

## **Introduction to Climate Change**

Welcome to Introduction to Climate Change. For the past decade, the World Economic Forum has put out a yearly review of the greatest threats to our world—the economic and geopolitical risks that endanger our planet, our way of life, and even our species. For four years running until 2020, failure to take action on climate change (leading to "extreme weather") has been recognised as the top threat. In 2021 this was displaced only by the coronavirus pandemic. And as we have seen over the past 18 months, extreme weather events which are exacerbated by climate change often interact with the pandemic to produce multiple crises for people and societies to deal with.

This subject asks - can we survive climate change? To answer this question we look at the science, the politics and who is most vulnerable to climate change. We will take you through the basics of understanding the causes behind climate change, future projections of climate impacts, and the political, economic and social solutions to climate change, both internationally and in Australia. We look forward to exploring these interlinked topics with you.

## **Subject Description**

### **Overview**

This subject is an introduction to the major topics in climate change, including the scientific basis of the greenhouse effect, the history of Earth's climate, energy options, economics and public policy, the effect of climate change on food, water and health, and the national and international legal frameworks for the management of climate change.

The issues around climate change are evolving rapidly, both politically and within the wider community. This subject is the first of a sequence of three subjects, aimed to provide a broad, cross-disciplinary approach to climate change. In particular, students will explore and debate the issues on a range of topics, with an emphasis on the international and global implications.

### **Intended Learning Outcomes (ILOs)**

The subject will provide a comprehensive and up-to-date introduction to all aspects of the climate change debate. Students will be provided with the opportunity to explore current issues, and to interact with Australian scientific and political leaders with expertise and interests in climate change. In addition, students will be asked to evaluate and integrate this information within their own local context.

Subject specific ILOs:

1. Be able to contrast disciplinary and interdisciplinary perspectives on climate change in order to evaluate local and international public discourse on the topic.
2. Investigate contemporary issues of national and global importance related to climate change and be able to apply relevant disciplinary perspectives to answer different aspects of questions raised.
3. Demonstrate the ability to critically analyse information on climate change through written and oral communication activities.

4. Demonstrate the capacity to integrate disciplinary knowledge and approaches when discussing interdisciplinary problems.
5. Define and identify the disciplinary foundation of key terms, concepts and theories of climate change knowledge.
6. Understand how their disciplinary expertise contributes to and responds to climate change.

### Skills

On the completion of this subject, students should have developed the following generic skills:

- Quantitative skills, including the ability to compute estimates of relevant data required to understand the scientific issues;
- The ability to write a logically argued and properly researched essay;
- The ability to critically assess information from a range of sources, and assess its quality and relevance to the questions under consideration.

### Timetable

The subject has two 1-hour lectures per week, on Mondays and Wednesdays at midday. Students will also be enrolled in a tutorial group, with one tutorial per week. Please see the Subject Information tab under Modules for a detailed lecture schedule.

### Assessment overview

Description	
1.	An abstract and outline for the essay, including bibliography (equivalent to 400 words), worth 10% of the final grade, due Week 6 <ul style="list-style-type: none"> <li>• 400 words</li> </ul>
2.	Essay worth 50% (2,000 words) Due Week 10 <ul style="list-style-type: none"> <li>• 2000 words</li> </ul>
3.	Tutorial Discussions Paper (equivalent to 600 words), worth 15% of the final grade, due throughout semester. <ul style="list-style-type: none"> <li>• 600 words</li> </ul>
4.	1-hour exam will be 25% (equivalent to 1,000 words) Due in the examination Period <ul style="list-style-type: none"> <li>• 1 hour</li> </ul>

### Lecture overview

	No	Title	Key learning outcomes
Introductory	1.1	INTRODUCTION	Can we survive climate change? Subject overview, assessment expectations
	1.2	THE STORY OF EMISSIONS:	How are emissions growth and economic development

		DEVELOPMENT SCENARIOS AND CLIMATE MITIGATION	linked? What are our future developmental choices and what does this mean for climate mitigation? Looking at growth in energy-use and consumption since the industrial revolution, which countries are responsible for emissions to date
Climate Science	2.1	CLIMATE SCIENCE OBSERVATIONS AND BASICS	What climate change have we observed recently? How does it compare to the Earth's history? How is climate change caused? how do we know that recent climate change is human-induced?
	2.2	EXPECTED FUTURE CLIMATE CHANGE	What climate change can we expect in the future? What do we need to know to project climate change? What are the major impacts expected in Australia? Time to say goodbye to coral reefs? What future climate change could people survive (or not survive)?
	3.1	THE THEORY OF CLIMATE SCIENCE	What does science tell us what we need to do to limit climate change? Can we limit sea level rise? Do we need to limit CO2 to net-zero? What is our remaining carbon budget? In more detail, how do so-called SSP and RCP future scenarios compare and what do they mean?
	3.2	THE SCIENCE BEHIND MITIGATING CLIMATE CHANGE	What is the carbon cycle and what does it do? What are other gases and driving forces of climate change? Is it true that every extra ton of CO <sub>2</sub> causes less and less climate change?
Physical Geography	4.1	CLIMATE CHANGE AND HYDROLOGICAL PROCESSES	What impact will climate change have on water resources? What is the spatial variability of hydrological change? How are different types of water resources affected?
	4.2	CLIMATE CHANGE IN THE COASTAL ZONE	To understand how interacting processes can shape global coastlines; To recognise how climate change can influence these processes and increase risk to coastal communities.
	5.1	THE HISTORY OF EMISSIONS 1	What do records of pre-instrumental climate change (e.g. from ice-cores and tree-rings) tell us about the magnitude of human impacts? What can information about the past inform what might happen in the future?
	5.2	THE HISTORY OF EMISSIONS 2	We can understand Earth's climate and greenhouse emissions history through the study of 'natural archives'. How is this research carried out and why is it so important?
Human Geography	6.1	FORESTS, BIODIVERSITY AND INDIGENOUS KNOWLEDGE	The climate crisis and biodiversity crisis overlap in both causes, impacts and solutions. This lecture looks at the role of forests and other natural ecosystems in responding to climate change, and how the practices, knowledge systems and land rights of indigenous peoples contribute to these solutions.
	6.2	SOCIAL VULNERABILITY TO CLIMATE CHANGE	What does vulnerability (to climate change) mean? How is/does that vulnerability caused by/impact on societies? What does that look like in the context of the South Pacific?
	7.1	ADAPTING TO CLIMATE CHANGE 1	What does it mean to adapt to climate change? How is this impacted by terms like adaptive capacity, sensitivity, exposure, maladaptation, and barriers and limits?

	7.2	ADAPTING TO CLIMATE CHANGE 2	What does it mean to adapt to climate change? What are the real-world implications of these concepts? What might be some of the constraints to adaptation in practice? What are some of the key considerations when deciding what adaptation actions a community might take?
Politics and economics	8.1	CLIMATE CHANGE AND EXISTENTIAL RISK	Climate change has increasingly been framed in political debate as an existential risk. That is, a state of affairs that might threaten the survival of the human species. How does that affect 'our' response to the question: can we survive climate change?
	8.2	SCIENCE, CLIMATE CHANGE EDUCATION AND COMMUNICATION	Scientific understanding of climate change has foregrounded disputes between scientific experts and non-scientists. What do these disputes do to the raft of policies and platforms for climate, including/especially climate change education & communication? What are possible pathways beyond the dispute platform for climate changing communities?
	9.1	POWER IN THE UNFCCC	The history and structure of the UNFCCC and key outcomes of the Paris Agreement. What is the role of power in international climate negotiations? Who are the main actors and major country alliances and their key objectives?
	9.2	CLIMATE JUSTICE IN THE UNFCCC	What is a fair and ambitious contribution to achieving the Paris Agreement? Identify strengths and weaknesses of key country NDCs. What types of climate responses help us survive climate change?
	10.1	THE BUSINESS CASE FOR EMISSIONS REDUCTIONS 1	What is the role of business in <i>causing</i> climate change? How has business helped drive climate science denial? What systemic drivers underpin business unsustainability?
	10.2	THE BUSINESS CASE FOR EMISSIONS REDUCTIONS 2	What is the role of business in <i>surviving</i> climate change? Do we need degrowth? What are the business risks and opportunities for being sustainable?
	11.1	AUSTRALIAN CLIMATE POLITICS AND POLICY 1	An overview of the history of climate politics in Australia.
	11.2	AUSTRALIAN CLIMATE POLITICS AND POLICY 2	Is Australia on track for meeting (and beating) its climate commitments? How do Australia's emissions compare to the rest of the world? Are our emissions going up or down?
	12.1	POLICIES, NDCs and SECTORAL EMISSION REDUCTIONS	To achieve the Paris Agreement targets, what do models say is the cost-effective way of reducing emissions? Is it optimal for Australia to reduce 28% in the electricity sector? What should Australia's target be? What do models suggest for sectoral energy development in a 200% renewable energy scenario for Australia?
	12.2	CONCLUSIONS: CAN WE SURVIVE CLIMATE CHANGE?	Pulling together subject themes and thinking about the exam.

## Readings

## What's expected?

The lectures for this course cover a lot of information and some complex concepts - these readings are chosen to help you prepare for the lectures so that you are ready to take in the information and understand the concepts as we go along.

While these readings are not compulsory it is clear from past years that the students who do them are the ones that excel in this course. They provide extra explanation of key concepts and theories and so are extremely useful for revision and preparation for your assessments, and are a good starting point for research for your major essay.

Readings for the tutorials are compulsory - you will not be able to participate in tutorial discussions or present a discussion paper without doing the tutorial readings. We have tried as much as possible to overlap these readings that support the lectures with the readings you will need to do for the tutorials. These are highlighted below for you, and are a good starting point with the readings.

Under 'Extra resources' at the bottom of this module you will find some other useful general reading material, links and resources.

## Week one: Introduction. Climate change and development

A great source of information about past, present and future emissions is the Global Carbon Atlas. Spend some time looking over the information it provides: <http://www.globalcarbonatlas.org/en/content/welcome-carbon-atlas>

1. Steffen, W., et al. (2015). The Trajectory of the Anthropocene: The Great Acceleration. *Anthropocene Review*, 1-18.
2. Turner, G. (2014). Is Global Collapse Imminent? University of Melbourne, Melbourne Sustainable Society Institute.
3. Global Energy Review 2021: Assessing the effects of economic recoveries on global energy demand and CO2 emissions in 2021. [GlobalEnergyReview2021.pdf](#)
4. For something a bit lighter, try Henley & Abram, The three-minute story of climate change. *The Conversation*: <https://theconversation.com/the-three-minute-story-of-800-000-years-of-climate-change-with-a-sting-in-the-tail-73368>

## Week two: Climate science basics

1. Sections A to E in the IPCC Fifth Assessment Report Summary for Policymakers of Working Group I, available here: [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_SPM\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_SPM_FINAL.pdf)
2. Section SPM1 (Observed changes and their causes) and SPM1.2 (causes of climate change) on pages 3 to 6 of the Synthesis Report of the IPCC Fifth Assessment Report: [https://www.ipcc.ch/site/assets/uploads/2018/02/AR5\\_SYR\\_FINAL\\_SPM.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/AR5_SYR_FINAL_SPM.pdf)
3. Section B "Projected Climate Change, Potential Impacts and Associated Risks" on pages 7 to 13 of IPCC Report on 1.5C warming, available here: [https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15\\_SPM\\_version\\_report\\_LR.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf)

### **Week three: The theory of climate science**

1. Section 6.1.1 and Box 6.1 in the IPCC Sixth Assessment Report of Working Group I, Chapter 6 “Carbon and Other Biogeochemical Cycles”, on pages 470 to 475, available here: [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_Chapter06\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter06_FINAL.pdf)
2. Riahi et al., (2017). The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. *Global Environmental Change*, 42: 153-168. <https://www.sciencedirect.com/science/article/pii/S0959378016300681>
3. Read this explanation of the shared socioeconomic pathways: <https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change>

### **Week four: Hydrological processes / coastlines and climate change**

1. Vörösmarty, Charles J., et al. (2000). Global water resources: vulnerability from climate change and population growth. *Science*, 289(5477): 284-288.
2. Drought in Australia  
<https://theconversation.com/is-australias-current-drought-caused-by-climate-change-its-complicated-97867>
3. Flood patterns in Australia  
<https://theconversation.com/planning-for-a-rainy-day-theres-still-lots-to-learn-about-australias-flood-patterns-68170>
4. McInnes, K.L., White, C.J., Haigh, I.D., Hemer, M.A., Hoeke, R.K., Holbrook, N.J., Kiem, A.S., Oliver, E.C., Ranasinghe, R., Walsh, K.J. and Westra, S., (2016). Natural hazards in Australia: sea level and coastal extremes. *Climatic change*, 139(1):69-83.
5. Hayward, B. (2008). 'Nowhere far from the sea': political challenges of coastal adaptation to climate change in New Zealand. *Political Science*, 60(1), 47-59.
6. Esteves, L. (2018). Climate change: we need to start moving people away from some coastal areas, warns scientist. *The Conversation*. <https://theconversation.com/climate-change-we-need-to-start-moving-people-away-from-some-coastal-areas-warns-scientist-101351>

### **Week 5: The History of emissions**

1. Jouzel and Masson-Delmotte, (2010). Paleoclimates: what do we learn from deep ice cores? *WIREs Climate Change*, 1. DOI: 10.1002/wcc.72
2. Stringer, (2011). A human perspective. *Nature Climate Change*, 1:287-28
3. Ruddiman et al. (2020) The early anthropogenic hypothesis: A review. *Quaternary Science Reviews*, doi.org/10.1016/j.quascirev.2020.106386

### **Week six: Social vulnerability to climate change**

1. Eriksen, S. H. & K. O'Brien (2007). Vulnerability, poverty and the need for sustainable adaptation measures. *Climate Policy*, 7, 337-352. DOI: 10.1080/14693062.2007.9685660
2. Hackmann, H., S. C. Moser & A. L. St. Clair (2014). The social heart of global environmental change. *Nature Climate Change*, 4, 653. DOI: 10.1038/nclimate2320

3. Kelly, P. M., & Adger, W. N. (2000). Theory and practice in assessing vulnerability to climate change and facilitating adaptation. *Climatic Change*, 47(4).

### **Week seven: Adapting to climate change**

1. Pages 3-13 of O'Brien, K., & Selboe, E. (Eds.). (2015). *The Adaptive Challenge of Climate Change*. Cambridge: Cambridge University Press.
2. Barnett, J. (2010) Maladaptation. *Global Environmental Change*, 20, 211-213.
3. Podcast: 2016. Community-based adaptation: Dr David Satterthwaite, IIED In *The Adaptation Conversation*. Acclimatise UK. Listen at: <https://soundcloud.com/acclimatise/community-based-adaptation-dr-david-satterthwaite-iiied> (10.5 mins)
4. Fisher, S. (2012) What is climate change adaptation? *The Guardian* 27 Feb. Accessed: <https://www.theguardian.com/environment/2012/feb/27/climate-change-adaptation>

### **Week eight: Climate change and existential risk**

1. Silova, I., Komatsu, H., & Rappleye, J. (2018). Facing the climate change catastrophe: Education as solution or cause? *Worlds of Education[blog]*. <https://www.norrag.org/facing-the-climate-change-catastrophe-education-as-solution-or-cause-by-iveta-silova-hikaru-komatsu-and-jeremy-rappleye/> (Links to an external site.)
2. Whyte, K. (2017). Indigenous climate change studies: Indigenizing futures, decolonizing the Anthropocene. *English Language Notes*, 55(1/2), 153–162. [Whyte, 2017, Indigenous climate change studies](#) (Links to an external site.)
3. Lobo, M., Bedford, L., Bellingham, R. A., Davies, K., Halafoff, A., Mayes, E., Sutton, B., Walsh, A. M., Stein, S., & Lucas, C. (2020). Earth unbound: Climate change, activism and justice. *Educational Philosophy and Theory*. <https://doi.org/10.1080/00131857.2020.1866541> (Links to an external site.)
4. Kareiva and Carranza, 2018. Existential risk due to ecosystem collapse: Nature strikes back. *Futures*, 102, 39-50.

### **Week nine: Understanding the UNFCCC**

1. Okereke, C., & Coventry, P. (2016). Climate justice and the international regime: Before, during, and after Paris. *WIREs Climate Change*, 7(6), 834–851. <https://doi.org/10.1002/wcc.419>
2. Dimitrov et al. 2019. Institutional and environmental effectiveness: Will the Paris Agreement work? *WIREs Climate Change*, 10(4).
3. Civil Society Review – Equity after Paris. [http://civilsocietyreview.org/files/COP24\\_CS0\\_Equity\\_Review\\_Report.pdf](http://civilsocietyreview.org/files/COP24_CS0_Equity_Review_Report.pdf)
4. Dooley & Stabinsky, (2015). How 1.5C became the most important number at the Paris climate talks, *The Conversation*. <https://theconversation.com/how-1-5-became-the-most-important-number-at-the-paris-climate-talks-51960>

## Week ten: The business case for emissions reductions

1. Wright and Nyberg, 2017, An Inconvenient truth: How organizations translate climate change into business as usual. *Academy of Management Journal*
2. Inside Interface's bold new mission to achieve 'Climate Take Back'.  
<https://www.greenbiz.com/article/inside-interfaces-bold-new-mission-achieve-climate-take-back>
3. Alexander, Samuel. We need economic 'degrowth' to stop a carbon budget blowout. *The Conversation*. <https://theconversation.com/we-need-economic-degrowth-to-stop-a-carbon-budget-blowout-31228>

## Week eleven: Australian climate politics and policy

1. Crowley, K. (2017). Up and down with climate politics 2013–2016: the repeal of carbon pricing in Australia. *WIREs Climate Change*. Vol 8(3).
2. Beckman, L. (2008). Do global climate change and the interest of future generations have implications for democracy? *Environmental Politics*, 17(4), 610-624.
3. Wood, P. M. (2004). Intergenerational justice and curtailments on the discretionary powers of governments. *Environmental Ethics*, 26(4), 411-428.

## Week twelve: Policies, national targets and sectoral emissions reductions

1. Section C in Summary for Policy Makers of the IPCC Special Report on 1.5C warming, on pages 12 to 17, available here:  
[https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15\\_SPM\\_version\\_report\\_LR.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf)

## Extra Resources

### Climate grief

- **Read** Blanche Verlie's work - Verlie, B. (2019). Bearing worlds: learning to live-with climate change. *Environmental Education Research*, 25(5), 751–766. <https://doi.org/10.1080/13504622.2019.1637823> (Links to an external site.)
- **Watch** this blog, where Blanche discusses the above paper - <https://www.youtube.com/watch?v=aHnoJ5eC6xs> (Links to an external site.)
- **Act**. Use this comprehensive toolkit "Staying sane in the face of climate change and other dilemmas" <https://indd.adobe.com/view/ba3ff4c0-e554-4230-b23a-533dbe7a26c9> (Links to an external site.)

### Indigenous perspectives

- **Watch** the 2020 Narrm oration from Associate Professor Michael Shawn-Fletcher. <https://www.youtube.com/watch?v=sK7gGVhss7w> (Links to an external site.)



- **Listen** to Sana Nakata & Michael-Shawn Fletcher in this podcast as they explore '5 things about Indigenous knowledge'. <https://player.whooshkaa.com/episode?id=845273> (Links to an external site.)
- **Read** a written summary of the First Nations Climate Justice Panel, which offers insights into the climate crisis from a First Nations' perspective and includes a range of resources to elevate First Nations voices in the climate conversation. <https://emergencyleadersforclimateaction.org.au/first-nations-climate-justice-panel/> (Links to an external site.)
- **Act.** Explore the theme of Heal Country from an Indigenous perspective in this article by Bhiemie Williamson. He provides three ways everyday Australians can stand up for and protect Country. <https://theconversation.com/although-we-didnt-produce-these-problems-we-suffer-them-3-ways-you-can-help-in-naidocs-call-to-heal-country-163362> (Links to an external site.)

### Climate Science

These sites have a huge amount of information and commentary that may be useful in guiding your thinking on key concepts for the assessment:

- The Intergovernmental Panel on Climate Change Latest Report - <https://www.ipcc.ch/report/ar5/>
- NASA Resources on Global Climate Change - <https://climate.nasa.gov/>
- CSIRO Latest Assessment of Climate Change in Australia - <https://www.csiro.au/en/Showcase/state-of-the-climate>
- Bureau of Meteorology Australian Climate Data and Maps - <http://www.bom.gov.au/climate/change/#tabs=Tracker&tracker=timeseries>
- Australian Academy of Science Key Climate Change Report - <https://www.science.org.au/news-and-events/news-and-media-releases/risks-australia-warmer-world> (Links to an external site.)
- Nature Climate Change Journal - <https://www.nature.com/nclimate/>

### Adaptation

- National Climate Change Adaptation Research Facility - <https://www.nccarf.edu.au/>

### International Negotiations

- The UNs Climate Change Portal - <http://www.un.org/climatechange/index.html>
- The UNFCCC Climate Change Portal - <https://unfccc.int/>