



Australia's
Global
University



IEST6911

Managing Greenhouse Gas Emissions

Summer // 2018

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Dr. Dennys Angove	d.angove@unsw.edu.au	9am - 4:45pm (c/- School) or via email	c/- School Office, 258, Level 2, Morven Brown Building	+61 2 9385 1681

Lecturers

Name	Email	Availability	Location	Phone
Dr. Mark Diesendorf	m.diesendorf@unsw.edu.au	9am - 4:45pm (c/- School) or via email	c/- School Office, 258, Level 2, Morven Brown Building	+61 2 9385 1681
Dr. Dennys Angove	d.angove@unsw.edu.au	9am - 4:45pm (c/- School) or via email	c/- School Office, 258, Level 2, Morven Brown Building	+61 2 9385 1681

School Contact Information

School of Humanities and Languages

Location: School Office, Morven Brown Building, Level 2, 258

Opening Hours: Monday - Friday, 9am - 4:45pm

Phone: +61 2 9385 1681

Fax: +61 2 9385 8705

Email: hal@unsw.edu.au

Attendance Requirements

Students are expected to be regular and punctual in attendance at all classes in the courses in which they are enrolled.

The Faculty of Arts and Social Sciences guidelines on attendance and absence can be viewed at: <https://www.arts.unsw.edu.au/current-students/academic-information/protocols-guidelines/>

From time to time, the Course Authority may vary the attendance requirements of a course. It is the students' responsibility to ensure that they are familiar with the specific attendance requirements

stipulated in the course outline for each course in which they are enrolled.

Students are expected to be regular and punctual in attendance at all classes in the courses in which they are enrolled. Students who seek to be excused from attendance or for absence must apply to the Course Authority in writing. In such situations, the following rules relating to attendances and absences apply.

A student who attends less than eighty per cent of the classes within a course may be refused final assessment. The final assessment in this course is identified under "*Course Assessment*".

In the case of illness or of absence for some other unavoidable cause students may be excused for non-attendance at classes for a period of not more than one month (i.e., 33%) or, on the recommendation of the Dean of the appropriate faculty, for a longer period.

Explanations of absences from classes or requests for permission to be absent from forthcoming classes should be addressed to the Course Authority in writing and, where applicable, should be accompanied by appropriate documentation (e.g. medical certificate). After submitting appropriate supporting documentation to the Course Authority to explain his/her absence, a student may be required to undertake supplementary class(es) or task(s) as prescribed by the Course Authority. If examinations or other forms of assessment have been missed, then the student should apply for [Special Consideration](#).

Students who falsify their attendance or falsify attendance on behalf of another student will be dealt with under the Student Misconduct Policy.

Essential Information

Class Clash

Students who are enrolled in an Arts and Social Sciences program (single or dual) and have an unavoidable timetable clash can apply for permissible timetable clash by completing an online application form. The online form can be found at: <https://www.arts.unsw.edu.au/ttclash/index.php>

Students must meet the rules and conditions in order to apply for permissible clash. The rules and conditions can be accessed online in full at: https://www.arts.unsw.edu.au/media/FASSFile/Permissible_Clash_Rules.pdf

Students who are enrolled in a non-Arts and Social Sciences program must seek advice from their home faculty on permissible clash approval.

Special Consideration for Illness and Misadventure

Students can apply for Special Consideration if illness or misadventure interferes with their assessment performance or attendance.

Applications are accepted in the following circumstances only:

- Where academic work has been hampered to a substantial degree by illness or other cause. Except in unusual circumstances, a problem involving only 3 consecutive days or a total of 5 days within the teaching period of a semester is not considered sufficient grounds for an

application.

- The circumstances must be unexpected and beyond your control. Students are expected to give priority to their university study commitments, and any absence must clearly be for circumstances beyond your control. Work commitments are not normally considered a justification.
- An absence from an assessment activity held within class contact hours or from an examination must be supported by a medical certificate or other document that clearly indicates that you were unable to be present. A student absent from an examination, or who attends an examination and wants to request special consideration, is normally required to provide a medical certificate dated the same day as the examination.
- An application for Special Consideration must be provided within 3 working days of the assessment to which it refers. In exceptional circumstances an application may be accepted outside the 3-day limit.

Students cannot claim consideration for conditions or circumstances that are the consequences of their own actions or inactions.

Applications are normally not considered if:

- The condition or event is not related to performance or is considered to be not serious
- More than 3 days have elapsed since the assessment for which consideration is sought
- Any key information is missing
- Supporting documentation does not meet requirements
- The assessment task is worth less than 20% of the total course assessment, unless the student can provide a medical certificate that covers three consecutive days.

Applications for Special Consideration must be made via Online Services in myUNSW. Log into myUNSW and go to My Student Profile tab > My Student Services channel > Online Services > Special Consideration.

Applications on the grounds of illness must be filled in by a medical practitioner. Further information is available at: <https://student.unsw.edu.au/guide>

If a student is granted an extension under Special Consideration, failure to meet the stipulated deadline will result in a penalty. The penalty will be invoked one minute past the approved extension time. See section "Submission of Assessment Tasks", under '*Late Submission of Assignments*' for penalties of late submission.

Formal Examination

Students will be informed by the course coordinators if a final exam is to be scheduled in the formal examination period for Summer Term (2-6 February 2018 and 9-12 February 2018). Students are expected to give their studies priority and this includes making themselves available for the entire examination period. Travel commitments made prior to the publication of the final examination timetable are not a valid reason for alternate assessment.

For information about examination dates, location and procedures at UNSW, visit: <https://my.unsw.edu.au/student/academiclife/assessment/examinations/examinations.html>

Grades

All results are reviewed at the end of each semester and may be adjusted to ensure equitable marking across the School.

The proportion of marks lying in each grading range is determined not by any formula or quota system, but by the way that students respond to assessment tasks and how well they meet the learning outcomes of the course. Nevertheless, since higher grades imply performance that is well above average, the number of distinctions and high distinctions awarded in a typical course is relatively small. At the other extreme, on average 6.1% of students do not meet minimum standards and a little more (8.6%) in first year courses. For more information on the grading categories see:

<https://my.unsw.edu.au/student/academiclife/assessment/GuideToUNSWGrades.html>

Grievances and Review of Assessment Results

Grievances

All students should be treated fairly in the course of their studies at UNSW. Students who feel they have not been dealt with fairly should, in the first instance, attempt to resolve any issues with their tutor or course convenor.

If such an approach fails to resolve the matter, the School of Humanities and Languages has an academic member of staff who acts as a Grievance Officer for the School. This staff member is identified on the notice board in the School of Humanities and Languages. Further information about UNSW grievance procedures is available at: <https://student.unsw.edu.au/guide>

Review of Assessment Results

There is no automatic right to have an assessment reviewed, the Faculty reserves the right to make such judgements.

In the first instance a student should seek an informal clarification, this should normally be done within two working days of the return of the assessed work.

If the student is not satisfied with the informal process, they should complete the UNSW Review of Results Application form, which is available at: <https://student.unsw.edu.au/results>. An application must be lodged within 15 working days of receiving the result of the assessment task.

Further information on review of student work in the Faculty of Arts and Social Sciences can be viewed at: <https://www.arts.unsw.edu.au/current-students/academic-information/Protocols-Guidelines/>

Course Evaluation and Development

Courses are periodically reviewed and students' feedback is used to improve them. Feedback is gathered from students using myExperience. It is encouraged students complete their surveys by accessing the personalised web link via the Moodle course site.

Student Support

The Learning Centre is available for individual consultation and workshops on academic skills. Find out more by visiting the Centre's website at: <http://www.lc.unsw.edu.au>

myUNSW

myUNSW is the online access point for UNSW services and information, integrating online services for applicants, commencing and current students and UNSW staff. To visit myUNSW please visit either of the below links: <https://my.unsw.edu.au>

OHS

UNSW's Occupational Health and Safety Policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others. For all matters relating to Occupational Health, Safety and environment, see <http://www.ohs.unsw.edu.au/>

Student Equity and Disabilities Unit

Students who have a disability that requires some adjustment in their learning and teaching environment are encouraged to discuss their study needs with the course convener prior to or at the commencement of the course, or with the Student Equity Officers (Disability) in the Student Equity and Disabilities Unit (9385 4734). Information for students with disabilities is available at: <https://student.unsw.edu.au/disability>

Issues that can be discussed may include access to materials, signers or note-takers, the provision of services and additional examination and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

Course Details

Credit Points 6

Summary of the Course

This interdisciplinary short course teaches students to explain and evaluate the scientific evidence for the anthropogenic greenhouse effect and its potential impacts; evaluate the various technologies proposed for greenhouse gas mitigation; develop policies and strategies for all levels of government to reduce substantially greenhouse gas emissions; and compare and evaluate different scenarios for achieving these reductions in the energy and transport sectors.

At the conclusion of this course the student will be able to

1. Explain and evaluate the key issues in the scientific evidence for the enhanced greenhouse effect (EGE) and its potential impacts, both biophysical and socio-economic.
2. Evaluate the various technologies proposed as greenhouse solutions.
3. Develop and evaluate policies, strategies and action plans for all levels of government and other stakeholders to reduce substantially Australia's greenhouse gas emissions.
4. Compare different scenarios for achieving the reductions.
5. Conduct intelligent and constructive dialogues with policy professionals from all principal stakeholders about reducing greenhouse gas emissions.

Teaching Strategies

This interdisciplinary short course uses lectures and tutorials to teach students to explain and evaluate the scientific evidence for the anthropogenic greenhouse effect and its potential impacts; evaluate the various technologies proposed for greenhouse gas mitigation; develop policies and strategies for all levels of government to reduce substantially greenhouse gas emissions; and compare and evaluate different scenarios for achieving these reductions in the energy and transport sectors. It is run intensively, with 3 days of classes, followed by a break and then another 2 days to allow students to read and prepare a presentation. Distance mode is available and the distance students have posts staggered over a longer time period to allow them more time to study the materials.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Group presentation to class	35%	04/12/2017 09:00 AM	
In-class examination	25%	11/12/2017 06:00 PM	
Report	40%	01/02/2018 04:00 PM	

Assessment Details

Assessment 1: Group presentation to class

Start date: 04/12/2017 09:00 AM

Length: 15 minutes plus presentation + 5 question time

Details: Approx 20 min group presentation. Verbal feedback immediately followed by a written mark sheet.

Additional details:

For on-campus students, this assignment should be prepared and presented in groups of two or three, preferably three. For distance students, it is to be prepared and presented individually. Learning outcomes assessed by this task are 2, 4 and 5.

Value: 35%

Choice of topic by 5.15 pm on Day 2 of classes

Due date: 9.00 am, Monday 4 December 2017

The focus of this assignment is the implementation and widespread dissemination of efficient energy use or energy demand reduction in the use of a specific, existing technology or measure, to be chosen from **one** of the following categories of efficient energy use or energy demand reduction:

- one household energy-using appliance: eg refrigerator, or washing machine, or TV;
- residential solar hot water;
- industrial solar hot water;
- residential solar space heating and cooling;
- solar cogeneration, that is, solar PV that also produces hot water or space heating;
- one energy-using item of office equipment: eg, photocopier, or printer, or computer;
- residential building envelope excluding windows (outer walls, roof & floors);
- windows;
- commercial building heating, ventilating and air conditioning (HVAC) system;
- refrigeration in supermarkets;
- one energy-intensive industrial process: eg, aluminium smelting, or steel-making, or petroleum refining;

- one energy-intensive item of industrial equipment: eg, boiler or electric motor;
- one construction material: eg, cement/concrete or steel or aluminium
- energy conservation (that is, having fewer energy services) in the home;
- electricity price structures to encourage demand reduction and solar PV while cutting peak demand.

The principal task of the assignment is to outline the barriers to, and the key policies and strategies required, for dissemination of your chosen technology/measure, indicating which stakeholders should implement each policy/strategy.

In the introduction to your presentation/poster, you will need to explain briefly how the technology or process works and its potential for cutting GHG emissions. Remember you are addressing a multidisciplinary and interdisciplinary class, so keep technical terms to the minimum and explain them when you introduce them.

Instructions for on-campus students

For on-campus students, this task should be undertaken in groups of two or three, preferably three. You will need to form a group and have your choice of topic approved by the course coordinator before 5.15 pm on Day 2 of classes (28 November 2017). This is to avoid having the same item of technology presented by more than one group. The first group to pick a topic and have it approved by the class facilitator gets it. You may form a group and choose a topic as soon as you receive this final version of the Course Outline. Email your group names and topic to d.angove@unsw.edu.au and await confirmation of your topic.

On-campus students will need to prepare and present a 15-minute 'slide' presentation (to be followed by up to 5 minutes of class discussion), in either PowerPoint or PDF format with one slide per page.

You should be ready to make your presentation to the class on the due date. Bring it on a USB memory stick (plus a backup). Maximum of 14 slides (minimum of 10), not counting cover-slide, to be submitted on due date in electronic form. It is recommended that group members share the delivery of the presentation to the class. All presentations will be made available to the class via the Web after the end of lectures as PDF files.

Marking will be based on content (70%) and clarity (30%) of presentation. Only a basic skill in using the software is required e.g. dot points with pictures, diagrams or graphs where appropriate. No additional marks will be awarded for elaborate or fancy slides with flashing lights.

For clarity, it is recommended that you don't squeeze too much information into each slide. The verbal explanation accompanying the presentation can fill out the details.

Instructions for distance students

For distance students, this task will be undertaken individually and will take the form of an online 'poster session' in Moodle, within which you will present material on your chosen topic, respond to questions from your classmates and ask them questions about their 'posters'.

Poster sessions are a common feature of academic conferences and symposia. They are often undertaken in a dedicated room at the conference venue, with presenters having to stand near a printed poster summarising their research in order to answer questions. Your task will follow this format, but with two key differences – your poster will be online (hence it will appear more like a blog post than a physical

poster) and you will not have to stand with your poster at a set time, but rather visit the discussion forum regularly across three days to respond to questions/comments.

You will need to have your choice of topic approved by the Dr. Angove before *5.15 pm on 28 November 2017*. This is to avoid having the same item of technology covered in more than one poster. Email your topic to d.angove@unsw.edu.au and await confirmation of your topic.

A discussion forum entitled 'Assessment 1 Poster Session' will be created on the Moodle page for IEST6911. All distance students will need to create a new discussion topic within the forum and present their poster (in the form of an initial post) by *9:30am on 4 December 2017*. This initial post is limited to 1000 words (excluding references and captions), but it can feature images, videos and links from various online sources. You should include a short list of references at the end, as is common with a poster presentation at a conference. However, if some of your source material is available online you may choose to reference this by embedding links into your post.

You are required to visit your 'poster' and respond to any questions or comments that have made by other students up until *12 noon Friday 8 December 2017*. You are also required to view the posters presented by other distance students and you are expected to make comments on at least three posters other than your own. You may ask a question, present your opinion, post additional information or build on comments made by other students.

Finally, you will need to make a concluding post as a 'reply' to your initial post (and the discussion that has flowed from it). This concluding post will need to be made sometime between *12 noon on Friday 8 December and 11:59 pm on Sunday 10 December*. This concluding post should reflect on the comments made by other students as well as what you have learnt from looking at other students' posters.

Marking for distance students will be based on content (70%), clarity of presentation (15%) and participation in the discussion of your poster and those of other students (15%). Given the limitations of Moodle discussion forums, you are not expected to use fancy formatting or features. However, you are encouraged to use the basic features available in Moodle to highlight key points in your presentation, such as dot points, diagrams, tables, embedded videos (e.g. from YouTube) and links where appropriate.

Turnitin setting: This is not a Turnitin assignment

Assessment 2: In-class examination

Start date:

Details: In-class exam (ca. 2 hours) with written feedback provided.

Additional details:

The purpose of the short informal test is to encourage you to keep up with, and strive to understand, the lectures as they are delivered and the textbook readings. Learning outcomes assessed by this task are 1, 2 and 4.

Value: 25%

For on-campus students, the 2-hour test will be held in Mathews 104 (CAT104) It will commence at 6:00 pm on *Monday 11 December*, with 15 minutes reading time followed by 2 hours writing time. Please be

sure to arrive by 6:00 pm. Books, printed notes and internet access are permitted.

For distance students, the test will be emailed out to you shortly before 6:00 pm on Monday 11 December. You will need to paste your answer to each question underneath the question, save the file as a pdf and email to d.angove@unsw.edu.au by 8:30 pm on Monday 11 December. The filename of your assignment should have the form: Familyname_IEST6911_Asst2.pdf and you should receive an acknowledgement within 24 hours. If any distance students wish to do the exam on-campus in Mathews 104, they should notify the course convener at least a day before the exam.

Turnitin setting: This is not a Turnitin assignment

Assessment 3: Report

Start date:

Length: 2000 words

Details: Final report. Approx 2000 words. Feedback via individual comments. This is the final assessment for attendance purposes.

Additional details:

An individual, written, take-home assignment of value 40%. It will be distributed on the last day of class. You will be asked to write a short paper to answer ONE out of two or three general questions, with your answer being about 1800 words (maximum 2000 words) plus references. Due *Thursday 1 February 2018, 4.00 pm* Australian eastern summer time. Learning outcomes assessed by this task are 2, 3, 4 and 5.

Referencing: A minimum of 5 key references is expected, maximum 10. Please use the Harvard system of referencing. In short, Harvard system cites author's surname, year and, if relevant, page number in the text and collects references at the end of your short paper in alphabetical order of surnames. Don't cite anonymous references such as Wikipedia or websites of unknown individuals or groups. Try to cite primary sources – such as journal papers, book chapters and reports from organisations – rather than secondary sources such as newspaper articles or blogs. Check that each reference cited in the text of your paper appears in the reference list at the end and that each reference in the list is cited in the text.

Requested format is PDF, with 3 cm margins, in Times Roman 12 point, single-spaced with a blank line between each paragraph. The first page of the paper should be a cover page, with your name, student ID, course code IEST6911 and Assignment 3. The filename of your assignment should have the form: Familyname_IEST6911_Asst3.pdf.

Submit your assignment via your login to Moodle as well as to d.angove@unsw.edu.au by the due date. Keep a copy.

Turnitin setting: This assignment is submitted through Turnitin, students do not see Turnitin similarity reports

Submission of Assessment Tasks

Assignments must be submitted electronically through Moodle (<http://moodle.telt.unsw.edu.au/>). You must use your zID login to submit your assignments in Moodle.

Refer to the section “*Course Assessment*” for details of assessment tasks that are to be submitted via Moodle.

**** Please note the deadline to submit an assignment electronically is 4:00 pm on the due date of the assignment.**

When you submit your assignment electronically, you agree that:

I have followed the [Student Code of Conduct](#). I certify that I have read and understand the University requirements in respect of student academic misconduct outlined in the [Student Code of Conduct](#) and the [Student Misconduct Procedures](#). I declare that this assessment item is my own work, except where acknowledged, and has not been submitted for academic credit previously in whole or in part.

I acknowledge that the assessor of this item may, for assessment purposes:

- provide a copy to another staff member of the University
- communicate a copy of this assessment item to a plagiarism checking service (such as Turnitin) which may retain a copy of the assessment item on its database for the purpose of future plagiarism checking.

You are required to put **your name (as it appears in University records)** and **UNSW Student ID** on **every page** of your assignments.

If you encounter a problem when attempting to submit your assignment through Moodle/Turnitin, please telephone External Support on 9385 3331 or email them on externalsupport@unsw.edu.au. Support hours are 8:00am – 10:00pm on weekdays and 9:00am – 5:00pm on weekends (365 days a year).

If you are unable to submit your assignment due to a fault with Turnitin you may apply for an extension, but you must retain your ticket number from External Support (along with any other relevant documents) to include as evidence to support your extension application. If you email External Support you will automatically receive a ticket number, but if you telephone you will need to specifically ask for one. Turnitin also provides updates on its system status on Twitter.

For information on how to submit assignments online via Moodle: <https://student.unsw.edu.au/how-submit-assignment-moodle>

Late Submission of Assignments

Students are responsible for the submission of assessment tasks by the required dates and times. Depending of the extent of delay in the submission of an assessment task past the due date and time, one of the following late penalties will apply unless Special Consideration or a blanket extension due to a technical outage is granted. For the purpose of late penalty calculation, a ‘day’ is deemed to be each

24-hour period (or part thereof) past the stipulated deadline for submission.

- **Work submitted less than 10 days after the stipulated deadline** is subject to a deduction of 5% of the total awardable mark from the mark that would have been achieved if not for the penalty for every day past the stipulated deadline for submission. That is, a student who submits an assignment with a stipulated deadline of 4:00pm on 13 May 2016 at 4:10pm on 14 May 2016 will incur a deduction of 10%.

Task with a non-integer percentage mark

If the task is marked out of 25, then late submission will attract a penalty of a deduction of 1.25 from the mark awarded to the student for every 24-hour period (or part thereof) past the stipulated deadline.

Example: A student submits an essay 48 hours and 10 minutes after the stipulated deadline. The total possible mark for the essay is 25. The essay receives a mark of 17. The student's mark is therefore $17 - [25 (0.05 \times 3)] = 13.25$.

Task with a percentage mark

If the task is marked out of 100%, then late submission will attract a penalty of a deduction of 5% from the mark awarded to the student for every 24-hour period (or part thereof) past the stipulated deadline.

Example: A student submits an essay 48 hours and 10 minutes after the stipulated deadline. The essay is marked out of 100%. The essay receives a mark of 68. The student's mark is therefore $68 - 15 = 53$

- **Work submitted 10 to 19 days after the stipulated deadline** will be assessed and feedback provided but a mark of zero will be recorded. If the work would have received a pass mark but for the lateness and the work is a compulsory course component (hurdle requirement), a student will be deemed to have met that requirement;
- **Work submitted 20 or more days after the stipulated deadline** will not be accepted for assessment and will receive no feedback, mark or grade. If the assessment task is a compulsory component of the course a student will receive an Unsatisfactory Fail (UF) grade as a result of unsatisfactory performance in essential component of the course.

Academic Honesty and Plagiarism

Plagiarism is presenting someone else's thoughts or work as your own. It can take many forms, from not having appropriate academic referencing to deliberate cheating.

In many cases plagiarism is the result of inexperience about academic conventions. The University has resources and information to assist you to avoid plagiarism.

The Learning Centre assists students with understanding academic integrity and how to not plagiarise. Information is available on their website: <https://student.unsw.edu.au/plagiarism/>. They also hold workshops and can help students one-on-one.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However, more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an Honours thesis) or even suspension from the university. The Student Misconduct Procedures are available here: <http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf>

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 27 November - 3 December	Blended	<p>Day 1 – 27th Nov, Lecture 1, 9 am – Noon</p> <p>Introduction (Dr. Angove)</p> <p>Overview of course & assessment. Formula for environmental impact $I = PAT$. This course focuses on Technology T, the need to address population P and affluence (consumption per person) A.</p> <p>Review of greenhouse (GH) science & impacts (Dr. Angove)</p> <p>Overview of atmospheric structure and science of the GH; critical analysis of claims by GH science deniers; global and Australian greenhouse gas (GHG) emissions by gas and by industry sector.</p> <p>DAY 1: 27th Nov., Lecture 2; 1–3 pm</p> <p>Introduction to energy (Dr. Angove)</p> <p>What is energy? Energy use in the world and Australia; breakdown of greenhouse gas emissions from energy sector. Energy conversion & its efficiency; Principle of Energy Conservation (1st Law of Thermodynamics); primary energy and end-use energy; units of energy and power; energy service; least-cost planning or energy performance contracting; 2nd Law of Thermodynamics. Efficient energy use: technical and economic potentials for electricity and heating/cooling. Demand reduction by smart devices.</p> <p>DAY 1: 27th Nov., Tutorial; 3-5 pm</p> <hr/> <p>DAY 2: 28th Nov., Lecture 1; 9 am-Noon</p> <p>Electricity generation systems. (Dr. Diesendorf)</p> <p>Basic concepts of balancing supply & demand; loss-of-load probability; base-load, intermediate load & peak-load demand; availability, capacity factor and</p>

capacity credit of power stations; optimal mix of power stations.

Renewable energy technologies (Dr. Diesendorf)

Wind, solar hot water, solar electricity, bioenergy, marine and geothermal energy: technologies, resources, economics and impacts

DAY 2: 28th Nov., Lecture 2; 1-3 pm

Renewable energy scenarios (Dr. Diesendorf)

Sustainable energy and transport scenarios for the world and Australia. Status of technologies.

Renewable energy deniers (Dr. Diesendorf)

Myths about renewable energy and their refutations

DAY 2: 28th Nov., Tutorial; 3-5 pm

DAY 3: 29th Nov., Lecture 1; 9 am-Noon

Nuclear energy (Dr. Diesendorf)

Technologies, status, scenarios, resources, economics, environmental & health impacts, proliferation of nuclear weapons. Timescale for dissemination. Different types of risk.

Transport (Dr. Angove)

Introduction to urban transport and urban form; comparative studies of global cities by Newman & Kenworthy; Current transport emissions; Technologies & urban planning for reducing transport emissions.

DAY 3: 29th Nov., Lecture 2; 1-3 pm

Policies for climate mitigation (Dr. Diesendorf)

Innovation theory: types of policy needed for technologies of different status. Why a carbon price is necessary but not sufficient; carbon tax and emissions trading in more depth; direct government funding; tax deductions; loan guarantees. Finance.

		<p>Clean coal technology (CCT) (Dr. Angove)</p> <p>What is CCT? Ultracritical/supercritical coal-fired power plants. Carbon capture, sequestration and process emissions. Benefits and risks of implementing clean coal technology.</p> <p>DAY 3: 29th Nov., Tutorial; 3-5 pm</p> <hr/> <p>Lecture Break: 30th Nov. to 3rd December inclusive</p> <p>Preparation of Assessment 1 on implementing efficient energy use.</p>
<p>Week 2: 4 December - 10 December</p>	<p>Blended</p>	<p>DAY 4: 4th Dec.; 9 am-5 pm</p> <p>Group presentations of Assessment 1 by on-campus students; individual assessments submitted by distance students</p> <hr/> <p>DAY5: 5th Dec., Lecture 1; 9 am-Noon</p> <p>Policies (continued) (Dr. Diesendorf)</p> <p>Renewable energy certificates or renewable portfolio standards; feed-in tariffs; contracts for difference; a just transition. Non-pricing policies for energy efficiency: regulations & standards. Merit Order Effect. The 'death spiral' faced by the electricity industry.</p> <p>DAY5: 5th Dec., Lecture 2; 1-3 pm</p> <p>Policies (continued) (Dr. Angove)</p> <p>International greenhouse processes, policies and politics. Current Australian federal & state government policies. Addressing growth in population and consumption per person. Is it possible to conduct rapid climate mitigation like a war? GH solutions in the face of intransigent governments: community action.</p> <p>DAY 5: 5th Dec., Tutorial; 3-5 pm</p>

		<p>Study Break: 6th to 10th December inclusive</p> <p>Study period for Assessment 2, Short Exam on 11th December</p>
Week 3: 11 December - 17 December	Assessment	<p>DAY 6: 11th Dec., Assessment 2; 6-8.15 pm</p> <p>Short informal exam</p> <p>On-campus students: Mathews 104 (CAT104); distance students: either online or (by arrangement) in Mathews 104 (CAT104)</p>

Resources

Prescribed Resources

The textbook for the course is:

Diesendorf M (2014) *Sustainable Energy Solutions for Climate Change*, UNSW Press, Sydney, and Routledge-Earthscan, London.

The textbook is available from the UNSW bookshop. It is strongly recommended that both on-campus and distance students read Chapters 1-4 of the textbook **before** the course commences officially on **27 November 2017**.

Recommended readings, websites and videos are also given in this course outline.

Recommended Resources

Most of the information you will need is in the lectures and textbook. Slideshows of lectures will be uploaded to the class Moodle website shortly after they are presented in class. Audio recordings of some of the lectures will also be uploaded.

The following supplementary readings are included to provide optional additional background, details and references. Some may be useful for your **Assessment 3**. The readings and websites marked * are particularly valuable for your education on GHG mitigation.

Websites were accessed October 2017. Please inform the course convener if any are no longer operating. Some references that cannot be accessed by Internet will be uploaded onto the Web, subject to copyright laws

Greenhouse science

CSIRO and Bureau of Meteorology (2016) *State of Climate 2016*. <http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2016.pdf>

*Hansen J, Sato M, Kharecha P et al. (2008) Target atmospheric CO₂: Where should humanity aim? *Open Atmospheric Science Journal* 2: 217–31.

IPCC (2013) *Climate Change 2013: The Physical Science Basis*.

IPCC (2014) *Climate Change 2014: Impacts, Adaptation and Vulnerability*.

IPCC (2014) *Climate Change 2014: Mitigation of Climate Change*.

Download from www.ipcc.ch . These are for reference. Note that the three reports and their Technical Summaries have been written by the scientists, but the Summaries for Policymakers have been modified by the representatives of various governments.

Krull E (2009) Amazonian's black magic has multiple benefits, *Ecos* 146:14–16, Dec-Jan, <http://www.ecomagazine.com/nid/206/issue/5304.htm> .

Mackey B, Keith H, Berry S, Lindenmayer DB (2008) *Green Carbon: The role of natural forests in carbon storage*, Part 1. A green carbon account of the eucalypt forests of south-east Australia. ANU E Press, Canberra.

NASA – Global Climate Change <https://climate.nasa.gov>

Parr JF, Sullivan LA (2005) Soil carbon sequestration in phytoliths. *Soil Biology & Biochemistry* 37: 117–124.

Potsdam Institute for Climate Impact Research <https://www.pik-potsdam.de>

Real Climate, a website by climatologists: www.realclimate.org.

Schiermeier Q (2010) The real holes in climate science. *Nature* 463:284–7, 21 January.

*Skeptical Science: Getting skeptical about global warming skepticism. www.skepticalscience.com .

Climate mitigation in general

Australian National Audit Office: <https://www.anao.gov.au/work/performance-audit/accounting-reporting-australias-greenhouse-gas-emissions-estimates>

Hamilton C (2013) *Earthmasters: The dawn of the age of climate engineering*. Yale University Press & Allen & Unwin.

Delina L, Diesendorf M (2013) Is wartime mobilisation a suitable policy model for rapid national climate mitigation? *Energy Policy* 58:371-380

Renewable energy and related technologies and policies

Allen P et al (2013) *Zero Carbon Britain: Rethinking the future*. Centre for Alternative Technology, Machynlleth UK <http://www.zerocarbonbritain.org/images/pdfs/ZCBrtflo-res.pdf>

Australian Broadcasting Corporation (2014) *Power to the People*. Four Corners, 8 July, www.abc.net.au/4corners/stories/2014/07/07/4038488.htm

Baumber A (2016) *Bioenergy Crops for Ecosystem Health and Sustainability*. London & New York: Earthscan from Routledge. Chapter 2: Bioenergy and Climate Change (on course Moodle website).

Boyle G (ed) (2012) *Renewable Energy: Power for a sustainable future*. 3rd ed., Oxford University Press.

Elliston B, MacGill I, Diesendorf M. (2014) Comparing least cost scenarios for 100% renewable electricity with low emission fossil fuel scenarios in the Australian National Electricity Market, *Renewable Energy* 66:196-204.

Eurosolar: <http://www.eurosolar.de/en/>

European Wind Energy Association: <http://www.ewea.org>.

ISES (International Solar Energy Society): www.ises.org .

INFORSE (International Network for Sustainable Energy): <http://www.inforse.org> .

IRENA (International Renewable Energy Agency): www.irena.org .

Jacobson MZ, Delucchi MA (2011) Providing all global energy with wind, water, and solar power, part I: technologies, energy resources, quantities and areas of infrastructure, and materials. *Energy Policy* 39 (3):1154-1169; Delucchi MA, Jacobson MZ (2011) Providing all global energy with wind, water, and solar power, part II: reliability, system and transmission costs, and policies. *Energy Policy* 39 (3):1170-1190.

*REN21 (2017) *Renewables 2017: Global Status Report*. <http://www.ren21.net/status-of-renewables/global-status-report> .

*RenewEconomy website and bulletin, edited by Giles Parkinson <http://reneweconomy.com.au> .

Sørensen, B (2011) *Renewable Energy: Its physics, engineering, environmental impacts, economics and planning*. 4th ed., Academic Press, San Diego. (Textbook for scientists and engineers.)

Energy efficiency

Energy Efficiency Council (2016) *Australian Energy Efficiency Policy Handbook*. 1st ed. <http://www.eec.org.au/policy-advocacy/handbook>

McKinsey & Company (2009) *Pathways to a Low-Carbon Economy*. Version 2 of the global greenhouse gas *abatement* cost curve, http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves

Transport and urban form

Bureau of Infrastructure, Transport and Regional Economics (BITRE) (2009) *Greenhouse gas emissions from Australian transport: projections to 2020, Working paper 73*, Canberra ACT.

Newman P, Beatley T, Boyer H (2009) *Resilient Cities: Responding to peak oil and climate change*, Island Press, Washington.

Newman P (2008) *Cities as Sustainable Ecosystems*. Island Press, Washington DC.

Victoria Transport Policy Institute, British Columbia, Canada: www.vtppi.org

Nuclear energy

Lowe, Ian (2007) Reaction time: climate change and the nuclear option. *Quarterly Essay*, Issue 27, pp.1–88.

* Schneider M, Froggatt A (2017) *The World Nuclear Industry Status Report 2017*, Mycle Schneider Consulting, Paris, London, Washington DC, July. <http://www.worldnuclearreport.org>

Sovacool, Benjamin K (2011) *Contesting the Future of Nuclear Power*. World Scientific, New Jersey.

World Nuclear Association <http://www.world-nuclear.org>

Economics, markets and carbon pricing

ABC national radio, Rear Vision, 12/1/2011, Carbon Tax.
<http://www.abc.net.au/rn/rearvision/stories/2011/3085312.htm#transcript>

Carbon Fee and Dividend: <https://citizensclimatelobby.org/carbon-fee-and-dividend>.

Carbon tax website: <http://www.carbontax.org> .

Center for the Advancement of the Steady State Economy: <http://steadystate.org> .

Dietz R, O'Neill D (2013) *Enough is Enough: Building a sustainable economy in a world of finite resources*, BK, San Francisco

Jackson, T (2009) *Prosperity without Growth: Economics for a finite planet*. Earthscan, London.

Laing T, Mehling M (2013) International Experience with Emissions Trading. Climate Strategies, <http://climatestrategies.org/publication/international-experience-with-emissions-trading/>

UNFCCC (2007) *The Kyoto Protocol Mechanisms: International Emissions Trading, Clean Development Mechanism, Joint Implementation*. <http://unfccc.int/resource/docs/publications/mechanisms.pdf>

Barriers to, myths about, and politics of mitigation

*Australian Broadcasting Corporation (2006) *The Greenhouse Mafia*, Four Corners, Program transcript, 13/2/2006 <<http://www.abc.net.au/4corners/content/2006/s1568867.htm>>.

Butler, M (2017) *Climate Wars*. Melbourne University Press, Melbourne.

*Diesendorf M (2016) Renewable energy versus nuclear: dispelling the myths. *The Ecologist*, 19 April, reprinted in *RenewEconomy* 22 April. <http://reneweconomy.com.au/renewable-energy-versus-nuclear-dispelling-the-myths-48635/>

*Diesendorf M (2016) Dispelling the nuclear 'baseload' myth: nothing renewables can't do better! *The Ecologist*, 10 March, http://www.theecologist.org/News/news_analysis/2987376/dispelling_the_nuclear_baseload_myth_nothing_renewables_cant_do_better.html

Diesendorf M (2014) Get fact: testing Ian Plimer on wind and solar power. Crikey.com, 14-7-2014, <http://www.crikey.com.au/2014/07/14/get-fact-testing-ian-plimer-on-wind-and-solar-power/>

*Keane S (2011) The ugly landscape of the Guardians.
<http://www.independentaustralia.net/2011/environment/the-ugly-landscape-of-the-guardians>.

*Klein, N (2011) Capitalism versus the climate. *The Nation*
<http://www.thenation.com/article/164497/capitalism-vs-climate?page=0,0> .

Naomi Klein interviewed on ABC national radio, Late Night Live (36 min.):
http://mpegmedia.abc.net.au/rn/podcast/2015/09/lnl_20150902_2205.mp3

Klein N (2014) *This Changes Everything*. Allen Lane.

O'Connor M, Lines W J (2011) *Overloading Australia: How governments and media dither and deny on population*. 4th edition, Envirobook, Sydney.

Oreskes N, Conway EM (2010) *Merchants of Doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. Bloomsbury.

Pearse G (2007) *High and Dry*. Viking, Melbourne. See also www.guypearse.com .

Pearse G, McKnight D, Burton, B (2013) *Big Coal: Australia's dirtiest habit*. New South Publishing, Sydney.

Riedy, C (2007) *Energy and Transport Subsidies in Australia*. A report to Greenpeace Australia Pacific. <http://cfsites1.uts.edu.au/find/isf/publications/riedy2007subsidies.pdf> .

Urgenda decision, Netherlands (2016). <http://www.urgenda.nl/en/climate-case/>

Washington H, Cook, J (2011) *Climate Change Denial: Heads in the sand*. Earthscan.

Waters, Larissa (2016). Ban donations from mining companies and stop ministers working for them 2016: http://www.theguardian.com/commentisfree/2016/mar/01/larissa-waters-ban-donations-from-mining-companies-and-stop-ministers-working-for-them?CMP=share_btn_tw

Community climate action

350.org

100% Renewable Energy: <http://www.100-percent.org> .

Act on Climate: <http://www.aoc.org.au>.

Australian Youth Climate Coalition: <http://aycc.org.au> .

Beyond Zero Emissions: <http://bze.org.au>.

Climate Action Network Australia: <http://cana.net.au> .

Climate Council: <https://www.climatecouncil.org.au>.

Climate and Health Alliance: www.caha.org.au/.

Citizens' Climate Lobby (Australia): <https://au.citizensclimatelobby.org>.

*Diesendorf, M (2009) *Climate Action: A Campaign Manual for Greenhouse Solutions*, UNSW Press, Sydney.

Doctors for the Environment Australia: <https://www.dea.org.au>.

Farmers for Climate Action: www.farmersforclimateaction.org.au.

Moral Ground: <http://moralground.com> .

Religious Response to Climate Change: <http://www.arrcc.org.au> .

Solar Citizens <http://www.solarcitizens.org.au> .

Videos

What's the worst that can happen? The most terrifying video you will ever see. 9:30 min.

<http://www.youtube.com/watch?v=zORv8wwiadQ>

*Video: Skeptical Science. 'The five characteristics of science denial' (9 min.)

<http://www.skepticalscience.com/One-Nation-Malcolm-Roberts-denial-about-facts-climate-change.html>

350.org: Do the Math – the Movie. 45 min. <https://www.youtube.com/watch?v=KuCGVwJIRd0>

*Samsø is CO2 negative. 5:33 min.

http://www.youtube.com/watch?v=1_ZY0ilFdYw .

*Güssing as a model for regional economic improvement. 8:13 min.

<http://www.youtube.com/watch?v=H1WsbQQNsV0> .

Smartgrid (Energinet, Denmark). 15 min. <http://energinet.dk/EN/FORSKNING/Energinet-dks-forskning-og-udvikling/Smart-Grid/Sider/Film-Smart-Grid-Danmark.aspx> .

Gemasolar concentrated solar thermal power station with thermal storage. 3:30 min.

<http://cleantechnica.com/2011/10/08/spains-gemasolar-247-power-plant-video> .

*icoal2.0 GetUpAustralia (53s)

<http://www.youtube.com/watch?v=2HCL4eH7yAc&feature=Playlist&p=EB5BD521B9ED258F&index=19>

Paul Ekins on carbon energy taxation: 24 min., <http://www.youtube.com/watch?v=88Q4Dbn5qv8> .

*GetUp: Climate change denier 'Lord' Monkton advising a room full of mining executives on how the industry must gain control of Australia's media. 3:29 min.

<https://www.getup.org.au/campaigns/mining/monckton/get-this-ad-in-the-paper> .

The Nocebo effect (relevant to the alleged wind turbine syndrome): 6.47 min.

http://www.youtube.com/watch?v=O2hO4_UeE-4&feature=youtu.be&a

The Nature of the Challenge by Prof. W. Steffen of the ANU Climate Change Inst.

<https://www.youtube.com/watch?v=yiHc8vbTOTI&feature=youtu.be> (46 mins).

Craig Morris: Germany is 20 years away from 100% renewable power – not.

<http://energytransition.de/2016/01/germany-is-20-years-away-from-100-percent-renewable-power-not/>

Course Evaluation and Development

The course is periodically reviewed and students' feedback is used to improve its content and

delivery. Feedback is gathered from students using myExperience. Students are encouraged to complete their surveys by accessing the personalised web link via the Moodle course site.

Image Credit

This image of a fall streak hole was photographed from Soldiers Beach in 2017 and was kindly supplied by Wes Hooper.

CRICOS

CRICOS Provider Code: 00098G