

## **CAS EE 349 - Global Climate Change: Science, Economics and Policy**

Spring 2014: Venice Environmental Program

Instructor: Enrica De Cian (enrica.decian@feem.it)

Location: BU Venice

Class location: BU Venice and lagoon

Credits: 4

### **Description and objective**

This course examines the issue of climate change, and the challenges faced by the international community in developing and implementing policies to address its potential impacts. Students will learn about the scientific underpinnings of the climate problem, the effects it is thought to have on the economy and society, the types of policies that are likely to be effective in addressing it, and how national and sub-national interests affect our ability to put these policies into practice. The course begins by introducing the global dimension of climate change, and then goes on to explore the local implications specific to the Euro-Mediterranean area, creating synergies with the course "Monitoring and management of coastal wetlands, lagoons and estuaries". Case studies in Europe and Italy will be used to illustrate how geographically heterogeneous impacts of climate change and economic interests determine mitigation and adaptation policy strategies within countries and at the EU level. The course will provide students with a working knowledge of the economic aspects of policies to address climate change, as well as opportunities to use this understanding to develop their own view about climate change policy.

### **Prerequisites and textbook**

Students are required to read the prerequisite course package. Students are strongly recommended to purchase the textbook before flying to Venice.

### **Textbook**

[FIELD] Barry C. Field & Martha K. Field, Environmental Economics: An Introduction, 5th edition.

### **Prerequisite course package**

Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis Summary for Policymakers. Available online

[http://www.ipcc.ch/report/ar5/wg1/#.UJ9BmZxk\\_X0](http://www.ipcc.ch/report/ar5/wg1/#.UJ9BmZxk_X0)

[FIELD] Chapter 20, pages 430-441, Global Warming.

### **Course format**

The course consists of lectures, activities, and a final project. The first day of each week will consist of a lecture that illustrates the concepts and analytical frameworks relevant to that week's topic. The remaining time will be dedicated to in-class activities (described below in the weekly calendar of class sessions), meetings with experts, and a final revision aimed at consolidating what learnt during the week.

The course will engage with local institutions in the Venice area and provide students with opportunities to meet with policy analysts, researchers, and experts from the institutions working in

the field of climate change. The final project will consist of a proposal for an international climate change agreement. It will build on the activities carried out in the in-class activities during the course. Each activity has the objective to familiarize students with the technical tools and concepts needed to formulate a critical view on climate change policy. During week 1, guidelines for the preparation of the final project will be distributed. Students are encouraged to visit the websites indicated in the weekly calendar as additional source of ideas and information for the final project. Week 6 will be dedicated to presentations of the final projects, discussion, and final briefing. The course will be organized in three meetings per week, of two hours each. The remaining time will be allocated to a field trip (join with the “Monitoring and management of coastal wetlands, lagoons and estuaries” course) and to individual consultation during office hours. Students are strongly recommended to attend individual consultation during office hours at least once before presenting the final project during week 6. For the final project students will have the possibility to choose between three projects:

- 1) Develop a proposal for an international climate change agreement
- 2) Climate change impacts, sea-level rise, and coastal cities: the case of Venice
- 3) Climate change impacts, sea-level rise, and coastal cities: challenges and opportunities in the agricultural sector

### **Assignments and grading**

Attendance is mandatory. Absence from classes and related activities will be granted only in the event of medical or family emergencies which must be documented and communicated to the instructor.

Class activities (including quizzes) in weeks 1-5: 50% (10% each)

Final project:	25%
Final presentation:	10%
Class participation:	15%

### **Academic honesty**

Academic misconduct will not be tolerated. Student academic misconduct is clearly explained in the CAS Academic Conduct Code:

<http://www.bu.edu/cas/academics/programs/conductcode.html>

Students are encouraged to form study groups and discuss assignments. However, providing to other students, or accepting from them printed or electronic copies of their responses to assignments is academic dishonesty. Copying text, tables, or graphs from printed materials, other students' work or internet sources and incorporating such material into assignments without proper attribution is plagiarism. Any student found guilty of academic misconduct will be referred to the CAS Academic Conduct Committee.

## Week 1

**Lecture 1:** What is climate change and why does it matter?

Overview of the science of climate change and introduction to the impacts of climate change on human and natural systems, with geographic focus on Europe, the Mediterranean area, and Italy.

**Activity 1:** Analysis of climate change impacts in selected countries

[Between day 1 and day 2 students will read one article each about climate change impact case studies located in the Euro-Mediterranean area. During the second meeting the instructor will distribute a list of questions for guiding the written analysis students will carry out during the in class Activity 1. Students will then present their view point in class. The activity will clarify the concepts of climate change, weather, and extreme events.]

<b>9 June - 9:30am -11am</b>	Lecture 1, Part I Climate change. The science and impacts. Preparation for Activity 1. Introduction and explanation of the final project
<b>13 June - 10:00am -11:30am</b>	Activity 1
<b>13 June - 12:30am -2pm</b>	Follow-up to Lecture 1 and Activity 1. Lecture 1, Part II. Climate change impacts in Europe

### **Reading Package Week 1:**

#### **Lecture 1, Part I**

**Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013:** The Physical Science Basis. Summary for Policymakers. Available online  
<http://www.ipcc.ch/report/ar5/wg1/>

**Working Group II Contribution to the IPCC Fifth Assessment Report Climate Change 2014.** Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for Policymakers. Available online  
<http://www.ipcc.ch/report/ar5/wg2/>

[FIELD] Chapter 20, pages 430-442, Global Warming.

#### **Lecture 1, Part I**

**Working Group II Contribution to the IPCC Fifth Assessment Report Climate Change 2014.** Climate Change 2014: Impacts, Adaptation, and Vulnerability. **Chapter 23.**

**Working Group III Contribution to the IPCC Fifth Assessment Report Climate Change 2014.** Climate Change 2014: Impacts, Adaptation, and Vulnerability. Summary for Policymakers. Available online  
<http://www.ipcc.ch/report/ar5/wg3/>

### **Readings for Activity 1**

#### Health:

**Schär, C.,** and G. Jendritzky, 2004: Hot news from summer 2003. *Nature*, 432, pp. 559–560. Available from the instructor.

**Wolf et al.** 2103. Health. In: *Regional Assessment of the Climate Change in the Mediterranean*, A. Navarra and L. Tubiana, Eds., *Advances in Global Change Research* 51, Vol. 2, Chapter 13, 13.1-13.4. Available from the instructor.

### Ecosystems

**Hoff** H. 2103. Mediterranean Tourism and Climate Change: Identifying Future Demand and Assessing Destinations' Vulnerability. In: Regional Assessment of the Climate Change in the Mediterranean, A. Navarra and L. Tubiana, Eds., Advances in Global Change Research 51, Vol. 2, Chapter 2. Available from the instructor.

### Agriculture:

**Carrera**, L, Mysiak, J and Crimi, J, 2013. Droughts in Northern Italy: Taken by Surprise, Again. Review of Environment, Energy and Economics (Re3). Available from the instructor.

### Sea-level rise:

**Nicholls**, R.J., Cazenave, A. (2010). Sea-Level Rise and Its Impact on Coastal Zones. Science 18 June 2010: Vol. 328 no. 5985 pp. 1517-1520 DOI: 10.1126/science.1185782. Available from the instructor.

### Tourism

**Magnan** A et al. 2013. Mediterranean Tourism and Climate Change: Identifying Future Demand and Assessing Destinations' Vulnerability. In: Regional Assessment of the Climate Change in the Mediterranean, A. Navarra and L. Tubiana, Eds., Advances in Global Change Research 51, Vol. 2, Chapter 15 (excluding 15.5). Available from the instructor.

### **Websites:**

[www.cmcc.it](http://www.cmcc.it)

<http://www.eea.europa.eu/>

<http://climatechange.worldbank.org/>

<http://news.nationalgeographic.com/news/2013/07/130701-american-heat-wave-global-warming-climate-change-weather-environment/>

<http://www.eenews.net/stories/1059982544>

## Week 2

**Lecture 2:** Climate change policy—what is it, why do we need it?

Introduction to the concepts of cost, benefit, damage, social costs, public goods, market failure and externalities. Introduction to criteria of Cost-Benefit analysis for evaluating policies and projects.

**Activity 2:** Application of marginal cost and damage concepts and CBA analysis of adaptation projects.

[During day 2 students will work in group on a set of exercises that will apply the concepts of marginal cost, marginal damage, cost-effective and efficient climate policies. Each group will present results to the class. The activity will reinforce the learning of the basic economic tools and frameworks introduced in Lecture 2. Between day 1 and day 2 students are expected to read the indicated chapters from the FIELD book, see reading package.]

During week 2 a field trip will be organized to see how Venice is adapting to the problem of sea-level rise. This activity will familiarize students with the practical implementation of economic criteria such as cost-benefit analysis for policy evaluation.

<b>16 June - 9:30am -11:30am</b>	Lecture 2, Part I. Economic tools for the analysis of the climate change problem (Ch. 6, 3). Concepts of benefit, cost, equimarginal principle. Activity 2, Part I.
<b>17 June - 9:30am -11:30am</b>	Lecture 2, Part I. Economic tools (Ch 4,5). Activity 2, Part I. Application of economic tools
<b>18 June - 9:30am -11am</b>	Lecture 2, Part III (Ch 6). Activity 2, Part II. Application of CBA to adaptation policies in coastal areas. The case of Venice.

**19 June – 9:00am-1:00pm** - Field trip 2 The lagoon natural and restored salt marshes and the MOSE system at the inlets. (joint activity with the “Monitoring and Management of Coastal Wetlands, Lagoons and Estuaries” course).

### Reading Package Week 2:

[FIELD] Chapter 6 (pp.118-123), 3 (pp. 44-64), 4 (pp. 65-75, 78-83), 5 (pp. 84-109), 6 (pp. 123-131)

**Bosello, F., E. De Cian (2013).** Modeling Climate Change Impacts and Adaptation to Sea-Level Rise and Coastal Disasters. A Critical Review, Energy Economics. Available from the instructor.

**Temmerman S et al. 2013.** Ecosystem-based coastal defense in the face of global change. Nature Vol. 504, 79-83. doi:10.1038/nature12859. Available from the instructor.

### Week 3

#### **Lecture 3:** How to evaluate policy benefits?

Introduction to economic approaches used to measure climate change damages. Focus on marginal damages and the role of adaptation. Introduction to adaptation policies and overview of the EU adaptation plan.

#### **Activity 3:** Analysis of marginal damages and adaptation options, joint activity with the “Monitoring and management of coastal wetlands, lagoons and estuaries” course

[Between day 1 and 2 students will read some preparatory notes that will be distributed in class during day 1 on sea-level rise impacts on agriculture, salt-water intrusion, and ecosystems in the Venice areas and surroundings. Students will then work in groups to develop a simple economic assessment of the adaptation strategies used in agriculture for specific case studies in Italy. A comparison with similar adaptation strategies around the world, as reported in the ICCGOV best-practices website, in National Adaptation Plans (UNFCCC), and other database will be encouraged. This activity will familiarize students with the practical implementation of multi-criteria analysis (MCA) for policy evaluation. Students will write a short report. ]

During week 3 a field trip will be organized to see how local farmers are adapting to that problem.

<b>23 June - 9:30am -11:30am</b>	Lecture 3 on climate change impacts and adaptation
<b>24 June - 9:30am -11:30am</b>	Activity 3. MCA of farmers’ adaptation
<b>25 June - 9:30am -11am</b>	Follow-up to Lecture 3 and Activity 3. Analysis of adaptation strategies worldwide using the Adaptation Atlas, BestPractices website, and maps.

**26 June – 9:00am-1:00pm** - Field trip 3 “Consorzio di Bonifica Adige-Euganeo” in the southern part of the lagoon watershed. (joint activity with the “Monitoring and Management of Coastal Wetlands, Lagoons and Estuaries” course).

#### **Reading Package Week 3:**

Mendelsohn R. (2000). Efficient Adaptation to Climate Change, Climatic Change 45: 583–600, 2000. Available from the instructor.

#### **Readings for Activity 3**

**Bryan, E., Deressa, T., Gbetibouo, G., Ringler, C., 2009.** Adaptation to climate change in Ethiopia and South Africa: options and constraints. Environmental Science - **Ethiopia and South Africa**

**Bryana, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S., Herrero, M. (2013).** Adapting agriculture to climate change in Kenya: Household strategies and determinants. Journal of Environmental Management 114, 26-35. - **Kenya**

**Bojovic, D., L. Bonzanigo, C. Giupponi.** Drivers of Change in Southern European Agriculture. Online Participatory Approaches for the Analysis of Planned and Autonomous Adaptation Strategies. Available at <http://www.e-agriculture.org/content/drivers-change-southern-european-agriculture>. -

#### **Italy**

**Greggio , Nicolas, Pauline Mollema, Marco Antonellini and Giovanni Gabbianelli.** Irrigation Management in Coastal Zones to Prevent Soil and Groundwater Salinization. Available at <http://dx.doi.org/10.5772/50534> – **Italy**

<http://www.tiamasg.org/ICARUS/SAWEN/>

**Websites:**

<http://www.worldbank.org/en/topic/climatechange/x/adaptation>

<http://climate-adapt.eea.europa.eu>

<http://www.adaptationatlas.org/>

<http://www.bestclimatepractices.org/>

**Week 4**

**Lecture 4:** How to evaluate emission reduction policies? Economic analysis of different policy tools to reduce emissions. Discussion of the pros and cons of different climate policy measures. Actual implementation in selected countries using the International Energy Agency Database (IEA). Description of the European Emission Trading System.

**Activity 4:** Analysis of differences between three key policy options for reducing emissions: command and control, tax and cap-and-trade (Part I). Analysis of selected countries' climate policies and discussion of way forwards in the international climate negotiation (Part II).

[In Part I students will form teams and play a game that will reinforce the notions of different policy options for emission reduction. In Part II students will use the IEA database to analyze the policy landscape of the assigned country. They will prepare and present a country policy report, and discuss with other students the pros and cons of country-specific situations. Guidelines for the analysis will be distributed in class. This activity will show in practice what are the preferred policies in different countries, and whether they differ from what prescribed by the economic theory learnt in the previous classes. Students are expected to familiarize with the database before class, between day 1 and day 2. Guidelines will be given on the day before the activity.]

**For Part I:** [inbalance.wordpress.com](http://inbalance.wordpress.com)

**For Part II:** <http://www.iea.org/policiesandmeasures/climatechange/>

<b>30 June - 9:30am -11:30am</b>	Lecture 4 Part I. The economics of climate change policy instruments. Activity 4 Part I.
<b>2 July - 9:30am -11:30am</b>	Lecture 4 Part I (cont.). The economics of climate change policy instruments. Activity 4 Part I(cont.).
<b>3 July - 9:30am -11:30am</b>	Follow-up to Lecture 4 and Activity 4 and Activity 4 Part II.

**Reading Package Week 4:**

[FIELD] Chapter 11 (pp.213-223), 12 (pp. 232-240), 13 (pp. 255-262 including box 13.1).

**Ellerman, AD (2008).** The European Union's Emissions Trading System in perspective, PEW Center. Available from the instructor.

[http://ec.europa.eu/clima/policies/ets/index\\_en.htm](http://ec.europa.eu/clima/policies/ets/index_en.htm)

## Week 5

**Lecture 5:** The role of mitigation policies. How to formulate and evaluate stabilization strategies? A focus on marginal abatement costs and application to the mitigation strategies across Europe. Introduction to the concept of energy mix, technology, abatement costs of emissions, marginal abatement cost curves. Overview of the EU Climate and Energy Plan and the EU Roadmap. Overview of the international negotiation landscape and the road taken by the international community thus far: from the Kyoto Protocol to Warsaw. Description of the European Emission Trading System.

**Activity 5:** Analysis of stabilization strategies (Part I) and analysis of European emission reduction strategies (Part II).

[In Part I students will form teams and play a game that will reinforce the notions of stabilization strategy. Between day 1 and day 2 students will be provided with background documentation about the European climate and energy plan. In Part II June 3-4:30pm

II students will analyze mitigation opportunities of different European countries using the EMF-EU database in various European countries. This activity will familiarize students with the practical applications of the economic concepts learnt in Lecture 1 and 2.]

**For Part I:** Stabilization Wedges: A Concept & Game <http://cmi.princeton.edu/wedges/>

**For Part II:** Database available from instructor and **Knopf**, B., B. Bakken, S. Carrara, A. Kanudia, I. Keppo, T. Koljonen, S. Mima, E. Schmid, D. van Vuuren (2013). Transforming the European energy system: Member States' prospects within the EU framework, *Climate Change Economics*. Available from the instructor.

<b>7 July - 9:30am -11:30am</b>	Lecture 5 Part I. The economics of stabilization policies. An international perspective
<b>8 July - 9:30am -11:30am</b>	Activity 5 Part I. Stabilization wedges game. Lecture 5 Part II, Introduction to the European Energy Roadmap and to the EMF study
<b>9 July - 9:30am -11am</b>	Follow-up to Lecture 5 and Activity 5 Part I and Activity 5 Part II. Analysis of EMFEU database

### **Reading Package Week 5:**

**European Commission** (2011). COMMUNICATION: A Roadmap for moving towards a competitive low carbon economy in 2050. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:EN:PDF>.

**Bodansky, D.** (2012). The Durban Platform: Issues and Options for a 2015 Agreement <http://www.c2es.org/publications/durban-platform-issues-options-2015-agreement>

**Diringer, E.** (2013). Climate change: A patchwork of emissions cuts, *Nature*, Vol. 501.

**OUTCOMES OF THE U.N. CLIMATE CHANGE CONFERENCE IN WARSAW** Nineteenth Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 19) November 11-22, 2013

<http://www.c2es.org/international/negotiations/cop-19/summary>

**Favero A., E. De Cian,** (2010). Fairness, Credibility and Effectiveness in the Copenhagen Accord: An Economic Assessment, *Fondazione Eni Enrico Mattei Working Paper No. 2010.21*. Available from the instructor.

### Week 6

Final project presentations. Students will have 20 minutes (15 minutes presentation + 5 minutes class discussion) each to present their final proposal for a climate change agreement.

<b>14 July - 9:30am -11am</b>	Review, Q&A about the final project
<b>15 July - 9:30am -11am</b>	Final Project – Student presentations & discussion
<b>16 July - 9:30am -11am</b>	Final Project – Student presentations & discussion

#### **Websites:**

<http://www.climatescienceandpolicy.eu>

<http://www.robertstavinsblog.org/>

<http://belfercenter.ksg.harvard.edu/>

<http://www.startnext.de/en/keep-cool-das-klimaspiel>

<http://www.climate-policy-watcher.org>