Climate Change (url: http://data.worldbank.org/indicator/EN.ATM.CO2E.PC)
3. Climate Data Online (Url: https://www.ncdc.noaa.gov/cdo-web/)

The research paper will be developed in the following stages:

-a research topic (due September 5)
-a research proposal/outline (due September 18);
-full paper (due November 20)

Presentation (10%)

Students will be required to make a presentation of their research paper. The presentations will take place on Week 13.

Textbooks

(1) Helm, D., Hepburn, C. (2010) The Economics and Politics of Climate Change. Oxford University Press, USA.

(2) Tietenberg, T., Lewis, L. (2016) Environmental & Natural Resource Economics, 10th Edition, Routledge: Oxford.

Note on Plagiarism

The NUS and the LKY School regard academic integrity as a very important value. To avoid giving the impression that you are passing off other people's work as your own, you will need to acknowledge conscientiously the sources of information, ideas, and arguments used in any of your assignments. In order to understand what counts as plagiarism and why it is wrong, students at the LKY School had taken the NUS online module on Academic Culture during the Orientation Programme and formally acknowledged that they had understood the contents. Students who would like an introduction to the different referencing styles can refer to the following website, among others: https://www.citethisforme.com/guides. You will be required to submit all written assignments that are uploaded on IVLE for **plagiarism check**.

Week 1

- Discussion about the course
  - Contents
  - Objectives
  - Assessment
  - Q&A

Week 2

Lecture topic: The Science of Climate Change

- An overview of the key climate change concepts
- Observed and future changes
- Global trend of GHG emissions
- Climate models and the Representative Concentration Pathways (RCP)
- Projected changes in the climate system
- Future risks and impacts caused by a changing climate
- Non-linear changes and threshold effects

Foundation readings

- IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Week 3

Readings for presentation and in-class discussions

(1) Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2015). Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences*, *112*(11), 3241–3246.
(2) Urban, M. C. (2015). Accelerating extinction risk from climate change. *Science*, *348*(6234), 571–573.
(3) Caminade, C., Kovats, S., Rocklov, J., Tompkins, A. M., Morse, A. P., Colón-González, F. J., ... & Lloyd, S. J. (2014). Impact of climate change on global malaria distribution. *Proceedings of the National Academy of Sciences*, *111*(9), 3286–3291.

Lecture topic: Climate Change and Economic Growth: Past, Present and Future

- Sources of GHG emissions and their historic and current trend
- Approaches to emission measurement and allocation of international responsibilities
- Economic impacts of climate change and their distributions
- Improving energy efficiency hidden costs and unintended consequences

Foundation readings

- Helm, D., Hepburn, C.: Chapter 5, 8 &17
- Tol, R. S., Downing, T. E., Kuik, O. J., & Smith, J. B. (2004). Distributional aspects of climate change impacts. *Global Environmental Change*, *14*(3), 259–272.
- Botzen, W. J., Gowdy, J. M., & van den Bergh, J. C. (2008). Cumulative CO2 emissions: shifting international responsibilities for climate debt. *Climate policy*, *8*(6), 569–576.

Week 4

Readings for presentation and in-class discussions

(4) Davis, S. J., & Caldeira, K. (2010). Consumption-based accounting of CO2 emissions. *Proceedings of the National Academy of Sciences*, *107*(12), 5687–5692.
(5) Grant, D., Jorgenson, A. K., & Longhofer, W. (2016). How organizational and global factors condition the effects of energy efficiency on CO2 emission rebounds among the world's power plants. *Energy Policy*, *94*, 89–93.
(6) To, H., & Grafton, R. Q. (2015). Oil prices, biofuels production and food security: past trends and future challenges. *Food Security*, *7*(2), 323-336.

Lecture topic: The Economics of Climate Change Mitigation

- Benefit cost analysis
- Private vs social discount rate
- Static vs dynamic efficiency
- Social cost of carbon
- Costs and Benefits of Climate Change
- The Stern Review
- The Climate-Policy Ramp (DICE-2013R Model)
- The Discount Rate Controversy: Inter-generational Justice

Foundation readings

- Tietenberg, T., Lewis, L.: Chapters 3 & 5.
- Helm, D., Hepburn, C.: Chapter 6.
- Lord Nicholas Stern, The Economics of Climate Change: The Stern Review, Cambridge University Press, 2007.
- Nordhaus W.D., Sztorc P., 2013, DICE 2013R: Introduction and User's Manual, http://www.econ.yale.edu/~nordhaus/homepage/documents/ DICE_Manual_103113r2.pdf

Week 5

Readings for presentation and in-class discussions

(7) Tol, R. S. (2013). Targets for global climate policy: An overview. *Journal of Economic Dynamics and Control*, *37*(5), 911–928.
(8) Moore, F. C., & Diaz, D. B. (2015). Temperature impacts on economic growth warrant stringent mitigation policy. *Nature Climate Change*.
(9) Dietz, S., Hope, C., & Patmore, N. (2007). Some economics of 'dangerous' climate change: reflections on the Stern Review. *Global Environmental Change*, *17*(3), 311–325.

Lecture topic: Policy Instruments for Climate Change Mitigation

- Economics of pollution control: An overview
- Carbon taxes, emissions trading and hybrid schemes
- International carbon finance and clean development mechanism
- EU climate change policy–A critique

Foundation readings

- Tietenberg, T., Lewis, L.: Chapters 2 & 14.
- Helm, D., Hepburn, C.: Chapter 11, 18 & 20.

Week 6

Group presentations of assignment 1

- Evaluation of (1) US, (2) Indian and (3) Chinese emissions trading scheme

Lecture topic: Policy Instruments for Climate Change Mitigation

- Further discussions on mitigation instruments and policy mix
  - Nuclear power, climate change and energy policy
  - Climate change mitigation from renewable energy
  - The national inventory approach for international forest-carbon sequestration management

Foundation readings

- Helm, D., Hepburn, C.: Chapters 12, 14 & 15.

****

Recess Week

****

Week 7

- *Mid-term Exam (90 minutes)*

Lecture topic: Climate Change Adaptation

- Adaptation opportunities
- Adaptation constraints and limits
- The economics of adaptation
- Climate change adaptation and migration

Foundation readings

- WGII Contribution to AR5. Chapter 16 and 17: Adaptation Opportunities, Constraints, and Limits & Economics of Adaptation
- Dow, K., Berkhout, F., Preston, B. L., Klein, R. J., Midgley, G., & Shaw, M. R. (2013). Limits to adaptation. *Nature Climate Change*, *3*(4), 305–307.
- Perch-Nielsen, S. L., Bättig, M. B., & Imboden, D. (2008). Exploring the link between climate change and migration. *Climatic change*, *91*(3–4), 375–393.

Week 8

Readings for presentation and in-class discussions

(10) Deressa, T. T., Hassan, R. M., Ringler, C., Alemu, T., & Yesuf, M. (2009). Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. *Global environmental change*, *19*(2), 248–255.

(11) Akter, S., & Mallick, B. (2013). The poverty–vulnerability–resilience nexus: Evidence from Bangladesh. *Ecological Economics*, *96*, 114–124.

(12) Lu, X., Wrathall, D. J., Sundsøy, P. R., Nadiruzzaman, M., Wetter, E., Iqbal, A., ... & Bengtsson, L. (2016). Unveiling hidden migration and mobility patterns in climate stressed regions: A longitudinal study of six million anonymous mobile phone users in Bangladesh. *Global Environmental Change*, *38*, 1–7.

Lecture topic: Global Common and Public Good

- Global public good
- Externality

- Tragedy of Commons
- The pursuit of economic efficiency
- Role of government
- Game theory and cooperation

Foundation readings

- Tietenberg, T., Lewis, L.: Chapters 2 & 12.

Week 9

Readings for presentation and in-class discussions

(13) Lindahl, T., Bodin, Ö., & Tengö, M. (2015). Governing complex commons—The role of communication for experimental learning and coordinated management. *Ecological Economics*, *111*, 111–120.

(14) Gatiso, T. T., Vollan, B., & Nuppenau, E. A. (2015). Resource scarcity and democratic elections in commons dilemmas: An experiment on forest use in Ethiopia. *Ecological Economics*, *114*, 199-207.

(15) Milinski, M., Semmann, D., Krambeck, H. J., & Marotzke, J. (2006). Stabilizing the Earth's climate is not a losing game: Supporting evidence from public goods experiments. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(11), 3994–3998.

Lecture topic: International Cooperation, Agreements & Instruments

- The UN Framework Convention on Climate Change
- History of international treaties
- Justice, equity and responsibility
- Ethics of global climate change
- The Kyoto Protocol: An evaluation

Foundation readings

- Helm, D., Hepburn, C.: Chapters 3, 4 & 21.
- Grunewald, N., & Martinez-Zarzoso, I. (2016). Did the Kyoto Protocol fail? An evaluation of the effect of the Kyoto Protocol on CO2 emissions. *Environment and Development Economics*, *21*(01), 1-22.

Week 10

Readings for presentation and in-class discussions

(16) Crowley, K. (2007). Is Australia faking it? The Kyoto Protocol and the greenhouse policy challenge. *Global Environmental Politics*, *7*(4), 118–139.

(17) Busato, F., & Maccari, N. (2016). Canadian oil sand extraction: Exploring the nexus between economic development and environmental sustainability. *The Extractive Industries and Society*, *3*(1), 141–148.

(18) Kuramochi, T. (2015). Review of energy and climate policy developments in Japan before and after Fukushima. *Renewable and Sustainable Energy Reviews*, *43*, 1320–1332.

Lecture topic: International Cooperation, Agreements & Instruments

- Paris Climate Conference (COP21) and INDC
- Legal bindingness and compliance
- Montreal vs Kyoto Protocol

Foundation readings

- Helm, D., Hepburn, C.: Chapter 22.
- Green, F. (2014). "This time is different": The prospects for an effective climate agreement in Paris 2015. Centre for Climate Change Economics and Policy, Policy Paper, Grantham Research Institute on Climate Change and the Environment
- Rose, A., Wei, D., & Bento, A. M. (2016). Equity Implications of the COP21 Intended Nationally Determined Contributions to Reduce Greenhouse Gas Emissions. *Available at SSRN 2736592*.
- Sunstein, C. R. (2007). Of Montreal and Kyoto: a tale of two protocols. *Harvard Environmental Law Review*, *31*, 1.

Week 11

- Group presentations on INDC and implementation plan of India, China and USA

Lecture topic: International Cooperation, Agreements & Instruments

- Reducing Emissions from Deforestation and Forest Degradation (REDD)
- The economics of transboundary haze pollution in Southeast Asia
- Environmental Kuznets Curve

Foundation readings

- Lee, J. S. H., Jaafar, Z., Tan, A. K. J., Carrasco, L. R., Ewing, J. J., Bickford, D. P., ... & Koh, L. P. (2016). Toward clearer skies: challenges in regulating transboundary haze in Southeast Asia. *Environmental Science & Policy*, *55*, 87–95.
- Anderson, Z. R., Kusters, K., McCarthy, J., & Obidzinski, K. (2016). Green growth rhetoric versus reality: Insights from Indonesia. *Global Environmental Change*, *38*, 30–40.

Week 12

Readings for presentation and in-class discussions

(19) Poudel, M., Thwaites, R., Race, D., & Dahal, G. R. (2015). Social equity and livelihood implications of REDD+ in rural communities–a case study from Nepal. *International Journal of the Commons*, *9*(1).

(20) Forsyth, T. (2014). Public concerns about transboundary haze: A comparison of Indonesia, Singapore, and Malaysia. Global Environmental Change, 25, 76–86.

(21) Apergis, N., & Ozturk, I. (2015). Testing environmental Kuznets curve hypothesis in Asian countries. *Ecological Indicators*, *52*, 16-22.

Lecture topic: Geoengineering Solution of Climate Change Mitigation

- Solar Radiation Management
- Carbon dioxide capture and storage
- On the regulation and ethics of geoengineering

Foundation readings

- Helm, D., Hepburn, C.: Chapters 13 & 16.
- Ming, T., Liu, W., & Caillol, S. (2014). Fighting global warming by climate engineering: Is the Earth radiation management and the solar radiation management any option for fighting climate change?. *Renewable and Sustainable Energy Reviews*, *31*, 792–834.

Week 13

- Research Paper Presentations