ENVE214

Climate Change

S2 Day 2014

Dept of Environment & Geography

Contents

General Information

Unit convenor and teaching staff
Lecturer, Co-convenor
Linda Beaumont
linda.beaumont@mq.edu.au
Contact via linda.beaumont@mq.edu.au
E8C246

Lecturer
Kevin Cheung
kevin.cheung@mq.edu.au
Contact via kevin.cheung@mq.edu.au
E7A 601

Unit Convenor
Ian Goodwin
ian.goodwin@mq.edu.au
Contact via ian.goodwin@mq.edu.au
E8C163

Tutor, Assistant Course Convenor
Thomas Mortlock
thomas.mortlock@mq.edu.au

Tutor, Couse Administration
Toni Mizerek
toni.mizerek@mq.edu.au

Tutor, Administration
Benjamin Ofori
benjamin.ofori@mq.edu.au

Credit points
3

Prerequisites
12cp(P)

Corequisites

Co-badged status

Unit description
Global climate change is one of the most important issues that humanity will have to grapple with in the twenty-first century. This unit investigates our climate system's complex processes, together with the impacts that climate change will have, and what we must do to adapt to and mitigate those impacts. Natural climate variability, abrupt climate change and anthropogenic climate change are key areas of study, together with their impacts on past and modern civilization. The unit is structured around three themes: - detection and attribution of climate change; - biophysical and socio-economic impacts of climate change; - adaptation, mitigation and decision making. This unit is pitched to a diverse audience; social, economic, engineering and political perspectives are all presented by a panel of internationally renowned experts drawn from the University's Concentration of Research Excellence (CORE) in Climate Futures. There are no presumed skills for enrolment in this multidisciplinary unit.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Investigate how the global climate system operates and uncertainties involved in its prediction,
Investigate the archive of paleoclimate data and the evidence for past climate changes,
Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
Examine terrestrial carbon sinks and their role in the workings of our climate system
Explore the complexities of climate change from a legal perspective, as well as that of the insurance industry,
Identify some of the human health implications of a changing climate,
Synthesise the impacts of the energy sector on climate, and its role in the mitigation of climate change,
Assess some of the economic impacts of a changing climate, including carbon trading.

General Assessment Information

ASSIGNMENT DEADLINES, RULES AND ADVICE

Assignments must be completed and submitted, on time and in full, in order to receive credit. Penalties for late assignments will be a minimum of 10% per day or part thereof, beginning at 0900, not at some time later in the day.

These are real deadlines - penalties will be imposed for late submission. Allowing some students to hand in assignments late is unfair to those who met the deadline.

The deadlines for assignments are not negotiable. Only a medical certificate or a letter with appropriate supporting documents outlining other serious, extenuating circumstances can be used to submit an assignment after the due date without penalty. Vague medical certificates are unconvincing – they must indicate how the illness impacted your ability to perform the assignment on time. Such permission must be sought before the due date unless this is absolutely impossible. Let us know of problems in advance or as soon as possible, not after the event: we are likely to be much more sympathetic and flexible in our requirements if you follow this advice.

All applications for extensions of deadlines for Assignment 1 must be submitted to Assoc/Prof Ian Goodwin or Mr Tom Mortlock. All applications for extensions of deadlines for Assignment 2 must be submitted to Dr Linda Beaumont, Ms Toni Mizerek

Please note the policy on word limits for these assignments

- Penalties apply for excessive length (10% for every 200 words exceeding the limit).

- Diagrams, figures, reference lists and footnotes don’t count in the word tally.

- Inclusion of the chart used by the lecturer in setting the question doesn't count in the word tally.

While not as important as content, the stylistics and presentation of your written work are still significant. You must express your ideas clearly and succinctly. ***Word limits will be enforced*** (see policy above), so you must take care to stick to the point.

If you experience difficulty achieving a good standard in your written presentations, please talk with your course convenor directly. The University offers excellent writing courses and resources designed to help you deal with what could potentially become a career-limiting problem if you lapse into denial about it.

Assessment of assignments will be based on the Macquarie University scale as set out in the Handbook of Undergraduate Studies (the “Calendar”): *High Distinction (HD), Distinction (D), Credit (Cr), Pass (P), Fail (Fail)*. The markers may choose to further refine these grades by appending “+” or “-” to indicate work towards the top or the bottom of each grade’s band of marks. Feedback will also come in the form of written comments on each student’s assignments,

as well as general comments directed to the entire class after all marked assignments have been returned (typically in class or via the online *Discussion Forum*). Assignments are generally marked and returned with a two-week turnaround (except if they are submitted late).

Citing and Referencing

NB: *References should ideally be restricted to peer-reviewed literature, government policies and official publications.* The use of web sites MUST be restricted to government departments or peer-reviewed scientific information. The referencing of blogs, special interest groups, media is rarely suitable, nor is the use of popular books. If in doubt, please check with the academic staff.

There are several systems of acknowledging your sources and other relevant work. The main requirements are clarity, consistency and the provision of all relevant bibliographic information so that someone else can easily find the source you are citing. Select a style and be consist with your usage of it. A good system widely adopted in the physical and environmental sciences is the “Harvard” or “author-date” method, where a brief reference to the source is given in the main text. Four examples of within-text referencing are;

- The sun is hot (Smith, 1978, pp. 4-5).
- According to Smith (1978, pp. 4-5), the sun is hot.
- Others have contested that the sun was hot, citing a lack of detailed information (Jones & Bloggs 1979).

Where there are **more than two authors**, you can abbreviate their names with a handy bit of Latin, "*et alia*" or "*et al.*" (literally meaning "and others"). And being Latin, we should *italicize* the font;

- Smith *et al*. (1981), in their reply to Jones and Bloggs (1979), presented additional data confirming that the sun is indeed hot.

Notice that I used an ampersand (“&”) within brackets only (c.f. Jones & Bloggs) but not in the running text.

Full bibliographic details of all sources cited must be listed in a “Reference List”, in alphabetic order of authors, at the end of the report. There, you should include details of the author(s), year of publication and specific pages (if required). Examples of how to construct a Reference List include;

For a **book** give: author(s), year of publication, title, publisher, and place of publication.

- Smith, K. 1994. *The Geography of Environment*. Jones Books, London.

For a **journal article** give: author(s), article title, journal name, volume number, issue number (in parentheses) and pages.

- Smith, K. and Jones, I. 1995. The Australian environment. *Geographical Review* 68(5), 99-111.

For a **chapter in an edited book**, give the following details:

- Smith, K. 1996. Seeing the Australian environment. In Jones, E. (editor) *Global Environment*. University Publishers, Melbourne, pp. 100-112.

Don't use "*et al*." in a reference list; spell out all authors. Our preference is also to include full journal names, not abbreviations.

To reference a **lecture** (which is not generally encouraged because ENVE214 assignments are supposed to stretch you beyond the lectures), you might use the following format:

- Flannery, T., ENVE214 lecture, 6th November, 2008, Macquarie University.

For a **web source** we have to ensure that - (a) authors get credit where it is due, and (b) sufficient detail is given for readers to be able to visit the site. For example, a reference to a Department of Environment and Conservation website in the text would be "DEC (2006)", and in the reference list this would expand to;

- DECC (NSW Department of Environment and Climate Change) 2008. NSW Department of Environment and Climate Change, incorporating Environment Protection Authority.

http://www.environment.nsw.gov.au/home.htm (accessed 05 August 2008).

This gives the author (in this case a corporate entity) credit for their web page, the date of their most recent update to their site, the name/title of the web site, the full URL location of their web site, and finally, the date on which you accessed their web site.

Submission of Assignments

All assignments must be submitted electronically through iLearn and in hard copy to the

Science Centre, Level 1 E7B

1. Assignments must be submitted through iLearn. All assignments will be passed through Turnitin, and students are strongly encouraged to view the originality report that turnitin creates (NB this may take 10-15 minutes after you submit your assignment).

2. All assignments are to be submitted to the Science Centre level 1 E7B by 5pm on the date specified and must include a completed and signed coversheet stapled to the front cover. The Assignment Cover Sheet can be downloaded from the web at http://www.science.mq.edu.au/documents/FoS_assignment_coversheet_09.pdf. Please do not use any other folders, plastic sleeves, wallets or envelopes - these will not be returned.

If you need to hand in your work after the date in which the rest of the assignments have been returned to students, you may be set a different assignment, even if you have completed the original one. External Students must submit all assignments through COE according to their specific protocols (i.e. using their special bar-coded folders for each submission). If you know that you are going to hand in an assignment late, you must contact the course convenor beforehand. Unless there is the appropriate documentation, late assignments will be penalised or not marked.

Obtaining Your Marked Assignment

Assignments will be returned within two teaching weeks of the submission date in the normally scheduled lectures or practical classes (so it is essential that you indicate your correct practical class timeslot on the assignment cover sheet). Assignments not collected will be returned later in the semester to the Science Centre and students may collect them there during working hours. Students will be required to show Student ID to collect assignments.

Assessment Tasks

Name	Weighting	Due
Practical/Tutorial sessions	25%	1 week after class
Assignment 1	15%	16th September, Week 7
Assignment 2	25%	4th November, Week 12
Examination	35%	November, 2014

Practical/Tutorial sessions

Due: **1 week after class**
Weighting: **25%**

Tutorial/Practical assignments (4 x 6.25%)

A brief report will be required for the tutorials/practicals in Week 2, 3, 8 and 10. These are each worth 6.25%, and are to be submitted via iLearn or at the Science Centre as advised by the lecturer, in the week following the tutorial/practical (i.e. Week 3, 4, 9, 11).

On successful completion you will be able to:

- Investigate how the global climate system operates and uncertainties involved in its prediction,
- Investigate the archive of paleoclimate data and the evidence for past climate changes,
- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
- Examine terrestrial carbon sinks and their role in the workings of our climate system
- Explore the complexities of climate change from a legal perspective, as well as that of the insurance industry,

Assignment 1

Due: **16th September, Week 7**
Weighting: **15%**

Assignment 1 (15%)

Students will be required to write a “News and Views” article demonstrating how scientific understanding of climate science has evolved over the last 20-30 years. This assignment must be uploaded onto iLearn by 5pm 16 September. More details on this assignment will be provided in the tutorial in week 4.

On successful completion you will be able to:

- Investigate how the global climate system operates and uncertainties involved in its prediction,
- Investigate the archive of paleoclimate data and the evidence for past climate changes,
- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,

Assignment 2

Due: **4th November, Week 12**
Weighting: **25%**

Assignment 2 (25%)

(Group & Individual-based assessment)

Group work will form the basis of this assignment. Students will work in groups of 3 to produce a 3-minute video on a given topic on climate change (10% on video, 5% on research quality). Students will also need to INDIVIDUALLY write a 1500-word essay associated with the video (10%). Videos will be premiered during tutorials in Week 12. More details on this assignment will be provided in the tutorial in week 6.

On successful completion you will be able to:

- Investigate how the global climate system operates and uncertainties involved in its prediction,
- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
- Examine terrestrial carbon sinks and their role in the workings of our climate system
- Identify some of the human health implications of a changing climate,
- Synthesise the impacts of the energy sector on climate, and its role in the mitigation of climate change,
- Assess some of the economic impacts of a changing climate, including carbon trading.

Examination

Due: **November, 2014**
Weighting: **35%**

2 hour long Final examination in the end of Semester 2 examination period.

Material drawn from all lectures, tutorials, practicals and assignments

On successful completion you will be able to:

- Investigate how the global climate system operates and uncertainties involved in its

prediction,

- Investigate the archive of paleoclimate data and the evidence for past climate changes,
- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
- Examine terrestrial carbon sinks and their role in the workings of our climate system
- Explore the complexities of climate change from a legal perspective, as well as that of the insurance industry,
- Identify some of the human health implications of a changing climate,
- Synthesise the impacts of the energy sector on climate, and its role in the mitigation of climate change,
- Assess some of the economic impacts of a changing climate, including carbon trading.

Delivery and Resources

There are two lectures each week. You also need to enrol in a specific practical class. The University expects that you devote 9 hours per week, in total, to a 3 credit point unit like ENVE214 - anything less will put you at a distinct disadvantage in terms of final grade.

Lectures

There are TWO lectures each week. These are:

Tuesday 11am W5A T1

Friday 9am W5A T2

N.B. Some lectures will be available as iLectures and/or as powerpoint presentations in this unit. However, you are **expected to attend and take notes during the live lectures**. Illustrative material from the lectures will be made available from the ENVE214 ilearn web site:

Practicals / Tutorials

There is ONE practical / tutorial each week. The options are:

Thursday 9 – 11am E5A260

Thursday 11 – 1pm E5A260

Thursday 2 – 4pm E5A260

Thursday 4 – 6pm E5A260

Friday 11 – 1pm E5A270

These 2-hour “hands-on” classes will be in the computer laboratory (E5A260 or E5A270). The practicals / tutorials are **compulsory** and are designed to help you work towards the assessable assignments, to allow you to build on lectures, reading and other material, and to develop some valuable generic skills. **You must complete all practicals, tutorials and both assignments in order to be eligible to sit the final examination and complete the unit successfully.**

Suggested Workload Proportion

Course Component	Suggested Workload Hours
Lecture Attendance	26 hours
Weekly Reading	26 hours
Practicals – on campus, and reporting	35 hours
Essay Assignments	40 hours
Final Examination Preparation	Minimum 8 hours

5. READING

Chapters from the following books will form the minimal reading requirements for most weeks lectures. Copies of these are held in the Macquarie University Library. Additional references on specific aspects of climate change will be announced during lectures and on the unit web page.

1. Houghton, J. 2010. Global Warming: The Complete Briefing. Fourth Edition. Cambridge University Press, Cambridge , U.K., 438 pages.

2. Hannah, L. 2010. Climate Change Biology. Academic Press. 416 pages.

Three other books that provide good overviews of Climate Change are:

1. Dessler, A. and Rason, A.A. 2010. The science and politics of global climate change. A guide to the debate. Second edition. Cambridge University Press, Cambridge , U.K., 211 pages.

2. Archer, D. and Rahmstorf, S. 2010. The climate crisis. An introductory guide to climate change. Cambridge University Press, Cambridge , U.K., 249 pages.

3. Steffen, W., Burbidge, A.A., Hughes, L., Kitching, R., Lindenmayer, D., Musgrave, W., Stafford Smith, M., P.A. Werner. 2010. Australia's Biodiversity and Climate Change. CSIRO.

CHANGES MADE IN THIS UNIT FROM 2013

The course lecture and practical content has been revised since 2013.

Unit Schedule

Climate change is one of the most important issues that humanity will have to grapple with in the 21st century. While our climate system's complex processes will certainly remain a focal point for science this century, the spotlight is shifting away from basic climate science towards questions concerning the impacts that climate change will have, and what we must do to adapt to and mitigate those impacts. The primary outcome of the course is to develop an understanding of the causes of climate change, future projections and solutions to the climate change problem.

Although it is designated as a "science" unit in the undergraduate handbook, ENVE214 is pitched to a very diverse audience; physical, biological, social, economic, and engineering perspectives will all be presented. The curriculum in ENVE214 is designed to explore the fundamentals of the climate system and the impacts on the physical environment, biological environments and social environments. We examine the global scale climate change processes including impacts on ice sheets, oceans and continental-scale precipitation, to regional climate change and impacts, with a focus on Australian and south-west Pacific regions. The unit then builds on this information to investigate the solutions to climate change including: mitigation, adaptation and renewable energy options, green business, international and national legal frameworks, and carbon emissions trading schemes.

ENVE214 Diary 2014

Date	Week	Lecture	Delivered by	Topic	Pracs/Tutorials	Due
5 Aug	1	1	Linda Beaumont	Climate change: what's the big deal?		
8 Aug		2	Ian Goodwin	Climate variation: a natural phenomenon		

12-Aug	2	3	Ian Goodwin	Climate change as a driver of human civilisations	Practical 1: Climate variability (6%) (Goodwin/Mortlock)	
15-Aug		4	Ben Ofori	Interactions between the biosphere, weather and climate		
19-Aug	3	5	Kevin Cheung	The climate system: atmosphere and ocean circulation	Practical 2: IPCC Emission Scenarios (6%) (Cheung/ Mortlock)	Practical 1
22-Aug		6	Kevin Cheung	Anthropogenic climate change: drivers and uncertainties		
26-Aug	4	7	Kevin Cheung	Climate trends, models and uncertainties	Assignment 1: Communicating climate science (Mizerek)	Practical 2
29-Aug		8	Ian Goodwin	Oceans and coastal environmental impacts		
2- Sep	5	9	Toni Mizerek	Global environmental change: the interactions of human-induced stressors		
5-Sep		10	Ian Goodwin	Alpine/polar environments		
9-Sep	6	11	Toni Mizerek	Biological fingerprints of anthropogenic climate change	Assignment 2 Vodcast (pt1) (Toni)	
12-Sep		12	Kevin Cheung	Water security		
16-Sep	7	13	Toni Mizerek	Future impacts: How can we feed a growing human population?		Assignment 1
19-Sep		14	Belinda Medlyn	Forests and terrestrial carbon sinks		
				MID SEMESTER BREAK		
7-Oct	8	15	Ben Ofori	Nature conservation in an era of climate change	Practical 3: Impacts and vulnerabilities (6%) (Ben)	
10-Oct		16	Ben Ofori	In sickness and in health: how does climate change impact on disease and human health		
14-Oct	9	17	Thomas Mortlock	Making space for water in coastal and estuarine environments		Practical 3

17-Oct		18	Peter Davies	Urban water and environments		
21-Oct	10	19	Kevin Cheung	Preparing for the worst: Extreme events	Practical 4: Geoengineering (6%) (Goodwin/Mortlock)	
24-Oct		20	Kevin Roche	Climate risk, natural disasters and insurance		
28-Oct	11	21	Ian Goodwin	Climate change mitigation with geoengineering		Practical 4
31-Oct		22	James Hazelton	Economic adaptation strategies to climate change and Carbon Tax		
4-Nov	12	23	Vlad Strezov	Energy alternatives	Vodcast (Toni, Ben)	Assignment 2
7-Nov		24	Lesley Hughes	Role of the IPCC, Climate Commission and communication climate change		
11-Nov	13	25	Peter Smith	Climate change in NSW and small island states: impacts and policy response		
14-Nov		26	Ian Goodwin	Summary lecture and overview of course		

The tutorial /practical sessions are 2 hours long. The lectures are 50 minutes each (starting at 5 minutes past the hour) and there are two per week.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_managemen

t/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them

competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Investigate how the global climate system operates and uncertainties involved in its prediction,
- Investigate the archive of paleoclimate data and the evidence for past climate changes,
- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
- Examine terrestrial carbon sinks and their role in the workings of our climate system
- Explore the complexities of climate change from a legal perspective, as well as that of the insurance industry,
- Identify some of the human health implications of a changing climate,
- Synthesise the impacts of the energy sector on climate, and its role in the mitigation of climate change,
- Assess some of the economic impacts of a changing climate, including carbon trading.

Assessment tasks

- Practical/Tutorial sessions
- Assignment 1
- Assignment 2

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Investigate how the global climate system operates and uncertainties involved in its prediction,
- Investigate the archive of paleoclimate data and the evidence for past climate changes,

- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
- Examine terrestrial carbon sinks and their role in the workings of our climate system
- Explore the complexities of climate change from a legal perspective, as well as that of the insurance industry,
- Identify some of the human health implications of a changing climate,
- Synthesise the impacts of the energy sector on climate, and its role in the mitigation of climate change,
- Assess some of the economic impacts of a changing climate, including carbon trading.

Assessment tasks

- Practical/Tutorial sessions
- Assignment 1
- Assignment 2

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Investigate how the global climate system operates and uncertainties involved in its prediction,
- Investigate the archive of paleoclimate data and the evidence for past climate changes,
- Evaluate the types and magnitudes of climatic impacts on the physical, biological (natural and human-managed) and built environments, and associated mitigation strategies,
- Examine terrestrial carbon sinks and their role in the workings of our climate system
- Explore the complexities of climate change from a legal perspective, as well as that of the insurance industry,
- Identify some of the human health implications of a changing climate,
- Synthesise the impacts of the energy sector on climate, and its role in the mitigation of climate change,
- Assess some of the economic impacts of a changing climate, including carbon trading.

Assessment tasks

- Practical/Tutorial sessions
- Assignment 1
- Assignment 2

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Assessment tasks

- Practical/Tutorial sessions
- Assignment 1
- Assignment 2