This handbook applies to students starting the MSc (by coursework) in Environmental Change and Management in Michaelmas Term 2017. The information in this handbook may be different for students starting in other years.

The Examination Regulations relating to this course are available at http://www.admin.ox.ac.uk/examregs/. If there is a conflict between information in this handbook and the Examination Regulations then you should follow the Examination Regulations. If you have any concerns please contact Dr Lorraine Wild (Academic Administrator) via lorraine.wild@ouce.ox.ac.uk.

Disclaimer
The information in this handbook is accurate as at 1st October 2017 however it may be necessary for changes to be made in certain circumstances, as explained at http://www.graduate.ox.ac.uk/coursechanges. If such changes are made the department will publish a new version of this handbook together with a list of the changes and students will be informed.

MSc (by coursework) in Environmental Change and Management

2017: version 1.0

For the latest version of this handbook please see http://www.qeog.ox.ac.uk/graduate/msc-ecm/handbook.html
I am delighted to welcome you to the School of Geography and the Environment. The School of Geography and the Environment and its associated research centres (Environmental Change Institute, Transport Studies Unit and the Smith School of Enterprise and the Environment) act as a unique hub for teaching and research at Oxford on the interactions between people and environments. Together, we provide our undergraduates, MSc, MPhil and DPhil students with the combination of social and natural science skills to engage effectively with the big themes of the 21st century: from climate change to globalization; from philosophies of nature and society to biodiversity conservation; and from the frontiers of environmental science to the hard realities of public policy and corporate decision-making. The world-class quality of our research, which was recognised yet again in the latest national assessment exercise (REF 2014), underpins our teaching excellence. Our strengths mean that the School continues to shine internationally, having recently come first for the seventh year running in the QS rankings of geography departments within the world’s top 900 universities. In 2017 the School was also awarded a bronze Athena SWAN award for its 4-year equality and diversity action plan. We take pride in the range and scope of our postgraduate programmes, and believe that our learning environment will further hone your intellectual skills – with lifelong benefits.

I hope that you will be very happy in the University of Oxford and that you will flourish academically and personally during your time here. The collegiate University provides a diverse and enriching series of opportunities to learn new skills, and I encourage you to make the most of what is on offer. Within the School, I trust that you will become active participants and engage with the many events and activities that we host.

Heather A Viles
Professor of Biogeomorphology and Heritage Conservation
Head, School of Geography and the Environment
As Director of Graduate Studies (Taught Programmes), I am delighted to welcome you to the School of Geography and the Environment. The School is an intellectually demanding but supportive environment in which to study. We emphasize both independent and collaborative styles of working, providing a wealth of opportunities to engage in an energetic research and teaching culture through class discussions, seminars, reading groups, field work and many other academic and social events. Gaining entry to our taught programmes is challenging and we therefore have great confidence that each of you brings something special to the cohort you are joining. I am sure you will be looking forward to getting to know your new classmates within the International Graduate School and to tackling new challenges and new ideas within your chosen taught programme. I look forward to meeting you as your course progresses.

Robert Whittaker
Professor of Biogeography,
Director of Graduates Studies (Taught Programmes)

The genius of this course is its focus on environmental change, which has always shaped human society just as humanity has shaped environmental change. As Course Director, I look forward to embarking with you on this intense but remarkable one year MSc. One of the exciting things about being at the ECI is the wonderful, creative mix of researchers, practitioners and students who come together around our critical ECM themes, including climate change, energy, food, water, and ecosystems. With such a dynamic, transdisciplinary combination of international expertise and experience, creative new synergies are bound to form. Through the ECM course and the extraordinary array of extracurricular opportunities available, students inevitably help to catalyse these synergies, and thus are a critical part of the ECI’s vitality and success. The teaching team consistently remarks upon how much they enjoy the mutual learning that goes on through group and one-on-one interactions with students. I encourage you to engage with the team and the wealth of resources and opportunities available within and beyond the School of Geography and the Environment as a means of extending your learning and capitalising on your own experience of environmental change.

Welcome to the Anthropocene! How should we respond to it?

Tom Thornton
Course Director, Senior Research Fellow & Associate Professor
The Environmental Change Institute (ECI) is Oxford University's interdisciplinary institute for research on the complex processes of global environmental change, the exploration of sustainable solutions and the promotion of change for the better through partnership and education. The Environmental Change Institute has 26 years of experience in helping governments, business and communities anticipate and respond to the risks and opportunities of environmental change. We do this through advanced measurement, analysis and simulation of environmental change and the drivers affecting it. At the ECI we are instinctive integrators who can’t resist grasping the interdependencies between the various dimensions of global environmental change. The ECI’s interdisciplinary approach is inspired by the needs of decision-makers who are striving to respond to global environmental change. Engaging seriously with the challenge confronted by decision-makers is a constant stimulus for innovation in our research, education and engagement.

As Director of the ECI, I would also like to welcome you to the ECI, and promise that your time with us will be fully utilised both in your own studies, but also in creating long lasting links with the many and varied researchers in the ECI and Oxford University. The Environmental Change and Management course is a centrepiece in the ECI’s mission. We have designed the course to reflect our ever-changing understanding of the processes that are shaping the planet and the opportunities for responding to them. Our aim is to get you to both learn about the issues and to contribute to their resolution. This is a tough assignment.

Jim W Hall

Professor of Climate and Environmental Risks
Director of the Environmental Change Institute
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1. INTRODUCTION

1.1. Course Introduction

This handbook provides an overview of the MSc in Environmental Change and Management (ECM). The MSc in ECM also serves as the first year (and qualifying examination) of the two year MPhil in Environmental Change and Management. MPhil students should also refer to the handbook for the MPhil course for the details of the MPhil examination conventions and the year two research thesis.

This handbook sets out the aims of the course, the content of the study programme and the various component parts of the course, including: lectures, electives, skills workshops, field trips, examinations, and dissertations. The handbook contains important information about submitting coursework, guidelines for dissertations and attending examinations. Please read through the booklet carefully and ensure that you understand your obligations throughout the course. We will provide you with more detailed material for particular parts of the course throughout the year.

1.2. School of Geography and the Environment

The School of Geography and the Environment (SoGE) and its associated research institutes, based in the Oxford University Centre for the Environment (OUCE), are internationally recognised for their excellence in environmental research and scholarship. The historical origins of OUCE lie in the former School of Geography, the first geography school to be established in the UK, over 100 years ago by Halford Mackinder. The School was established through a co-operative effort involving the Royal Geographical Society and Oxford University. From these deep roots the School has grown and prospered. The ethos of the School of Geography and the Environment is to promote research that is bold, innovative and challenging whilst remaining committed to the highest standards of scholarship.

Today, the School of Geography and the Environment (SoGE) is one of the leading centres of scholarship for environmental and social change. The SoGE is committed to training a new generation of graduate students in the core research fields of environmental science and human geography and in the new and exciting interdisciplinary research frontiers that exist between and across these disciplines.

The School of Geography and the Environment is home to the internationally recognised Environmental Change Institute (ECI) and other vibrant research centres, such as the Oxford Centre for Tropical Forests (OCTF) and the Oxford Centre for Water Research (OCWR), along with cross-departmental research groups, such as the Climate Systems and Policy, African Environments Programme (AEP) and the Global Environmental Change and Food Systems (GECAFS) international project office. In January 2013, the Smith School of Enterprise and the Environment became a research centre within the School of Geography and Environment. Creative combination of theory and practice provides a relevant and fertile training ground for our postgraduates. Our research programmes span the globe with researchers working in Africa, Asia, the Caribbean, and North America along with a strong record in European studies and, of course, the UK.

The SoGE currently offers five thesis-based higher research degrees (DPhil and four MPhil courses) and four MSc courses. The DPhil requires a separate application of admission which is contingent on outstanding performance in
the MSc (see the SoGE website for additional details and attend the Michaelmas Term information session). Conversion to the MPhil requires an application of transfer, which is described in detail below. The four SoGE Masters of Science courses are:

- MSc Biodiversity, Conservation and Management
- MSc Environmental Change and Management
- MSc Nature, Society and Environmental Governance
- MSc Water Science, Policy and Management

The four MPhil courses are two-year version of these programmes aimed at students who wish to have a substantial research component to their studies. In the first year, candidates take the coursework and examinations associated with one of the four MSc courses in the School of Geography and the Environment and in the second year, students devote most of their time to researching and writing a thesis of 30,000 words.

1.3. Transfer from MSc to MPhil

During the MSc course some students decide that they would like to extend their studies by transferring to the 2 year MPhil programme. In the first instance you should discuss the possibility of transferring with your Course Director. The deadline for making an application to transfer to the MPhil is Friday week 1 of Trinity Term. Applications should be submitted to Ruth Saxton, Research Degrees Coordinator (research-degrees-coordinator@ouce.ox.ac.uk). The application should include:

- an email of support from the agreed supervisor of your MPhil thesis (sent directly to Ruth Saxton by the deadline)
- a completed Change of Programme of Study form (GSO.28) signed by and approved by both your college and proposed dissertation supervisor.
- an MPhil dissertation proposal (to a maximum of 1000 words) outlining the context, aims, methods, and timetable of your proposed research.

All applications will be reviewed by a panel Chaired by the DGS (Taught Programmes) in early Trinity Term.

Applications will be assessed on the basis of the academic performance of the applicant, the dissertation proposal, and any resource requirements from the School (including staffing and supervision resources). Applications will normally only be considered from students who have achieved at least 60% in their assessed essays from the two electives. Students will not be permitted to transfer to the MPhil if they do not pass all of their MSc examinations.

Final decisions on applications to transfer to the MPhil will only be confirmed after the meeting of the MPhil (Qualifying Examination) board in early July. The department retains the right to refuse a transfer.

You should also note that your college will ask for evidence that you have the financial means to cover the fees and living expenses of the additional year of study.

1.4. The Environmental Change Institute

Within the School, the Environmental Change Institute is the largest entity with more than 90 researchers, 300
partners, and approximately 70 postgraduate students in the ECM MSc, MPhil, and DPhil programmes. The ECI is a hub for environmental research, policy solutions and outreach and helps to anchor the five Oxford Networks for the Environment (ONE): biodiversity, climate, energy, food, and water.

An interdisciplinary institute that undertakes research on pressing environmental issues, the ECI organises this MSc, and fosters university-wide networks and outreach on the environment. It is a major centre for environmental activities at the University. The ECI was founded in 1991, through benefactions, and designed to answer questions about how and why the environment is changing and how we can respond through public policy, private enterprise, and social initiatives. The ECI’s interdisciplinary approach, bringing together natural and social scientists and engineers, is inspired by the needs of decision-makers who are striving to respond to global environmental change.

The Institute is currently organised around three major research themes – climate change, energy and lower carbon futures, and ecosystem science and conservation - with close links to the School of Geography of Environment research clusters in climate systems and policy, landscape dynamics and biodiversity, as well as the Smith School for Enterprise and the Environment, the Martin School, and the Saïd Business School (see 1+1 MBA Programme: http://www.sbs.ox.ac.uk/degrees/oxford1plus1/Pages/default.aspx).

Most ECI staff are full time research scientists working on specific externally funded projects within the Institute’s research themes, although we also host a number of research fellows working more independently on cross-cutting issues, as well as a wide range of Honorary Research Associates (HRAs). Many of the research projects have a goal of influencing and informing public policy and decisions about the environment. We encourage you to engage with ECI staff, many of whom teach on the course and their specific research programmes. For more information on the ECI see www.eci.ox.ac.uk.

This inter-disciplinary course is led by academics in SoGE and other departments from anthropology to zoology, and supported by experienced practitioners, all of whom have considerable national and international expertise.

The core staff teaching on the course are listed in the appendix and more detailed personal profiles are available at: http://www.eci.ox.ac.uk/people/. Their specific roles on the course are described below.

The ECI hosts a special welcome event for new students during the first weeks of Michaelmas Term.

1.5. Oxford Learning Environment

1.5.1. Learning Approach

During your time at Oxford you will experience a wide range of different formats and styles of teaching, from small group discussions to field visits, from skills based workshops to presentations, and from traditional lectures to public talks by some of the world’s leading academics. In keeping with Oxford’s tradition of academic freedom, the exact nature of the learning experience within any particular tutorial, seminar or lecture is left to the discretion of the instructors which, we hope, produces a dramatic variety of learning experiences. Yet, the most typical forum for teaching and learning remains the lecture – although there is immense variation in how lectures are delivered and all involve opportunity for participation and discussion.

In the International Graduate School, we place strong emphasis on peer group and individual learning. Your peer
group consists of exceptionally talented scholars from around the world (typically 13-20 different countries and 5-6 continents), many of whom have practical experience or extensive knowledge of issues and topics covered in the MSc course. We strongly recommend that you form strong academic bonds with your peers and we encourage this with small group projects, reading groups, workshops and discussions.

There is an obligation on you as an individual to develop your own spheres of interest within the subject area and to work hard at identifying gaps in your knowledge and training. Oxford’s exceptional learning facilities provide unrivalled opportunities for individual learning, not to mention the array of international researchers and scholars who present their work at external lectures around the university. We urge you to take full advantage of all of these opportunities in order to get the most out of your time at Oxford.

Staff members are available to advise students on reading, literature, methods, skills and topics. Staff members include not only faculty who lecture, but also those who lead workshops, symposia, exercises, reading groups, methods surgeries and other special forums. Each core module is led by a team, including faculty members and a course animator or teaching assistant. The course animator’s role is to help link module lectures and readings with practical skills, and also to extend learning and reinforce key concepts through other modes of learning, such as reading groups, field courses, discussions, and debates. This year we are fortunate to have two primary teaching assistants (TAs) for the course, Daniel Adshead, Carolina Gueiros, and two additional TAs, Jade Leung and Kiron Neale, who will provide additional support to the overall teaching and learning environment and mission. Finally, an ECI Graduate Supervisor will be assigned to assist and oversee each student, and will endeavour to contact you regarding your progress at least once a term and to respond to your termly self-assessments on the GSS or Graduate Supervision System (http://www.admin.ox.ac.uk/gss/). As well, your College will provide a personal adviser who can give additional support.

Students should note the University guidelines on graduate students undertaking paid work: http://www.admin.ox.ac.uk/edc/policiesandguidance/policyonpaidwork/

1.5.2 Feedback on Learning and Assessment

Throughout the year, there will be opportunities for informal and formative feedback on your learning and understanding through class discussions, peer feedback on presentations and interactions with course staff. You will receive written and/or oral feedback on at least one piece of formative assessment for each elective and written feedback on your two summative elective essays. This feedback will focus on identifying the good points of your essay and give suggestions on how to improve the quality of your written work. You will also receive written feedback on your dissertation.

1.5.3 If you need help

If you find yourself facing a problem during your course of study you can seek advice and support from various sources in the University. Generally, the department is best qualified to help you navigate problems relating to the academic content of the course and your college is best qualified to provide support and advice relating to health or personal problems.
Every college has their own systems of support for students, please refer to your College handbook or website for more information on who to contact and what support is available through your college. Details of the wide range of sources of support available more widely in the University are available from the Oxford Students website (www.ox.ac.uk/students/welfare), including in relation to mental and physical health and disability.

1.5.4. Library and Learning Facilities
The Oxford University library system is extensive, with dozens of individual facilities around the city. For most students the Radcliffe Science Library (RSL) is the primary port of call. Andrew Kernot is the geography librarian, based at the RSL, and leads workshops on library skills and resources during induction week.

More information may be found at: http://www.ox.ac.uk/research/libraries/ and in the library subject guide for Geography & the Environment: http://libguides.bodleian.ox.ac.uk/geography

1.5.5. WebLearn
WebLearn is Oxford University’s virtual learning environment. Each course has its own space (rooms) where we post general course information along with lecture notes, reading lists and other materials specific to each module, workshop or field trip. The WebLearn resource system also contains information on all staff and students at Oxford, and their groups, thus allowing you to easily restrict access to certain cohorts. https://weblearn.ox.ac.uk/portal.

1.5.6. Oxford University Computing Services
Oxford University Computing Services (http://www.oucs.ox.ac.uk/) offer a wide range of Information Technology support including excellent training courses and a shop selling leading software at educational discount prices.

1.5.7. Alumni Networks
The MSc in Environmental Change and Management has been running an active alumni network since its first year. Twenty years on, with some 700 alumni spanning over 70 countries, the ECM community is a growing source of professional contacts, knowledge, and advice.

You will be invited to become part of the ECI alumni network upon graduating, starting with the annual ECI Alumni Dinner, just after you hand in your dissertation. There is a monthly newsletter as well as a Facebook and a LinkedIn group which make it easy to stay in touch and share information on job vacancies, academic research and social activities, such as informal drinks events in London, Oxford or around the world.

As a former student of the School of Geography and the Environment you will also be able to participate in the whole School’s alumni activities, which widens your network to over 1,000 Masters graduates and more than 5,000 former geography undergraduates.

However, you can benefit from your own Masters network or the wider School’s network during your MSc year, for example by joining the LinkedIn groups, to get an idea of what alumni went on to do, find people to give you advice about internships or your dissertation, or by attending alumni drinks or networking events organised by the ECI.
1.5.8. Other Opportunities

A. ECM Fellowships

The Environmental Change Institute supports a small grants programme for costs associated with research projects, such as MSc/MPhil dissertations, about which more information and application materials will be provided during the year. Fellowships and scholarships are also available to incoming students, and in some cases, returning students (see: [http://www.eci.ox.ac.uk/msc/funding.html](http://www.eci.ox.ac.uk/msc/funding.html)).

B. Internship Opportunities

**Training Better Leaders | Sustainability Internship Programme**

Sustainability is a growing, multi-disciplinary field that is becoming a priority in many organisations. Our TBL: Training Better Leaders Programme is designed to help students gain relevant, engaging and interesting work experience in sustainability. Currently partnering with over 15 organisations across sectors, we offer paid international placements for students and recent graduates to gain experience working in organizations on socio-economic and environmental issues through a variety of projects. As part of the programme, we also offer a sustainability skills training course that allows students to develop and practice crucial skills for the workplace, while networking with peers and professionals. If you have any questions, please contact the TBL programme coordinator.

**Carbon Innovation Programme**

The Carbon Innovation Programme is an opportunity for staff and students to generate unique ideas for carbon reduction and bid for funding to implement the idea within the University estate.

It runs annually, October to April. Teams/individuals are supported through the initial process of producing a viable business case for an innovative project, service or product that can be applied to a specific area of the functional estate in order to generate carbon savings.

Teams then present their proposals to the judging panel in January, where funding is then allocated to the best projects. If you are interested please come to the launch event in Michaelmas Term at Said Business School (tbc). If you have any questions, please contact Jennifer Jack in Estate Services: jennifer.jack@admin.ox.ac.uk.

C. ECI Mentorship Programme

Since 2015, the ECM course has been running a voluntary mentoring scheme to match interested students and alumni. Mentorship can be an excellent strategy for helping students transition into a new environment successfully, and to help them develop and assess their ideas, interests and aspirations. Individual mentors are paired with current students to help mentees consider ECM and post-ECM goals and transitions. Interactions may take place.
through face-to-face online media, such as Skype, or in person if mentors are based locally. Participants will be expected to attend an orientation session and interface at least 2-3 times with their mentor. Due to the voluntary nature of alumni participation, we cannot guarantee a specific mentor for every student.
2. COURSE INFORMATION

Master of Science in Environmental Change and Management
FHEQ level 7
Duration of course: 12 months

The Master of Science in Environmental Change and Management (MSc ECM) is among Oxford’s most competitive and popular graduate science courses, and one of the world’s most highly regarded and sought after interdisciplinary graduate environmental training programmes, attracting 250-400 applicants each year. The course is a 1-year MSc by coursework, and consists of full time study with assessment by course assignments, written examinations and a 15,000 (maximum) word dissertation.

2.1. Aims/Objectives

Understanding Environmental Change

Responding to Environmental Change

Methods & Techniques in Environmental Management

The programme aims to:

- Examine the nature, causes and impacts of major types of environmental change, and how these changes operate and interact on global, regional and local scales and in relation to critical social, physical, and ecological systems.

- Engage the economic, legal, cultural, and ethical underpinnings of environmental responsibility and systemic solutions, including mitigation, adaptation, remediation, enhanced resource stewardship and other sustainable responses to environmental change at different scales and within different organisational contexts.

- Facilitate a critical appreciation and understanding of the science underpinning climate, energy, and ecosystems and the social science and ethical roots that inform human behaviour.

- Empower environmental leaders with the analytical and practical skills, integrity and broad appreciation of earth systems and societies in relation to environmental change necessary to address the world’s most pressing environmental problems.
• Provide an entry-point for those who wish to go on to further advanced research, policy, academic business, NGO or other environmental leadership work in the School and elsewhere.

Students will develop a knowledge and understanding of:

1. The key concepts of earth systems, ecosystems, and human systems in relation to environmental change (e.g., the Anthropocene).
2. The theoretical and practical basis for human adaptation, development, governance, sustainable decision-making, energy production and demand, natural resource management, and climate policy,
3. Techniques for understanding environmental change through assessment, modelling, valuation, remote sensing, field studies and monitoring.
4. The key research skills and methods of analysis for integrated environmental assessment, strategic planning, measuring sustainability, and evaluating policy in response to environmental change.
5. The intersecting issues involving climate, energy, biodiversity, water, and food security in the present and future.
6. Specialist topics consistent with candidate's particular interests and the expertise of the School.

The importance of interdisciplinary approaches in the solution of environmental problems is a major theme in this course. We take a problem-based approach to interdisciplinarity through key environmental management issues. The course is structured to enable students to develop their own interdisciplinary thinking. At the Masters level, we believe it appropriate that students are given the opportunity to explore diverse literatures, approaches, and issues concerning environmental change and management. Capstone and other integrative exercises within and across various modules provide students with opportunities to do this in groups as well as individually.

2.2. The Study Programme

2.2.1. Overview

Seminars, lectures, and workshops form an important compulsory core of the ECM course. These take place in Oxford at local sites, while the varied field courses offer opportunities to see key aspects of environmental change and management in other parts of Britain and Europe. Electives allow for smaller group study and in-depth discussion in the typical Oxford "tutorial" atmosphere.

The end of the year examinations are designed to elicit the student's grasp of the wide range of material covered, and also are an opportunity for the students to display the results of their individual study and interdisciplinary synthesis. The dissertation is a major component of the course, and is an opportunity for individual, original, and specialised in-depth work on some aspect of environmental change and management.

The formal ECM course load is designed to be sufficient to provide basic or advanced knowledge over a range of integrated topics, themes, and skills but not to be so great as to preclude students engaging in individual reading and further study in order to broaden their knowledge. Optional workshops and supplemental activities are scheduled in the programme and beyond, but students should be selective of these so as to allow sufficient time for reading and reflection on core material.
2.2.2. The MSc course comprises:

- Two terms of core lectures, assessed through written examination;
- Two elective modules, assessed through essays;
- Research and skills training;
- Workshops, symposia, forums, field trips and supplementary lectures, and
- A research dissertation of up to 15,000 words.

2.2.3. Core lectures

Core lectures take place daily (typically Monday to Thursday), relate directly to your exams, and consist of the following:

**Overture: Welcome to the Anthropocene**

An interdisciplinary introduction to the course, focusing on the concept of the Anthropocene and its implications for human society.

**A. Understanding Environmental Change**

**A1. The Earth System**

Training students to understand and investigate the major processes and change drivers which contribute to particular climate conditions in the earth system at different scales. An understanding of the interdependencies between the grand cycles (water, carbon, nitrogen, phosphorus) in the Earth System. The policy, economic, and ethical dimensions of climate change – an exemplar of the controversies of responding to environmental change. Capacity to synthesise, model, and analyse key environmental data sets.

**A2. Global Change and the Biosphere**

Analyses roles played by the biosphere in global and local environmental change: how is it affected by environmental change and how can changes in the biosphere affect global change? A macro-scale view of global biosphere function in Earth history and the global impact of humanity, putting contemporary environmental change into wider context. How ecologists explore biosphere responses to global change through field studies, satellite remote sensing and modelling, with examples from contemporary research in tropical biomes and local temperate woodlands.

**A3. Human Systems and Environmental Change**

Examines human systems of knowledge, values, organization, technology, and behaviour in relation to environmental change in an evolutionary and social development context. What is the utility of viewing human societies as systems? How do the complexity, diversity, stratification, and resource management strategies of human societies shape their contributions and responses to critical environmental parameters and challenges? The module introduces relevant cognitive, social, economic, and human ecological concepts and theory to understand historical developments in social-ecological systems and address contemporary issues of sustainability and wellbeing.
in an increasingly populous and globalised society.

A4. Economics of the Environment
Equips students with the foundational concepts, methods and analytical tools to examine the role and application of economic approaches to environmental and related policy issues across a range of contexts, scales and issues.

B. Responding to Environmental Change

B1. Energy Systems and Mitigating Climate Change
Investigates the role of energy systems in causing and mitigating climate change. Debates and major trends in the role of technologies, economics, human behaviour, social change and governance in avoiding dangerous anthropogenic climate change. Developing analytical, problem solving and communication skills in the context of a major infrastructure system.

B2. Sustainable Responses to Environmental Change
Analyses how to respond to environmental change, while dealing adaptively with risks, uncertainties, and contingencies for the future. How do we make sustainable decisions in such contexts to find the right trade-offs and viable solutions to environmental challenges?

B3. Governing the Anthropocene
Examines the complex challenges of governing collective action in the Anthropocene. The term “governance” reflects a growing awareness that not only governments but a wide range of non-governmental actors at multiple scales – from international NGOs to corporations and local communities – are involved in shaping environmental strategies and outcomes. Conceptual lenses to examine and critique this complex governance landscape: from common pool resource theory; to the political economy of trade and development; to integrative conceptions of “earth system governance”. These concepts are applied across a range of substantive issue areas, including climate, forests, agriculture and coastal and marine systems.

C. Methods and Techniques in Environmental Management
Introduces cross-cutting, multidisciplinary methods and techniques for addressing environmental change issues, as introduced throughout the core lectures, readings, field courses, workshops and other media. Beyond the many methods and techniques introduced throughout the course, students are also encouraged to pursue innovative and mixed method approaches to environmental change and management problems through the elective programme, dissertation projects, and other outlets, as appropriate. A quantitative skills module is offered to ensure students have requisite techniques for interdisciplinary environmental science.

2.2.4. Elective Modules

A separate Electives Handbook provides overviews of available elective module options in the School of Geography and the Environment for the forthcoming year. Please note, however, that module details may change at short notice due to changes in staff availability or updates. Elective Modules offer a small-group teaching and discussion environment, based on a wide range of contemporary research themes and skills that reflect the specific interests of core faculty and visiting research associates. Each student has the opportunity to identify electives of particular interest, though the selection process will be made through committee at the start of term. The teaching aim is to foster discussion and debate between academic staff and students and to identify and explore theory, methods and
practice in an academic space that encourages a critical dialectic.

Each elective is assessed through a submitted essay of no more than 4,000 words. For details of submission of elective essays see https://intranet.ouce.ox.ac.uk/msc/submission/electives.html

2.2.5. Feedback

You will receive feedback on a formative assessment submitted for each elective as well as on select core module and field course exercises. You will also receive written feedback and marks on the summative elective essays. We aim to provide this feedback within eight weeks of the work being submitted. Written feedback will focus on how to improve the quality of your written submissions and/or research design. Written feedback is also provided on dissertations, but not examinations.

2.2.6. Friday Workshops and Policy Forums

Friday workshops and policy forums provide an opportunity to explore topics in depth not dealt with in other parts of the MSc course. Many of these are of professional or vocational interest.

2.2.7. Field Courses

Field trips take us to diverse sites to see environmental change and management in action. There are various mandatory field courses, most of which are residential. The exact number of trips and venues will be decided from year to year, and those planned for 2017-18 are listed separately in Section 6 of this handbook.

The costs of all compulsory fieldtrips are covered by the department, although if students wish to stay at the destination after the fieldtrip they will have to pay for the costs of their return fare.

2.2.8. Dissertation

The dissertation forms a significant part of the course in terms of student interest, learning and assessment. The end product is a dissertation of not more than 15,000 words. This is an opportunity for students to investigate in-depth a problem of their choice (after consultation with the Course Director and supervisory staff) within the broad conspectus of environmental change and management. Students are free to pursue their own topics or may choose from those presented by ECI and partner research teams.

A supervisor will be appointed to guide the student during this work, the bulk of which will be carried out after the examinations are over in May, and will be completed by the first weekday in September. It is expected that the best of the dissertations will be worthy of publication, and all should show high quality, competent and creative scholarship. All dissertations will be judged on the degree to which they represent a logical, thorough, and intelligible report on a piece of original research, of a standard expected of an Oxford Masters student. Prizes are awarded for the best dissertations, and eligible students may seek funding to support an additional stay at the ECI in order to convert their dissertation into one or more academic publications.

2.2.9. Optional Modules

Innovative Food System Teaching and Learning (IFSTAL)
IFSTAL is an interactive training programme offered by a group of Universities, including the University of Oxford, with the aim of generating a cohort of MSc and PhD graduates equipped to address food system challenges by framing their specialist understandings (e.g. of Environmental Management) with the broader social, economic and environmental context. Participation is on a voluntary basis and will involve evening lectures, engagement with other participating students via a virtual learning environment, an internship programme, symposiums, away days and a summer school. In addition, a certificate of participation will be available at the end of the year. Further information about this programme is available at www.ifstal.ac.uk.

2.3. Course overview by term

<table>
<thead>
<tr>
<th>Course Structure</th>
<th>MT</th>
<th>HT</th>
<th>TT</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer reading and essay assignment</td>
<td>from summer 2017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Welcome to the Anthropocene&quot; (Intensive Wk 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>The Earth System (Wed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Global Change and the Biosphere (Tues)</td>
<td></td>
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<tr>
<td>Economics of the Environment (Mon)</td>
<td></td>
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<tr>
<td>Human Systems &amp; Environmental Change (Thurs)</td>
<td></td>
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<tr>
<td>Energy Systems &amp; Climate Mitigation (Wed, including Intensive Wk 1)</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Sustainable Responses to Environmental Change (Mon)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Governing the Anthropocene (Tue)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Trips (Courses)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Research methods and practical skills</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Workshops and supplementary lectures</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Student-led event Responding to</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

*MPhils take a third elective in their second year.
Environmental Change (TBC) |  |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation planning</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>Dissertation research</td>
<td>✓ ✓ Due by noon on the first weekday of September 2018</td>
</tr>
</tbody>
</table>

3. ASSESSMENT

3.1. University Examinations

The procedure for entering for University examinations is explained on the University website: [http://www.ox.ac.uk/students/academic/exams/entry](http://www.ox.ac.uk/students/academic/exams/entry). If you have any questions about your entry for the examinations or requesting alternative examination arrangements, you should contact the academic office at your college.

The examination timetable will be confirmed no less than five weeks before the examination. The provisional dates for the examinations are in 4th week of Trinity Term. Once they are confirmed, the examination timetables may be found at: [http://www.ox.ac.uk/students/academic/exams/timetables](http://www.ox.ac.uk/students/academic/exams/timetables).

Information on (a) the standards of conduct expected in examinations and (b) what to do if you would like examiners to be aware of any factors that may have affected your performance before or during an examination (such as illness, accident or bereavement) are available on the Oxford Students website ([www.ox.ac.uk/students/academic/exams/guidance](http://www.ox.ac.uk/students/academic/exams/guidance)).

The Examiners’ Report on the previous examinations may be found at: [https://intranet.ouce.ox.ac.uk/msc/](https://intranet.ouce.ox.ac.uk/msc/)

3.2. The Exam Board

The University appoints an exam board comprising three or four members of faculty and an external examiner. The current Chair of MSc in Environmental Change and Management is Professor Yadvinder Malhi. The exam board is responsible for ensuring that the examinations are conducted fairly and according to University regulations. The board of examiners may be assisted in setting and marking assessed elements of the course by other internal staff members who are termed assessors.

The external examiner is a senior academic from a reputable external academic institution whose role is to verify the quality of the examination materials, advise the MSc course team on course content, and sit on the final examination board. The current External Examiner of the MSc in Environmental Change and Management is Professor Frans Berkhout (King’s College, London). The external examiner has the right and the duty to modify marks if she or he sees fit.

Students are strictly prohibited from contacting external examiners directly. If you are unhappy with an aspect of your assessment you may make a complaint or appeal (see section on Complaints and Appeals).
3.3. Role of Colleges and Proctors

There are several important actors within the examination process all of whom have distinct roles. Below is a brief guide to these roles:

1. **Colleges**: if you need to ask for an extension on a piece of coursework or your research dissertation, or are ill and cannot attend an examination, or have any other reason for not taking part in the examination process in a typical way, you should liaise with the university authorities through your college, not through SoGE. Only your college can organise this in advance of the deadline.

2. **The Proctors** are responsible for the integrity, quality and effectiveness of the Oxford University examination system. Ultimately, they are responsible for making decisions on extensions, resubmission or any other aspect of examination protocol. Requests to the Proctors can only be made through your College. Under the University Examination Regulations candidates are not permitted to communicate with examiners about any aspects of the assessment process after the examinations have begun. Any complaints about assessment procedures should be addressed to the Proctors via the candidate’s college.

3.4. Feedback on Learning and Assessment

Throughout the year, there will be opportunities for informal feedback on your learning and understanding through class discussions, peer feedback on presentations and interactions with course staff. You will receive written and/or oral feedback on at least one piece of formative assessment for each elective and written feedback on your two summative elective essays. This feedback will focus on identifying the good points of your essay and give suggestions on how to improve the quality of your written work. You will also receive written feedback on your dissertation.

3.5. Monitoring Academic Progress

All students are assigned a supervisor for the duration of the course. Once you start work on your dissertation you will also be assigned a specialist dissertation supervisor. Your supervisor will be responsible for monitoring your academic progress and each term your supervisor will complete a GSS report (Graduate Supervision System). These reports will be read by the Course Director and the DGS (Taught Programmes). The GSS system also allows you to complete an evaluation of your own progress. We highly encourage you to complete this self-evaluation during the open GSS window each term.

3.6. Good Academic Practice and Avoiding Plagiarism

Plagiarism is presenting someone else’s work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Plagiarism may be intentional or reckless, or unintentional. Under the regulations for examinations, intentional or reckless plagiarism is a disciplinary offence. Please see the University guidelines: [http://www.ox.ac.uk/students/academic/guidance/skills/plagiarism](http://www.ox.ac.uk/students/academic/guidance/skills/plagiarism).

All submitted work will be run through Turnitin (an electronic text matching system).

3.7. Examinations Conventions

Examination conventions are the formal record of the specific assessment standards for the course or courses to which they apply. They set out how your examined work will be marked and how the resulting marks will be used to
arrive at a final result and classification of your award. They include information on: marking scales, marking and classification criteria, scaling of marks, progression, resits, use of viva voce examinations, penalties for late submission, and penalties for over-length work.

The Examination Conventions for this course may be found at:
https://intranet.ouce.ox.ac.uk/msc/examination-conventions/

These conventions are the definitive version to apply to examinations in 2018.

4. ASSESSMENT COMPONENTS

There are three areas of formal assessment: written examinations, elective module essays, and dissertations. In addition, the teaching team offers formative assessments and exercises within core modules, electives modules, and field courses, typically with oral or written feedback to promote learning and prepare students for their formal assessments and careers in environmental change and management.

4.1. Written examinations

Core courses will be examined by means of three three-hour written examinations in Trinity Term. These examinations are designed to determine the student’s critical understanding and knowledge of the range of issues covered, and also provide opportunity for students to display the results of their individual study, and use information gained from field courses and seminar series.

For ease of reference, the official course Schedule provides the following examination rubric:

(i) **Understanding environmental change.** Candidates will be expected to have integrative knowledge of the critical issues in past, current and future environmental change as applied to terrestrial, aquatic, and atmospheric systems. Forces driving change including resource scarcity, competition, population, land use, pollution, technological change, cultural and climatic factors.

(ii) **Responding to environmental change.** Candidates will be expected to have knowledge of governance, economics, ethics, law, and sociocultural dimensions of mitigating and adapting to environmental change. Strategies appropriate for the management of changing environments.

(iii) **Methods and techniques for environmental management.** Candidates will be expected to have knowledge of methods for environmental assessment and management. These may include: basic computing and modelling, experimental design, data acquisition and handling, environmental statistics, spatial analysis, and methods of ecological, economic and social analysis.

(iv) **Electives.** Candidates will be expected to show advanced knowledge of two of the elective courses on offer in any one year.
4.2. Elective modules

Elective courses: candidates will be expected to show advanced knowledge of two of the option elective courses on offer in any one year.

Students are required to submit written essays (of no more than 4,000 words plus 150-word abstract) on two elective courses, no later than 12 noon on the first Monday of the following term after which the elective module was taken (i.e. a Michaelmas elective module requires submission on the first Monday of Hilary Term).

Full details on the required format and how to submit the elective essays can be found at: https://intranet.ouce.ox.ac.uk/msc/submission/electives.html

4.3. Dissertation

You must submit to the Environmental Change and Management MSc Course Director before the end of Hilary Term in the year in which you enter the examination, the title and details of your dissertation as set out in the proposal template, together with the name of a person who has agreed to act as your supervisor during preparation of the dissertation.

Each student may have up to eight hours of supervision from their appointed supervisor.

While many dissertations are submitted in a traditional thesis format (e.g. a series of chapters covering introduction, literature review, methods, results, discussion), it is also permissible to submit a dissertation in journal paper format, prepared as if for submission to a specified international journal. Students should discuss this option with their supervisor. All ‘paper format’ dissertations should contain at least two separate sections:

a) an academic paper in the appropriate format for submission to an international journal, where students should follow the published ‘Instructions for Authors’ for the journal in question and should prepare the paper according to the exact requirements of submission to that journal, including a copy of those instructions bound in as an appendix to the thesis, and

b) up to 7,000 words framing the content of the academic paper, potentially including research questions, further literature review, discussion of methods and results. This can be divided into sections before and after the paper to promote a logical flow and reduce repetition.

The total text of the entire dissertation (as defined above) should not exceed 15,000 words.

Full details on the required format and how to submit the dissertation can be found at: https://intranet.ouce.ox.ac.uk/msc/submission/dissertations.html

4.4. Submission deadlines

The deadlines for handing in assessed course work are as follows:
Elective module essays

Michaelmas Term essay: 1st Monday of Hilary Term by 12 noon (Monday 15th January 2018)

Hilary Term essay: 1st Monday of Trinity Term Monday by 12 noon (Monday 23rd April 2018)

Note: There are no elective modules in Trinity Term.

Research dissertation

By 12 noon on first weekday of September (3rd September 2018).

4.5. Good Academic Practice and Avoiding Plagiarism

Plagiarism is presenting someone else’s work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Plagiarism may be intentional or reckless, or unintentional. Under the regulations for examinations, intentional or reckless plagiarism is a disciplinary offence. Please see the University guidelines: http://www.ox.ac.uk/students/academic/guidance/skills/plagiarism.

4.6. Course Governance and Student Representation

4.6.1. Graduate Teaching and Examinations Committee

Graduate Teaching and Examinations Committee (GTEC), chaired by the Director of Graduate Studies (Taught Programmes), defines the strategic direction of MSc provision in line with SoGE’s evolving academic strategy. It is responsible for coordinating academic programmes, staffing and timetabling across all four courses. It receives and considers the minutes of course team meetings, examiners’ reports and student assessments in preparation for Divisional scrutiny. It discusses and proposes amendments to assessment regulations for approval by higher committees as appropriate.

4.6.2. Student Representation: Joint Consultative Committee

At the start of the course the ECM student group elects two of their members to serve as representatives on the School’s Joint Consultative Committee (JCC), which meets each term. If you have any comments or concerns you should pass these on to your representatives who will raise them with the Course Team at the JCC meeting.

4.6.3. Feedback and concerns

Our courses are constantly being adjusted in response to changes in the field, faculty input and student feedback. We welcome your constructive feedback and have a number of avenues through which you can contribute feedback. You can also use these avenues to raise any concerns that you might have; we will seek to resolve these as quickly as possible.

You can:

- Provide feedback and ask questions during weekly class meetings;
- Speak with your Course Director or Academic Director during his/her weekly office hours;
• Provide feedback or raise concerns via your class representatives;
• Ensure that at the end of each term you complete an evaluation of each module, field-trip, or workshop.

This feedback, along with any concerns, will be discussed at the termly Joint Consultative Committee (JCC) for your course. The minutes of the JCC and the module feedback are then considered by the relevant Course Team and by GTEC (on which there is student representation).

Students on full-time and part-time matriculated courses are surveyed once per year on all aspects of their course (learning, living, pastoral support, college) through the Student Barometer. Previous results can be viewed by students, staff and the general public at: www.ox.ac.uk/students/life/feedback.

4.7. Complaints and Academic Appeals

The University, the Social Sciences Division and the School of Geography and the Environment all hope that provision made for students at all stages of their course of study will result in no need for complaints (about that provision) or appeals (against the outcomes of any form of assessment).

Where such a need arises, an informal discussion with the person immediately responsible for the issue that you wish to complain about (and who may not be one of the individuals identified below) is often the simplest way to achieve a satisfactory resolution.

Many sources of advice are available from colleges, faculties/departments and bodies like the Counselling Service or the OUSU Student Advice Service, which have extensive experience in advising students. You may wish to take advice from one of those sources before pursuing your complaint.

General areas of concern about provision affecting students as a whole should be raised through Joint Consultative Committees or via student representation on the faculty/department’s committees.

4.7.1 Complaints

If your concern or complaint relates to teaching or other provision made by the faculty/department, then you should raise it with the Director of Graduate Studies (Taught Programmes), Professor Rob Whittaker. Complaints about departmental facilities should be made to the Head of Administration and Finance, Richard Holden. If you feel unable to approach one of those individuals, you may contact the Head of School, Professor Heather Viles. The officer concerned will attempt to resolve your concern/complaint informally.

If you are dissatisfied with the outcome, you may take your concern further by making a formal complaint to the Proctors under the University Student Complaints Procedure (https://www.ox.ac.uk/students/academic/complaints).

If your concern or complaint relates to teaching or other provision made by your college, you should raise it either with your tutor or with one of the college officers, Senior Tutor, Tutor for Graduates. Your college will also be able to explain how to take your complaint further if you are dissatisfied with the outcome of its consideration.
4.7.2 Academic Appeals

An academic appeal is an appeal against the decision of an academic body (e.g. boards of examiners, transfer and confirmation decisions etc.), on grounds such as procedural error or evidence of bias. There is no right of appeal against academic judgement.

If you have any concerns about your assessment process or outcome it is advisable to discuss these first informally with your subject or college tutor, Senior Tutor, course director, director of studies, supervisor or college or departmental administrator as appropriate. They will be able to explain the assessment process that was undertaken and may be able to address your concerns. Queries must not be raised directly with the examiners.

If you still have concerns you can make a formal appeal to the Proctors who will consider appeals under the University Academic Appeals Procedure (https://www.ox.ac.uk/students/academic/complaints).

4.8. Key Departmental Contacts

- DGS (Taught Programmes): Professor Robert Whittaker
- Academic Director: Professor Jim Hall
- Course Director: Dr Tom Thornton
- Course Coordinator: Faith Opio
- Academic Administrator: Dr Lorraine Wild
- Head Administration and Finance: Richard Holden
- Disabilities Officer: Dr Vanessa Winchester

4.9. Key Dates

**Term dates**

<table>
<thead>
<tr>
<th>Michaelmas 2017</th>
<th>Sunday, 8 October</th>
<th>Saturday, 2 December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hilary 2018</td>
<td>Sunday, 14 January</td>
<td>Saturday, 10 March</td>
</tr>
<tr>
<td>Trinity 2018</td>
<td>Sunday, 22 April</td>
<td>Saturday, 16 June</td>
</tr>
</tbody>
</table>

**Assessment Dates**

- 1\textsuperscript{st} elective submission: 12 noon first Monday of Hilary Term
- 2\textsuperscript{nd} elective submission: 12 noon first Monday of Trinity Term
- Dissertation submission: 12 noon 3\textsuperscript{rd} September 2018
- Provisional dates for examinations: Week 4 in Trinity Term (to be confirmed)
5. COURSE MODULES

5.1 Understanding Environmental Change

Michaelmas Term 2017

Understanding Environmental Change consists of four core lecture modules—The Earth System, Ecosystems, Human Systems and Environmental Change, and Economics of the Environment—with a provocative, introductory overture, Welcome to the Anthropocene, three field courses and a range of research methods and transferrable skills to aid students in developing an integrated human-environmental systems perspective on global environmental change.

Introduction: Welcome to the Anthropocene

Module Leaders: Professor Jim Hall, Dr Tom Thornton

The aim of “Welcome to the Anthropocene” week is to provide an overview of the driving forces and implications of global environmental change. We seek to provide a broad coverage of issues, which are then elaborated upon, and responses developed, in the subsequent weeks across all ECM modules.

<table>
<thead>
<tr>
<th>Day in Week 1</th>
<th>Location</th>
<th>Lecture</th>
<th>Teaching Staff</th>
<th>From module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon 9th Oct</td>
<td>Beckit</td>
<td>Introduction to Anthropocene Week: &amp; Collapse/This Changes Everything discussion</td>
<td>Tom Thornton</td>
<td>Ecosystems + Human Systems</td>
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<tr>
<td>09:00-11:00</td>
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<tr>
<td>Mon 9th Oct</td>
<td>Beckit</td>
<td>The concept of the Anthropocene</td>
<td>Yadvinder Malhi</td>
<td>Ecosystems + Human Systems</td>
</tr>
<tr>
<td>11:00-13:00</td>
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<tr>
<td>Mon 9th Oct</td>
<td>SoGE Auditorium</td>
<td>The economics of environmental change</td>
<td>Cameron Hepburn</td>
<td>Economics of the Environment</td>
</tr>
<tr>
<td>14:00-16:00</td>
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<tr>
<td>Tue 10th Oct</td>
<td>Beckit</td>
<td>Ten billion reasons not to be scared of each other – population, equality and reducing pollution</td>
<td>Danny Dorling</td>
<td>Human Systems</td>
</tr>
<tr>
<td>09:00-11:00</td>
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<tr>
<td>Tues 10th Oct</td>
<td>Beckit</td>
<td>Planetary boundaries and social boundaries</td>
<td>Kate Raworth</td>
<td>Human Systems</td>
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<tr>
<td>Date</td>
<td>Time</td>
<td>Location</td>
<td>Topic</td>
<td>Presenter(s)</td>
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<tr>
<td>Tue 10&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>11:00 - 13:00</td>
<td>(potentially followed by a de-brief session)</td>
<td></td>
<td></td>
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<tr>
<td>Tue 10&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>14:00-16:00</td>
<td>Herbertson</td>
<td>Escalating losses from natural hazards</td>
<td>Jim Hall</td>
</tr>
<tr>
<td>Tue 10&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>16:30 - 18:00</td>
<td>Gottmann &amp; Gilbert</td>
<td><strong>ECI WELCOME PARTY for MSc, MPhil, DPhil Students</strong></td>
<td></td>
</tr>
<tr>
<td>Wed 11&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>09:00-11:00</td>
<td>Beckit</td>
<td>Energy and the Anthropocene</td>
<td>Nick Eyre</td>
</tr>
<tr>
<td>Wed 11&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>14:00 – 16:00</td>
<td>Beckit</td>
<td>Anthropogenic influence upon the climate</td>
<td>Myles Allen</td>
</tr>
<tr>
<td>Wed 11&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>16:15 – 19:00</td>
<td>TBC</td>
<td>Doughnut Economics: How to think Like a 21&lt;sup&gt;th&lt;/sup&gt; Century Economist</td>
<td>Kate Raworth</td>
</tr>
<tr>
<td>Thu 12&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>10:00-12:00</td>
<td>Beckit</td>
<td>Governance and environmental justice in the Anthropocene</td>
<td>Chuks Okereke</td>
</tr>
<tr>
<td>Thu 12&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>14:00 – 16:00</td>
<td>Beckit</td>
<td>Economic Globalisation in the Anthropocene</td>
<td>Dariusz Wójcik</td>
</tr>
<tr>
<td>Thu 12&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>17:00-19:00</td>
<td>SoGE Auditorium</td>
<td>Water risks and insecurity</td>
<td>David Grey</td>
</tr>
<tr>
<td>Fri 13&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>10:00 - 12:00</td>
<td>Beckit</td>
<td>Thinking in Systems Workshop</td>
<td>Kate Raworth</td>
</tr>
</tbody>
</table>
Fri 13th Oct 14:00-16:00  SoGE Auditorium  Prospects for global food (in)security  John Ingram  All Modules

Fri 13th Oct 16:15-17:30  SoGE Auditorium  Capstone Event  Student-led discussions on aspects of the Anthropocene leading to a Manifesto for understanding and responding to the Anthropocene  Moderated by Staff  All Modules

Overview Readings (see also Week 1 Readings for individual MT module lectures)


Week 2 – Follow-up events

<table>
<thead>
<tr>
<th>Day in Week 2</th>
<th>Location</th>
<th>Lecture</th>
<th>Teaching Staff</th>
<th>From module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed 18th Oct 11:00-13:00</td>
<td>Herbertson</td>
<td>Viking Economics: How the Scandinavians got it right and how we can, too</td>
<td>George Lakey</td>
<td>Economics, Human Systems</td>
</tr>
<tr>
<td>Wed 18th Oct 16:15-19:00</td>
<td>TBC</td>
<td>Big History: Humans and their Environment</td>
<td>Sir Crispin Tickell</td>
<td>Welcome to the Anthropocene</td>
</tr>
</tbody>
</table>
I. Economics of the Environment

Module Leader: Dr. Dustin Garrick
Teaching staff: Prof. Cameron Hepburn, Dr. Robert Hope and Dr. Linus Mattauch

Monday, 2-4pm

Module rationale

Economics is critical for understanding contemporary environmental, natural resource and sustainable development challenges. Economic ideas, incentives and institutions are both a root cause of these challenges and a key feature of market-based responses to them, spanning from climate change and biodiversity loss to water scarcity and service delivery.

The Economics of the Environment module will introduce economic frameworks, methods and tools to understand and address environmental management, natural resource and sustainable development challenges.

The module will be organised in two phases, leveraging the interdisciplinary economic research and teaching across the School.

PHASE I (weeks 1-4) covers the foundations of economics and the environment, examining the economic roots of environmental issues and problems and providing a survey of economic approaches to environmental policy ranging from instrument choice to property rights.

PHASE II (weeks 6-8) of the module shifts from foundations to applications, organising the students into specialised tracks for each MSc with interactive lectures and exercises. The specialised tracks in phase II are problem-based, fostering critical examination and application of economics to a range of contexts, scales and issues relevant to environmental change and management.

Students in ECM will have a choice for phase II of the course based on their interests, background and quantitative skills:

OPTION A) modelling and quantitative analysis of the economics of the environment, featuring formal approaches sets (calculus is a prerequisite), or

OPTION B) policy analysis of economics of the environment, featuring a case-oriented approach to understand the role of economics in policy design and evaluation.

Intended learning outcomes

This module will equip students to understand and apply economic frameworks, methods and tools to environmental and natural resource management, sustainable development and related policy challenges.

Students will identify the main trends and debates of economics in a logical and systematic way; acquire practical experience with methodologies for policy analysis, instrument design and evaluation; and learn to apply economics with other natural and social science frameworks, tools and methods for understanding and responding to current and future environmental, resource and sustainable development issues.
Teaching approach

The module will be taught through a series of lectures. The first four sessions (PHASE I, FOUNDATIONS) will introduce and illustrate the conceptual building blocks, history and evolution of environmental economic thought and practice.

The three remaining sessions (PHASE II, APPLICATIONS) will include lectures and interactive discussions or exercises across a spectrum of problems relevant to each course. Examination

Students in Environmental Change and Management (ECM) will be examined in Trinity Term.

Module Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Description</th>
<th>Staff</th>
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<tbody>
<tr>
<td>Week 1</td>
<td><strong>Foundations: Economics of the Environment</strong></td>
<td>Prof. Cameron Hepburn</td>
</tr>
<tr>
<td>9th Oct</td>
<td>This session introduces the economic roots of contemporary environmental problems, ranging from biodiversity loss and climate change to water shortages and deforestation. It briefly defines economics along with some key concepts, before offering an overview of debates about the feasibility and desirability of continued economic growth.</td>
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<tr>
<td>Week 2</td>
<td><strong>Markets and market failure</strong></td>
<td>Dr Dustin Garrick</td>
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<tr>
<td>16th Oct</td>
<td>This session reviews the principles of markets and the sources of market and government failures that cause environmental and resource management problems. Key topics include efficiency, externalities, common pool resources, public goods, natural monopolies and information asymmetries.</td>
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<tr>
<td>TBA</td>
<td><strong>Discussion Group</strong></td>
<td>Micol Chiesa</td>
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<tr>
<td>Week 3</td>
<td><strong>Revision of weeks 1 and 2</strong></td>
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<tr>
<td>23rd Oct</td>
<td><strong>Property rights and the commons</strong></td>
<td>Dr Dustin Garrick</td>
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<td></td>
<td>This session introduces the tragedy of the commons thesis and examines the property rights systems to respond to scarcity, drawing on the Coase theorem, game theory and transaction costs to introduce and compare different approaches to resource allocation.</td>
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<tr>
<td>Week 4</td>
<td><strong>Instrument choice: regulation and pricing</strong></td>
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<tr>
<td>30th Oct</td>
<td>This session examines how the government can intervene to improve market outcomes. It covers which policy instruments economists suggest to address pollution and to protect the environment and how these instruments work in practice across diverse contexts. Dr. Linus Mattauch</td>
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</tbody>
</table>
| Week 5     | **Discussion Group**  
No regular class this week; discussion session only.  
Revision of weeks 3 and 4 Micol Chiesa |
| Students in ECM will choose between two options: |
| 1. Policy analysis |
| 2. Modelling and quantitative analysis (prerequisite: calculus) |
| Week 6     | **Environmental Policy Evaluation and Cost-Benefit Analysis**  
1. Policy  
This session covers cost-benefit analysis as a means of policy evaluation and project assessment, introducing and applying relevant concepts and critiques of discounting, valuation, and uncertainty analysis. Dr. Dustin Garrick |
| 2. Modelling  
This session uses modelling and quantitative analysis to examine the themes covered by the policy track by introducing students to a mathematical example of project evaluation as well as to various cost-benefit analyses of the economics of climate change. Dr. Linus Mattauch |
| Week 7     | **Behavioural Economics and Environmental Policy**  
1. Policy  
This session covers some findings from behavioural economics. If focusses on how people make decisions and why economic decisions often diverge from standard assumptions in economics. Students will discuss the implications for environmental policy. Dr. Dustin Garrick |
| 2. Modelling  
This session uses modelling and quantitative analysis to examine the themes covered by the policy track by introducing simple mathematical descriptions of behavioural effects and how they differ from basic rational choice theory. It also covers normative and policy implications of behavioural economics models. Dr. Linus Mattauch |
| Week 8     | **Public Finance, Macroeconomics and the Environment**  
1. Policy  
This session considers whether solutions to global environmental problems are compatible with economic growth and explains in which Dr. Dustin Garrick |
circumstances pricing pollution can yield non-environmental benefits.

2. Modelling

This session uses modelling and quantitative analysis to examine the themes covered by the policy track by outlining how to handle a basic formal approach to the double dividend of environmental taxation. Students will learn a basic model of economic growth.

Dr. Linus Mattauch

Reading Expectations

Each session will have two key readings, one providing an overview of the relevant concepts and a second supplementary reading providing an in-depth application.

Discussion groups will convene students in weeks 3 and 5 to deepen inquiry and debate, as well as develop analytical skills; the discussion groups will be customised and coordinated separately for each MSc programme.

Keohane and Olmstead (2nd edition, 2016; details below) is a required text for the Phase I of the course. Selected chapters are assigned in weeks 1-4, and the remaining chapters are suggested reading. Order your paperback early or purchase the e-book version.

All other key readings will be provided online on Web2Learn.

Module Readings

Week 1: Economics of the Environment


Additional recommended reading for ECM:


Week 2: Markets and Market Failure


Additional recommended reading for ECM:


Week 3: Property Rights and the Commons
Environmental Change and Management MSc/MPhil Course Handbook


Additional recommended reading for ECM:


Week 4: Instrument Choice


Additional recommended reading for ECM:


PHASE I, OTHER ADDITIONAL RECOMMENDED READINGS


PHASE II, POLICY TRACK

Week 6: Environmental Policy Evaluation and Cost-Benefit Analysis


Week 7: Behavioural Economics and Environmental Policy

Week 8: Public Finance, Macroeconomics and the Environment


Phase II, Modelling Track

Week 6: Environmental Policy Evaluation and Cost-Benefit Analysis


Week 7: Behavioural Economics and Environmental Policy


Week 8: Public Finance, Macroeconomics and the Environment


II. Global Change and the Biosphere

Module Leader: Professor Yadvinder Malhi
Teaching Staff: Professor Yadvinder Malhi, Dr Pam Berry, Dr Terhi Riutta, Dr Mark Hirons,
Course Animator: Imma Oliveras

Tuesday, 2-4 pm

Module rationale

This module examines the roles played by the biosphere in global and local environmental change, both in how it is affected by environmental change and in how changes in the biosphere can affect global change. It starts with a macro-scale view of global biosphere function in Earth history and the global impact of humanity, putting contemporary environmental change into wider context. It then explores how ecologists explore the responses of the biosphere to global change through field studies, satellite remote sensing and modelling, focussing on examples from contemporary research in tropical biomes and in local woodlands.

Intended learning outcomes

At the end of this module you will have a broad perspective on contemporary human impacts on ecosystems, and understand key concepts in ecosystems ecology.

Module outline

<table>
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<tr>
<th>Week/Delivery</th>
<th>Description</th>
<th>Concurrent methods &amp; skills sessions</th>
<th>Staff</th>
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<tbody>
<tr>
<td><strong>Week 1</strong>&lt;br&gt;Mon 9&lt;sup&gt;th&lt;/sup&gt; Oct&lt;br&gt;2 hour Lecture and discussion</td>
<td>The concept of the Anthropocene&lt;br&gt;This lecture will explore the history and concept of the Anthropocene, and how it is employed by various users including Earth system scientists, geologists, conservation scientists, social scientists and the wider media. It highlights the vigorous debates about its definition, its start date and whether there can be a “good Anthropocene”</td>
<td></td>
<td>Professor Yadvinder Malhi</td>
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<tr>
<td><strong>Week 2</strong>&lt;br&gt;17&lt;sup&gt;th&lt;/sup&gt; Oct&lt;br&gt;2 hour Lecture and discussion</td>
<td>The metabolism of a human-dominated planet&lt;br&gt;This lecture will explore how human impacts on the planet have increased over time, using the lens of social metabolism. The lecture will address (1) the concepts of social metabolism, (2) metabolisms of individuals and societies in human and insect societies, (3) environmental resource use and human impacts on the biosphere through human history and (4) human activity in the context of global biosphere activity.</td>
<td></td>
<td>Professor Yadvinder Malhi</td>
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<tr>
<td>Week 2</td>
<td>Fri 20th Oct</td>
<td>Wytham Woods Field trip</td>
<td><strong>Friday fieldtrip to Wytham Woods</strong></td>
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<td>This field trip will address key questions of forest ecology in the context of global change. We will learn about methods to assess plant species composition, diversity and carbon stocks. Wytham Woods has a rich history of ecological research that we will learn about. We will visit research plots to learn about the active ecosystems research going on.</td>
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<td></td>
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<td>Field techniques in assessing forest ecosystems</td>
<td>Staff &amp; Dr. Mike Morecroft</td>
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<tr>
<th>Week 3</th>
<th>24th Oct</th>
<th>2 hour Lecture and discussion</th>
<th><strong>Metrics for human impacts on the biosphere</strong></th>
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<td>This lecture will explore different approaches and metrics for human impacts on the biosphere, and the debates surrounding various metrics. Approaches studies include vegetation cover change, ecological footprints, extinction and animal abundance indices, Human Appropriation of NPP, and various metrics used to assess planetary boundaries and Sustainable Development Goals. Historical and recent trends in these metrics will be discussed.</td>
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<td>Professor Yadvinder Malhi</td>
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<tr>
<th>Week 4</th>
<th>1st Nov</th>
<th>2 hour Lecture and discussion</th>
<th><strong>Tropical forests and global change</strong></th>
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<td>The lecture will present a more detailed assessment multi-faceted Anthropocene change in one iconic biome: the tropical rainforest. It will explore the drivers and spatial patterns of change in tropical forests related to land use change, harvesting, defaunation and global atmospheric change, and explore opportunities to mitigating acute impacts.</td>
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<td>Discussion and skills sessions begin; including on building simple models; Dorset Field Course on Marine Ecology &amp; Coastal Environmental Management</td>
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<td>Professor Yadvinder Malhi</td>
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<tr>
<th>Week 5</th>
<th>7th Nov</th>
<th>2 hour Lecture and discussion</th>
<th><strong>The role of animals in ecosystem function</strong></th>
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<td>We examine the interaction between plants, animals and fungi in determining in shaping the structure and biogeochemical cycling of ecosystems. Animals are often perceived as passive beneficiaries of the productivity of plants. Here we explore how animals ranging in size from extinct mammoths to forest litter ants actively shape the structure and function of ecosystems, and identify the key processes involved. Loss and depletion of animals has often led to trophic cascades and of many ecosystems – we draw examples from research ranging from extinction of Pleistocene megafauna to current changes in African savannas.</td>
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<td>Professor Yadvinder Malhi</td>
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<tr>
<td>Week 6</td>
<td>15&lt;sup&gt;th&lt;/sup&gt; Nov</td>
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| 2 hour Lecture and discussion | **Climate change and biodiversity**
This week will focus on the drivers of biodiversity change and loss, concentrating on the impacts of climate change. It will examine what is the nature of these impacts and what methods are used to understand these past and future changes. There will be examples of the challenges of modelling changing biodiversity at different scales. This will be followed by an opportunity to think about what these means for conservation policy and management in practice. |
| Dr Pam Berry | **Research method and transferrable skills:** Field experiment design in ecosystem ecology |

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<th>Week 7</th>
<th>21&lt;sup&gt;st&lt;/sup&gt; Nov</th>
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| 2 hour Lecture and discussion | **Case studies of global change in the tropics**
This week will focus on ecological case studies that demonstrate why tropical gradients are powerful ecological tools. It will focus on an elevation gradient in Peru, a disturbance gradient in Malaysia and coffee and cocoa agroforests in Africa, beginning with an introduction to continuing research currently underway. There will be a description of the wide variety of different methods to study tree, bird and insect diversity. This will be followed by a description of ecosystem ecology methods to understand changes in the carbon balance of the forest and soils. This section will provide insights in how the future carbon cycle and biodiversity may respond to various drivers of global change. |
| Professor Yadvinder Malhi, Dr Terhi Riutta and Dr Mark Hirons | **Research method and transferrable skills:** biodiversity and how to inform policy |

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<th>Week 8</th>
<th>28&lt;sup&gt;th&lt;/sup&gt; Nov</th>
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| **Capstone: Humanity and the Biosphere in the Anthropocene**
The module will end in a fun and interactive event where students “present” in groups on a particular topic of relevance to the module. The form can take quiz shows, plays, songs, poems, comedy sketches, movies, but standard Powerpoints are definitely not allowed! Prizes for the most engaging and informative performances. |
| Professor Yadvinder Malhi | **Introductory readings**

Week 1: The concept of the Anthropocene

Key Readings

Malhi (2017) The concept of the Anthropocene, *Annual Reviews in Environment and Resources* (should be available online about August 2017)


Supplementary Reading


Week 2: The metabolism of a human-dominated planet

Key Readings


Supplementary Reading


Week 2: Friday field trip to Wytham Woods

Savill et al. (2011) Wytham Woods: Oxford’s Ecological Laboratory, OUP.

There is an excellent series of short science videos about the research at Wytham: [http://www.ox.ac.uk/content/wytham-woods-laboratory-leaves](http://www.ox.ac.uk/content/wytham-woods-laboratory-leaves)

Week 3: Metrics for human impacts on the biosphere

**Week 4: Tropical forests in the Anthropocene**

**Key Readings**


**Supplementary Reading**


**Week 5: The role of animals in ecosystem function**

**Key Readings**


**Supplementary Reading**


**Week 6: Climate change and biodiversity**

**Key Readings**


**Supplementary Reading**


Week 7: Case studies of global change in the tropics

Key Readings


Supplementary Reading

III. The Earth System

Module Leader: Professor Myles Allen
Course Animators: Peter Watson

Wednesday, 2-4 pm

Overview

This module introduces processes of change in the atmosphere, oceans, cryosphere, and biosphere, with a focus on climate change. Interactions between these earth system components are explored with particular focus on carbon and hydrological cycles. The role of the biosphere in the earth system is introduced, including nitrogen, phosphorus, and energy cycling; complementing more in depth examination of ecological processes in the Ecosystems module. The course will begin with an investigation of anthropogenic influences on the climate in the context of historical variability and change, and then outline the connections to other earth system components, with a focus throughout on the sources of evidence for recent trends, and the techniques used to understand drivers of change.

Objectives and competencies

The aim of this module is to deliver a holistic understanding of the processes of interaction and feedbacks within the earth system, as well as an introduction to the methods used to monitor and understand past changes, and to predict how the earth system might evolve in future. Students will receive hands on experience of data manipulation, environmental modelling and sensitivity analysis including working with a simple climate model, which will also deliver a more critical perspective on the evidence. The attribution game, a participatory exercise during which students will become farmers, scientists, and policymakers, will deepen their understanding of the science and test their ability to apply scientific results to policy-making.

Reading Groups and Q&A

Optional Q&A sessions will be run alongside the lectures, led by Peter Watson. These are designed to support the understanding of core concepts, such as the greenhouse effect, capabilities of climate models, and climate change detection and attribution. There will provisionally be 3 Q&A sessions in weeks 3, 5, and 7; and students will have the opportunity to sign up for these classes and post questions a week before the session.

Module outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Description</th>
<th>Concurrent methods &amp; skills sessions</th>
<th>Staff</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Anthropogenic influence upon the climate: past observations and future prospects</td>
<td></td>
<td>Myles Allen</td>
</tr>
<tr>
<td>Week 2</td>
<td>18th Oct</td>
<td>Lecture and discussion</td>
<td>The biosphere in the Earth System</td>
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<td>The main regions of the biosphere and their key properties and differences. The cycles of energy, water, carbon, nitrogen, and phosphorus in the terrestrial biosphere. Carbon, nitrogen, phosphorus budgets and future prospects.</td>
</tr>
<tr>
<td>Week 3</td>
<td>25th Oct</td>
<td>Lecture and discussion</td>
<td>Understanding the Greenhouse Effect</td>
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<td>The Earth’s radiation budget. The Greenhouse Effect and enhancement from anthropogenic emissions.</td>
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<tr>
<td>Week 4</td>
<td>1st Nov</td>
<td>Lecture and discussion</td>
<td>Understanding 21st century global temperature change</td>
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<td>Climate sensitivity, the transient climate response, and the role of the oceans. Introduction to simple climate models</td>
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<tr>
<td>Week 5</td>
<td>8th Nov</td>
<td>Lecture and discussion</td>
<td>The carbon cycle</td>
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<td>Components of the carbon cycle. Influence of the carbon cycle on 21st century climate change. Cumulative carbon and the role of short lived climate forcings.</td>
</tr>
<tr>
<td>Week 6</td>
<td>15th Nov</td>
<td>Lecture and discussion</td>
<td>Implications for climate change mitigation policy</td>
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<td>What does our understanding of rising global temperatures mean for climate policy? What are the implications of the 1.5°C goal?</td>
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<tr>
<td>Week 7</td>
<td>22nd Nov</td>
<td>Lecture and discussion</td>
<td>Beyond global temperature</td>
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<td>How much do we know about changes in other variables and at regional scales? Can we attribute extreme weather events to climate change?</td>
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### Week 8
29th Nov
Lecture and discussion

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<th>The hydrological cycle, land surface interactions and hydrological modelling</th>
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<tr>
<th>Exercise: Climate changes in your region</th>
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<tbody>
<tr>
<td>Analysis of future climate change projections (Peter Watson)</td>
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</table>

### Reading/Preparation

For the Earth System module the priority is that students understand key concepts, rather than arguments from different authors. Therefore referencing specific papers is less important than for some other modules, and we have chosen the readings and preparation to try to help students understand as much as possible about the Earth System, including websites and online courses. Some key readings for each topic are provided below.

**Online course:** Students are encouraged to complete the following short course “An Introduction to the Science of Climate and Climate Change” before coming to Oxford. The course is free and available at climateeducation.net.

### General Readings

**Stocker, T. et al. (2013) Climate Change: the Physical Science Basis, IPCC 5th Scientific Assessment, available at:** [ipcc.ch](http://ipcc.ch)


The following are reputable sources for questions about climate science, and answering “sceptic” questions:

- [http://www.realclimate.org/](http://www.realclimate.org/)

### On the greenhouse effect


A useful blog on the greenhouse effect:


David Archer’s MODTRAN model (to play around with the impact of CO₂ on outgoing radiation):

[http://geoflop.uchicago.edu/forecast/docs/Projects/modtran.orig.html](http://geoflop.uchicago.edu/forecast/docs/Projects/modtran.orig.html)

### On observed climate change


On climate models and projections (Week 4)

**Relevant chapters of the IPCC AR5 WG1 report (available at: ipcc.ch): Chapter 9 and 12


Smith, Leonard – has written many papers emphasising the uncertainty associated with climate models, but in particular I’d recommend you watch a presentation he gave at a workshop in which he compares a climate model to a rubber duck. Go to the following link and you can watch the video by clicking on MP4 next to “Lenny Smith: Distinguishing Uncertainty, Diversity and Insight”

https://www2.image.ucar.edu/workshops/uncertainty-climate-change-research-archive

On attribution

**Relevant chapters of the IPCC AR5 WG1 report (available at: ipcc.ch): Chapter 10

A great presentation by Claudia Tebaldi on detection and attribution can be viewed at the following link by clicking on MP4 next to “Claudia Tebaldi: Observed and Projected Changes in Extremes: Detection, Attribution, and Uncertainty Characterisation”:

https://www2.image.ucar.edu/workshops/uncertainty-climate-change-research-archive

On extreme event attribution:


Peterson, T. (2012). Explaining Extreme Events of 2011 from a Climate Perspective. Bulletin of the American Meteorological Society, 1041–1067. doi:10.1175/Bams-D-12-00021.1 [The introduction gives a good overview of what this science is trying to achieve and then each paper gives a short example]


On the relevance of extreme event attribution for the UNFCCC:


On the biosphere


On the carbon cycle


On cumulative carbon and the trillionth tonne:

See also:
http://trillionthtonne.org/
https://www.youtube.com/watch?v=YGc6knmpL2E

On short lived climate forcings


On the hydrological cycle


Teaching Staff

Myles Allen is Professor of Geosystem Science. His research focuses on how human and natural influences on climate contribute to observed climate change and risks of extreme weather and in quantifying their implications for long-range climate forecasts. Myles has served on the Intergovernmental Panel on Climate Change as Lead Author on Detection of Climate Change and Attribution of Causes for the 3rd Assessment in 2001 and as Review Editor on Global Climate Projections for the 4th Assessment in 2007. He proposed the use of Probabilistic Event Attribution to quantify the contribution of human and other external influences on climate to specific individual weather events and leads the www.climateprediction.net project, using distributed computing to run the world’s largest ensemble
climate modelling experiments.

Yadvinder Malhi is Professor of Ecosystems Science, and leads the Ecosystems module of the ECM.

Friederike Otto is a senior researcher in the ECI Global Climate Science Programme and leads and coordinates the distributed computing climate modelling project climateprediction.net. Her main research interest is extreme weather events, improving and developing methodologies to answer the question 'whether and to what extent external climate drivers alter the likelihood of extreme weather'.

Simon Dadson is an Associate Professor in Physical Geography. His research focuses on the processes that link climate, hydrology, and geomorphology. These links range from the potential impacts of future climate change on river flows, to the study of how continental-scale weather patterns have influenced the development of mountain topography over the past few million years.

Peter Watson is a Research Fellow in the Predictability of Weather and Climate group. A climate physicist by training, his research focuses on the impact of climate change on atmospheric dynamics and how this affects the occurrence of extreme weather events.
IV. Human Systems and Environmental Change

Module Leaders: Dr Tom Thornton and Dr Kate Raworth
Teaching Assistant:
Thursday, 2-4 pm

Overview

This module examines human systems of environmental knowledge, values, organization, technology, and behaviour in relation to environmental change in an evolutionary and social development context. What is the utility of viewing human societies as systems? How do complexity, diversity, stratification, and strategising in human societies shape their contributions and responses to critical environmental parameters and challenges? The module introduces relevant cognitive, social, economic, and human ecological concepts and theory to understand historical developments in social-ecological systems and address contemporary issues of sustainability and wellbeing in an increasingly populous and globalised society. It takes a critical perspective on contemporary environmental social science, which is often limited and reductionist in studies of global environmental change (GEC), while advocating for a deeper more systemic analysis of the key problems humans face in responding to this change.

Objectives and competencies

This module aims to assist students in gaining a critical understanding of the interactions between environmental change and society in an interdisciplinary, social-ecological systems context. Major topics and methods include social and evolutionary theory, historical and political ecology, cultural models of the environment, biocultural diversity, adaptation, resilience, and concepts of human, economic, and sustainable development. Students will be expected to master appropriate concepts and skills for analysing the development, dynamics, and sustainability of complex social-ecological systems, including both historical and contemporary examples. In addition students will apply these skills to design innovative human-environmental systems research, compose policy briefs, and engage in debates on contemporary social-environmental problems.

Reading and skills sessions

Reading and concurrent skills sessions will be scheduled within the module. These will be led by either the module leaders or the teaching assistant and include emphasis on communication skills (reading, discussion, writing, oral) and cognitive model building, and research design (anticipating dissertation research). The reading group will facilitate discussion on the emergence of ‘sustainable development’ as a dominant theme in international development from both a practical and academic perspective. Participants will discuss various perspectives on what might be considered ‘sustainable development’ and how its definition and framing have influenced efforts to operationalise and measure it at a range of governance levels and in a diverse range of geographic settings. There will be an initial discussion about decision making for sustainable development and the role of indicators. This will link with the Hilary term module and reading group on Sustainable Responses to Environmental Change. Readings will be distributed prior to the session.

The Writing for Policy Influence workshop presents a highly effective step-by-step approach to communicating research so that it reaches and influences policymakers, the media, funders and other research users. It is highly recommended for anyone who wants their work to be accessible to readers beyond their own field.
## Module outline

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<tr>
<td><strong>Week 1</strong>&lt;br&gt;9th Oct Lecture and discussion</td>
<td><strong>Redefining human prosperity</strong>&lt;br&gt;Part of the “Welcome to the Anthropocene” series.&lt;br&gt;An introductory exploration of social and planetary boundaries, with discussion of the major factors shaping humanity's role in driving environmental change.</td>
<td>Discussion and writing skills-Collapse &amp; This Changes Everything: (tbc)&lt;br&gt;Friday workshop: Core Concepts for Systems Thinking (Kate Raworth)</td>
<td>Kate Raworth/Tom Thornton</td>
</tr>
<tr>
<td><strong>Week 1</strong>&lt;br&gt;10th Oct and 12th Oct Lecture and discussion</td>
<td>Part of the “Welcome to the Anthropocene” series...&lt;br&gt;&lt;br&gt;<strong>Global population: patterns and prospects (10 Oct)</strong>&lt;br&gt;An introduction to the dynamics of population growth and environmental change, with an overview of the changing historical and political conceptions of this relationship.&lt;br&gt;&lt;br&gt;<strong>Economic globalisation in the Anthropocene (12 Oct)</strong></td>
<td></td>
<td>Danny Dorling &amp; Dariusz Wójcik</td>
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<tr>
<td><strong>Week 2</strong>&lt;br&gt;19th Oct Lecture and discussion</td>
<td><strong>Social-Ecological Systems (SES) in evolutionary context:</strong>&lt;br&gt;<strong>Metabolic rescaling and rifts in the transition from local to global production</strong>&lt;br&gt;What is the unity and diversity of human organisation and complexity in relation to environmental diversity &amp; change? How have developments in globalising production affected social-ecological systems? What tools are needed to understand and respond to these developments?&lt;br&gt;Friday Workshop: Writing for policy influence (Kate Raworth) (tbc)</td>
<td></td>
<td>Tom Thornton</td>
</tr>
<tr>
<td><strong>Week 3</strong>&lt;br&gt;26th Oct Lecture and discussion</td>
<td><strong>Resilience, vulnerability and adaptation in human-environmental systems</strong>&lt;br&gt;How do systems and communities become vulnerable, resilient and adaptive? How do diverse perceptions and experiences of environmental problems and human-environmental relations affect responses to environmental change?&lt;br&gt;Friday Workshop: Using cultural models to understand social-ecological values and cognition (Tom Thornton) (tbc)</td>
<td></td>
<td>Tom Thornton</td>
</tr>
<tr>
<td>Week 4 2&lt;sup&gt;nd&lt;/sup&gt; Nov</td>
<td><strong>Social-Ecological Systems, Stewardship and sustainability</strong>&lt;br&gt;What is the relationship between resilience and sustainability in the Anthropocene? What role has/can ecosystem stewardship play in improving the sustainability of critical resources, habitats, services amidst change and uncertainty?</td>
<td>Marine Ecology &amp; Coastal Environmental Management; Research design, survey, monitoring &amp; mitigation techniques</td>
<td>Peter Henderson, Tom Thornton, Staff</td>
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<tr>
<td>Week 4 3&lt;sup&gt;rd&lt;/sup&gt; – 5&lt;sup&gt;th&lt;/sup&gt; Nov Dorset Field Course</td>
<td><strong>Coastal and marine systems and environmental change</strong>&lt;br&gt;Marine ecology, environmental change, energy and resource development, impacts, monitoring, assessment; policy and governance issues.</td>
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<tr>
<td>Week 5 Lecture and discussion 9&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td><strong>Analysing power and identify</strong>&lt;br&gt;How can diverse concepts of power enrich the analysis of socio-ecological systems? And how might social differences such as those based on gender, ethnicity and class be taken into account in analysing and responding to environmental change?</td>
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<tr>
<td>Week 5 Lecture and discussion 9&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td><strong>The influence of indicators and goals</strong>&lt;br&gt;What is sustainable development and how should it be measured? An overview of the evolution of indicators for development and the rise of global goals, with implications for environmental change.</td>
<td>Discussion session (tbc)</td>
<td>Kate Raworth</td>
</tr>
<tr>
<td>Week 6 10&lt;sup&gt;th&lt;/sup&gt; Nov Lecture and group exercise</td>
<td><strong>Sustainability reading group</strong>&lt;br&gt;Versions of sustainability&lt;br&gt;Operationalizing sustainability</td>
<td>First reading group with subsequent meetings and times (tbc)</td>
<td>Daniel Adshead, Carolina Gueiros, Kiron Neale, and Jade Leung</td>
</tr>
<tr>
<td>Week 6 16&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td><strong>Exploring ecological economic paradigms</strong>&lt;br&gt;What is green growth and is it possible? If so, under what circumstances? If not, what are the alternatives? An introduction to the evolving theory and evidence on reframing economic development.</td>
<td>Friday workshop: Innovating in the Anthropocene (KR)</td>
<td>Kate Raworth</td>
</tr>
</tbody>
</table>
Week 8
30th Nov
Capstone debate

<table>
<thead>
<tr>
<th>Synthesis debates</th>
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</thead>
<tbody>
<tr>
<td>Critical dilemmas: is sustainability achievable in the Anthropocene? Four controversial motions to be debated in teams.</td>
</tr>
</tbody>
</table>

Kate Raworth and Tom Thornton

Readings

Week 1: Welcome to the Anthropocene

Monday Collapse / This Changes Everything/Anthropocene Discussion (Thornton):

  https://stockholmuniversity.box.com/s/spjgi7ln9s9umjgb0l6nbb7t73noo0v6


Video flip lecture by Kate Raworth introducing social and planetary boundaries. Required prior viewing, available on Weblearn from 1st October 2017 (Wk1-Raworth-fliplecture.mp4).

Preparation for class discussion: available on Weblearn from 1 October 2017 (Wk1-Raworth-questions.doc).

Friday Workshop on systems thinking:


Week 2: Social-Ecological Systems (SES) in evolutionary context


Supplementary


Mitchell, T. 2009. Carbon democracy, economy and society 38(3): 399-432, DOI: 10.1080/03085140903020598 To link to this article: http://dx.doi.org/10.1080/.

Week 3—Resilience, diversity and adaptation in human-environmental systems


Supplementary


Week 4: Social-Ecological Systems, stewardship and sustainability


Supplementary


Week 4 - Dorset Field Course on Marine Ecology and Coastal Environmental Management

Henderson, Peter. n.d. [2016]. A summary of environmental issues linked to fracking. Briefing paper to be


Other short readings (tbd).

**Week 5: Analyzing power and identity**


‘Kimberlé Crenshaw discusses ‘Intersectional feminism’, Lafayette College, online video (10 mins)
https://www.youtube.com/watch?v=ROwguqX_Gxc

Agrawal, B. 2009. Gender and forest conservation: the impact of women’s participation in community forest governance. Ecological Economics 68 (2785-2799)

Either: Ray-Bennett, N. 2009. The influence of caste, class and gender in surviving multiple disasters: a case study from Orissa, India. Environmental Hazards 8 (5-22)


Video flip lecture by Kate Raworth: an introduction to gender analysis, Weblearn (Wk5-Raworth-fliplecture.mp4)

Preparation for class discussion: Weblearn (Wk5-Raworth-questions.doc).

**Week 6: The influence of indicators and goals**


Video flip lecture by Kate Raworth: the evolution global indicators for ‘sustainable human development’, Weblearn (Wk6-Raworth-fliplecture.mp4)

Preparation for class discussion: Weblearn (Wk6-Raworth-questions.doc)

**Week 7: Exploring futures of economic growth**


Video flip lecture by Kate Raworth: analyzing growth-dependent economies, Weblearn (Wk7-Raworth-fliplecture.doc)

Preparation for discussion: Weblearn (Wk7-Raworth-questions.doc)

**Week 8: Capstone debate on human systems and environmental change**

Readings to be determined by debating motions.

**Teaching Staff**

**Tom Thornton** serves as Director of the Environmental Change and Management MSc and is a Senior Research Fellow in the ECI and Associate Professor in the School of Geography and the Environment. He received training in anthropology, environmental studies, education, and sociology at Swarthmore College (BA) and the University of Washington (MA, PhD). He is the author of *Being and Place among the Tlingit* (University of Washington Press, 2008), *Haa Léelk’w Háas Aaní Saax’u / Our Grandparents’ Names on the Land* (University of Washington Press and Sealaska Heritage Institute, 2012), and numerous articles and chapters on environmental issues and policy among the indigenous peoples of the Far North and, more recently, cities in Europe and Asia. He is also the editor of *Haa Aaní, Our Land: Tlingit and Haida Land Rights and Use* (1998) and *Will the Time Ever Come?* (2001, with A. Hope III). His main research interests are in human ecology, adaptation, local and traditional ecological knowledge, conservation, coastal and marine environments, conceptualizations of space and place, and the political ecology of resource management and sustainability in urban and rural settings. See [www.eci.ox.ac.uk/people/thorntontom.php](http://www.eci.ox.ac.uk/people/thorntontom.php) for further information.

**Kate Raworth** is a Senior Visiting Research Associate at Oxford University's Environmental Change Institute, and a Senior Associate of the Cambridge Institute for Sustainability Leadership. Her research is focused on rethinking economics so that it is fit for tackling the 21st century's social and ecological challenges, and she is the author of Doughnut Economics: seven ways to think like a 21st century economist (Penguin Random House). Kate was previously senior researcher at Oxfam, economist and co-author of UNDP’s Human Development Report, and a fellow of the Overseas Development Institute based in Zanzibar. She holds a first class B.A. in Politics, Philosophy and Economics, and a Masters in Economics for Development, both from Oxford University. She is a member of the advisory board of the Environmental Change Institute, the Stockholm School of Economics Global Challenges Programme, and the University of Surrey’s Centre for the Understanding of Sustainable Prosperity.
5.2 Responding to Environmental Change

Hilary Term 2017

Responding to Environmental Change consists of three core lecture modules - Energy Systems and Mitigating Climate Change, Sustainable Responses to Environmental Change, and Governing the Anthropocene - with a special introductory week on the energy system, three field courses and a bevy of research methods and skills sessions to aid students in developing an integrated perspective and practical skills for responding to environmental change. The core modules include reading group options and transferrable skills sessions.

The Brussels field trip at the end of Hilary Term serves as capstone exercise for understanding and evaluating the European Union’s climate, energy, and ecosystem responses to environmental change.

**Introduction: Energy Systems (Weeks 1-2)**

*Module Leader: Dr Chris Jardine*

*Teaching Assistant: Kiron Neale*

This intensive week examines the foundational role of the energy system in affecting societal impacts and responses to environmental change. The first week provides an introductory series of lectures on critical energy supply, demand, development and policy issues. This is followed in the second week by a field course to the Centre for Alternative Technology (CAT) in Wales, with visits to other energy sites. By the end of this introductory module you should have a clear grasp of the main components of energy systems and why it is important to view energy from a systems perspective in mitigating and adapting to climate change in sustainable ways.

The schedule of lectures will be circulated separately.
Overview

Responding to environmental change is essentially about making choices. Any policy response will involve costs and benefits, risks and opportunities, and trade-offs between winners and losers. The balance of beneficial and negative impacts will be strongly dependent on the characteristics of particular contexts. This module explores the approaches and methods that may be used in environmental decision making. It begins with sustainability as a broad aim of environmental decision making and includes a reading group to explore the various versions and critiques of sustainability that have appeared in the extensive sustainability literature. The theoretical basis for normative decision making is presented. A particular emphasis is placed upon the treatment of risk and uncertainty, which helps to evaluate the different future scenarios originating from our decisions. Furthermore, decision theory relies upon the capacity to value costs, benefits and impacts, for which we turn to environmental economics. Tools for environmental decision making in Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), resource modeling and lifecycle analysis are presented. The lecture series is accompanied by master class workshop sessions with leading practitioners to explore environmental decision making from different perspectives in the public and private sectors.

Aims and competencies

The course aims to equip students with the theories and tools to make decisions about management of the environment, taking into account costs, benefits, and risks. Students will learn about practical methods for analysing decisions, including multi-criteria analysis and Cost-Benefit Assessment. This will equip them to use these methods in decision making and to critique their use by others. Examples will be drawn widely from environmental management, but with a particular emphasis upon decisions about adaptation and mitigation. Master class workshop sessions will provide insights into practical decision making and sustainable assessment, including skills of advocacy and argumentation and verbal/written presentation skills.

Learning objectives

- Critical understanding of principles and application of concepts of:
  - Sustainability
  - Decision making under uncertainty

- Ability to critically apply the following methods and techniques:
  - Multi-criteria analysis
  - Risk analysis
  - Cost-benefit analysis
  - Simple integrated assessment modelling
  - Environmental Impact Assessment and Strategic Environmental Assessment
  - Life-cycle analysis and resource modelling
• Appreciation of the practicalities of environmental decision making in a variety of different settings, including:
  o Climate change adaptation
  o Businesses
  o Finance

Delivery

The course will be delivered in the following ways:

• presentation of fundamental principles, techniques and supporting examples in lectures
• a reading group on sustainable development which will explore and critique key readings on sustainability
• practical exercises in multi-criteria analysis, risk analysis, CBA and mitigation decision making
• workshop sessions with practitioners to explore practical examples of environmental decision making
• a capstone exercise, in which students have to identify an example of sustainable decision making, identify and evaluate options using one of the methods or techniques discussed in class, and present their recommendations to the rest of the class as a ‘business case’.

Module outline

<table>
<thead>
<tr>
<th>Week/Delivery</th>
<th>Description</th>
<th>Staff</th>
</tr>
</thead>
</table>
| Week 2        | Sustainability  
  Introduction to the course  
  Definitions and concepts of sustainability  
  History of development of sustainability theory and practice  
  Sustainable Development Goals  
  Introduction of the capstone exercise | Jim Hall |
| Week 3        | Making decisions  
  Valuation and preference orderings  
  Single and multi-objective decision making  
  Decision making under uncertainty  
  Group decisions  
  Decision making in practice | Jim Hall |
| Week 3        | Sustainability reading group  
  Versions of sustainability  
  Operationalizing sustainability | Jade Leung |
| Week 3        | Corporate sustainability officer  
  Role of the corporate sustainability officer | Francis Sullivan |
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Topics</th>
<th>Facilitators</th>
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</thead>
<tbody>
<tr>
<td>10-12pm</td>
<td>Friday Workshop</td>
<td>Investment and finance decisions</td>
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<td></td>
<td><strong>Week 4</strong></td>
<td><strong>Analysis of environmental risks</strong></td>
<td>Jim Hall</td>
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<td></td>
<td>5&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td>Definitions of risk</td>
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<td>2-4pm</td>
<td>Qualitative and risk ranking methodologies</td>
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<td>Quantitative risk assessment</td>
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<td>Risk perception and risk management</td>
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<td>7&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td><strong>Practical session (computer room)</strong></td>
<td>Jim Hall</td>
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<td>11-1pm</td>
<td>CBA</td>
<td>Jade Leung</td>
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<td>Multi-criteria analysis</td>
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<td></td>
<td>Quantified risk analysis</td>
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<tr>
<td></td>
<td>9&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td><strong>Practical session (computer room)</strong></td>
<td>Richard Millar</td>
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<td></td>
<td>10-12pm</td>
<td>Mitigation decisions with IAMs and the DICE model</td>
<td>Jade Leung</td>
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<td>Process for conducting and evaluating EIA</td>
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<td><strong>Week 6</strong></td>
<td><strong>Scenarios and integrated assessment</strong></td>
<td>Myles Allen</td>
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<td></td>
<td>12&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td>Integrated Assessment models of climate change</td>
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<td>Costs and benefits of mitigation pathways</td>
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<td>Assumptions and uncertainties in Integrated Assessment</td>
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<td>16&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td><strong>Feedback on proposals for capstone exercise</strong></td>
<td>Jim Hall</td>
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<td></td>
<td>10-1pm</td>
<td>Workshop session in which students present proposals for “sustainability business case”</td>
<td>Jade Leung</td>
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<td></td>
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<td>and obtain initial feedback</td>
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<td></td>
<td><strong>Week 6</strong></td>
<td><strong>Climate change adaptation decisions</strong></td>
<td>Jim Hall</td>
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<td>19&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td>Principles of adaptation decisions</td>
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<td>2-4pm</td>
<td>Climate change risk assessment</td>
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<td>The role of government in adaptation</td>
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<td>UK legislative arrangements for adaptation</td>
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<td></td>
<td><strong>Week 6</strong></td>
<td><strong>Sustainability reading group</strong></td>
<td>Jade Leung</td>
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<td></td>
<td>20&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td>Decision-making under uncertainty</td>
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<td></td>
<td>10-12pm</td>
<td>Operationalizing sustainability</td>
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<td><strong>Week 6</strong></td>
<td><strong>Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)</strong></td>
<td>Nicola Lee</td>
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<td>23&lt;sup&gt;rd&lt;/sup&gt; Feb</td>
<td>Principles and rationale behind SEA and EIA</td>
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<td>10-12pm</td>
<td>Legislative basis for EIA and SEA</td>
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<td>Identification of categories of impact, consideration of cumulative impacts and SEA</td>
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<td>Process for conducting and evaluating EIA</td>
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</table>
Week 7  
26th Feb  
Monday Lecture

<table>
<thead>
<tr>
<th>Resource modelling and lifecycle analysis</th>
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<tbody>
<tr>
<td>Resource inputs to material goods. Industrial ecology</td>
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<tr>
<td>Lifecycle analysis</td>
</tr>
<tr>
<td>Resource modelling of a system e.g. urban metabolism</td>
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</tbody>
</table>

Katy Roelich

Week 7  
2nd Mar  
10-12pm  
Friday workshop

<table>
<thead>
<tr>
<th>Adaptation in practice</th>
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<tbody>
<tr>
<td>The adaptation cycle</td>
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<td>UKCIP’s adaptation tools</td>
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<tr>
<td>Adaptation in businesses</td>
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<tr>
<td>Adaptation at a national and European scale</td>
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</table>

Roger Street

Week 8  
5th Mar  
2-5pm  
Monday session

<table>
<thead>
<tr>
<th>Capstone exercise</th>
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<tbody>
<tr>
<td>Presentations of urban sustainability businesses cases</td>
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</table>

Jim Hall  
Jade Leung

A revision session will be arranged during Trinity Term.

Readings

Key readings are identified with an asterisk *

Sustainability


  * Chapter 1 – concept of transition to sustainability and roles of science, technology and values
  * Chapter 2 – overview of trends in social and environmental change that define transition to sustainability
  * Chapter 3 – review of range of modeling, assessment and scenario methods


Decision making

  - Chapter 2 – General decision-making process overview
  - Chapter 4 – MCA overview including MAUT, AHP and outranking methods
  - Chapters 5 and 6 – Details of MCDA process
  - Chapter 7 – Some useful case studies

  - Chapter 2 – Decisions under risk and analysis
  - Chapter 3 – Preference order and value functions
  - Chapter 4 – Multi-attribute decision analysis

  - Chapter 4 – Decisions under risk
  - Chapter 5 – Decisions under uncertainty


- Chapter 3 – Overview of quantitative policy analysis


**Risk analysis**


- Section 1.5 – The Principles of Decision Making Under Uncertainty


Scenario analysis


Integrated assessment


Adaptation decisions


Environmental Impact Assessment / Strategic Environmental Assessment

Bond, A., & Pope, J. (2012). The state of the art of impact assessment in 2012. Impact Assessment and Project Appraisal, 30(1), 1-4. (This article is an editorial but the issue of Impact Assessment and Project Appraisal includes summary articles on environmental; impact assessment, strategic environmental assessment, social impact assessment and sustainability assessment.) [5 pages, article]


Overview

This module examines the complex challenges of governing collective action in the twenty-first century. The term “governance” reflects a growing awareness that not only governments but a wide range of non-governmental actors at multiple scales – from international NGOs to corporations and local communities – are involved in shaping environmental strategies and outcomes. This course applies a range of conceptual lenses to examine and critique this complex governance landscape, from common pool resource theory, to the political economy of trade and development, to integrative conceptions of “earth system governance”. These concepts are applied across a range of substantive environmental issues, governance problems, and geographic scales, with a focus on climate, forests, agriculture and coastal and marine systems.

Objectives and competencies

This course aims to assist students in gaining a critical understanding of governance theory and social science research methods and their relevance to major environmental and social problems.

Module outline

<table>
<thead>
<tr>
<th>Week/Delivery¹</th>
<th>Description</th>
<th>Concurrent methods &amp; skills sessions</th>
<th>Staff</th>
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</thead>
<tbody>
<tr>
<td>Week 2</td>
<td>Intro to Governance I: Locating governance in the Anthropocene</td>
<td>Social science research design workshop 1: Research questions² (developed over MT-HT break)</td>
<td>Constance McDermott</td>
</tr>
<tr>
<td>2 hour Lecture and discussion + 2 hour methods and skills session</td>
<td>Why/what/where is governance in the Anthropocene? This lecture will explore the rising eminence of the term ‘governance’, drawing on examples from the forest sector and beyond.</td>
<td>(C McDermott and staff)</td>
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</table>

¹ The precise order of the lectures is subject to change.
² Among the workshop goals is to help students develop skills in social science research, with a particular emphasis on how to approach social science questions in their dissertations. The emphasis will be on overarching design questions rather than specific research skills. The latter, e.g. interview design, data analysis, etc., is material to be covered in surgeries.
<table>
<thead>
<tr>
<th>Week 3</th>
<th>Intro to Governance II: Contrasting theories of governance</th>
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<tbody>
<tr>
<td>2 hour Lecture and discussion + 2 hour methods and skills session</td>
<td>From positivist to constructivist, institutionalist to Foucault. The linkage of theoretical frames with Gaventa’s ‘Power Cube’, differing world views and social science methods</td>
</tr>
</tbody>
</table>

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<tr>
<th>Week 4</th>
<th>Intro to Governance III: Adaptive and polycentric governance in the face of environmental change</th>
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<tbody>
<tr>
<td>2 hour Lecture and discussion + 2 hour methods and skills session</td>
<td>Examination of adaptive governance theory and the problem of “conservation governance” in polycentric systems across scales.</td>
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<th>Week 5</th>
<th>Workshop applying social theory to research and practice</th>
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<tr>
<th>Part II: Guest lectures</th>
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<tr>
<td>Week 6</td>
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<tr>
<td>2 hour open lecture and discussion</td>
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<tr>
<th>Week 6</th>
<th>EU environmental governance</th>
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<tr>
<td>2 hour Lecture and discussion + 2 hour methods and skills session</td>
<td>Environmental governance at the EU level, through policy controversies relating to biofuels and sustainable road transport. Critical analysis of the formal and informal components of politics and policy making in Brussels today.</td>
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<tr>
<th>Part III: Conclusion</th>
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<tr>
<td>Week 8</td>
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<tr>
<td>2 hour lecture, discussion and group exercise</td>
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modules. Students will experiment with designing and diagramming multi-scale governance frameworks for select issue areas (e.g. forests, food, etc.).

Course Field Trip

<table>
<thead>
<tr>
<th>Week 9</th>
<th>Environmental Governance in the EU</th>
<th>Field trip</th>
<th>14th – 16th March 2018</th>
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<tbody>
<tr>
<td>3-day field trip to Brussels</td>
<td>Field-based study of EU institutions for environmental governance and management.</td>
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Elective Activities

<table>
<thead>
<tr>
<th>Hilary Term</th>
<th>COP23 Bonn</th>
<th>Benito Muller et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTIONAL seminar</td>
<td>Debrief Seminar on the outcome of COP 23</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reading group (TBC)</th>
<th>Model UNFCCC</th>
<th>Bettina Wittneben</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Practicing Participatory Governance</th>
<th>Monika Zurek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A lecture and workshop to build skills in designing, implementing, and governing participatory processes in assessment, resilience and adaptation.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Commons Governance: Fishbanks simulation</th>
<th>Erik Gomez-Baggethun</th>
</tr>
</thead>
</table>

Readings

General Reading


Environmental Change and Management MSc/MPhil Course Handbook 66

**Week 2 Lecture**


Young, O. 2013. Ch 4 Horizontal Interplay; Ch 5: Vertical Interplay. In: On Environmental Governance.


**Supplemental**


**Research Design Workshop I:**


**Supplemental**


**Week 3 Lecture**


**Week 4 Lecture**


Scott, James C. 1998. Seeing like a state: how certain schemes to improve the human condition have failed. New...


Supplemental


Research Design Workshop 2:


Methods bibliography: (To be deposited in Weblearn).

Guest Lectures

Week 6 Lecture


Supplemental


Young, O. R. Ecosystem Services: Thinking in Systems. IN On Environmental Governance, Ch. 3. Paradigm.

Week 7 Lecture


Optional Activities

**Practicing Participatory Governance workshop**

MA. 2005. Millennium Ecosystem Assessment Manual, particularly chapters 1, 2 and 5. 
http://www.millenniumassessment.org/en/index.html

https://www.unep-wcmc.org/system/dataset_file_fields/files/000/000/109/original/EcosystemsHumanWellbeing.pdf?1398679213


**Teaching Staff**

Constance McDermott is a James Martin Senior Fellow in forest governance and Chair of the Forest Governance Group at the Oxford Centre for Tropical Forests. She received training in anthropology, sociology and forestry through the course of her undergraduate and graduate studies at Amherst College (BA), the University of Washington (MSc), and the University of British Columbia (PhD). Over the past twenty-five years she has conducted research and applied work on local, state and market-based approaches to forest governance, including community forestry, forest certification, FLEGT, comparative public forest policy, intergovernmental forest and climate negotiations and REDD+. This includes fieldwork in North America, Asia and Latin America as well as global and regional comparative studies covering tropical, temperate and boreal forest zones in over 65 countries. Recent publications include books on comparative environmental forest policy and REDD+, as well as global forest expert assessments prepared for the international, multi-agency Collaborative Partnership on Forest.

Tom Thornton serves as Director of the Environmental Change and Management MSc and is a Senior Research Fellow in the ECI and Associate Professor in the School of Geography and the Environment. He received training in anthropology, environmental studies, education, and sociology at Swarthmore College (BA) and the University of Washington (MA, PhD). He is the author of *Being and Place among the Tlingit* (University of Washington Press, 2008), *Haa Léelk’w Hás Aani Saax’u / Our Grandparents’ Names on the Land* (University of Washington Press and Sealaska Heritage Institute, 2012), and numerous articles and chapters on environmental issues and policy among the indigenous peoples of the Far North and, more recently, cities in Europe and Asia. He is also the editor of *Haa Aani, Our Land: Tlingit and Haida Land Rights and Use* (1998) and *Will the Time Ever Come?* (2001, with A. Hope III). His main research interests are in human ecology, adaptation, local and traditional ecological knowledge, conservation, coastal and marine environments, conceptualizations of space and place, and the political ecology of
resource management and sustainability in urban and rural settings. See [www.eci.ox.ac.uk/people/thorntontom.php](http://www.eci.ox.ac.uk/people/thorntontom.php) for further information.

**Mark Hirons** is a Research Fellow in Environmental Social Science. His main research interests are in the political ecology of natural resource governance and development, particularly with respect to forests. For the past four years he has worked on the Ecosystem Services and Poverty Alleviation (ESPA) ECOLIMITS project. This interdisciplinary project investigates the linkages between ecosystem service provision and the multiple dimensions of poverty in coffee- and cocoa-dominated agricultural settings, focusing on Ethiopia and Ghana respectively. The project uses a range of methods to develop a holistic understanding of how ecosystems influence, and are influenced by, socio-economic, political and cultural conditions across various scales. The project has also investigated the impact of, and response to, a drought related to the 2015 El Niño event. The project aims to feed new understanding into the identification of poverty alleviation strategies which account for the complexity of ecosystems and the lives they support. Before coming to Oxford he did a BSc in Environmental Science at the University of East Anglia and an MSc in Environment and Development and PhD in International Development and Rural Livelihoods at the University of Reading where he researched mining and forestry land-use conflict.

**Guest Lecturers**

**Kaysara Khatun** is a Marie Curie Fellow at the Environmental Change Institute (ECI) at Oxford University. She has over 15 years of experience in the private, NGO and academic sectors working in Asia, Africa, Europe and South America. Her research interests are situated in the interdisciplinary areas of climate change policy, land use change, and natural resource management. These include adaptation and mitigation reflecting a keen interest in policy formation and implementation in international, national through to community levels, mainly in the forestry and sustainable development contexts. Her work links insights from both the social and the natural sciences with a strong commitment to empirical research. She has been involved in projects (or in an advisory capacity) with the Carbon Trust (UK), CATIE (Costa Rica), CIFOR (Indonesia), MCDI (Tanzania), IISc (India), BC3, ICTA-UAB (Spain), Winrock international (USA), The Govt of Ecuador etc.

**Erik Gomez-Baggethun** is a Professor in Environmental Governance and the Norwegian University of Life Sciences (NMBU), Research Professor at the Norwegian Institute for Nature Research (NINA) and a Senior Visiting Research Associate at the School of Geography and the Environment at University of Oxford. His research covers topics in ecological economics, political ecology, and environmental governance, fields in which he has authored or co-authored >100 papers, book chapters and policy reports. He is vice president of the European Society for Ecological Economics and editorial board member of several international scientific journals. Erik has been lead author of the report ‘The economics of Ecosystems and Biodiversity’ (TEEB), chapter coordinator of the CBD’s report ‘Cities and biodiversity Outlook’, and expert for the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES).

**James Palmer** is the Course Director of the MSc in Nature, Society and Environmental Governance. James' research examines the roles of science, evidence and discourse in EU biofuels policy making, focusing in particular on debates about biofuels' land-use change impacts.
III. Energy Systems and Mitigating Climate Change  

Module Leaders: Dr Chris Jardine, Dr Sarah Darby, Dr Phil Grunewald  
Course Animator: Dr Chris Jardine  
Teaching Assistant: Kiron Neale  

Wednesday, 2-4pm  

Overview  

The module will provide an understanding of the role of energy in causing and mitigating climate change. It will take a broad approach to energy systems, to include the supply and use of fuel, electricity and passive measures for energy services, as well as the associated infrastructures, social practices and governance. An important focus is the role of energy system transition in avoiding dangerous anthropogenic climate change. However, the module will also address other drivers and constraints on energy system development, such as affordability, energy security and non-greenhouse-gas environmental impacts. Energy systems are socio-technical in nature, and therefore the theoretical approaches upon which the module draws are eclectic, including thermodynamics, innovation theories, practice theory, public policy analysis and various strands of economic thought.  

Learning objectives  

The learning objectives are essentially twofold. First, students will gain knowledge of the key concepts and debates related to energy, with particular reference to infrastructures and to climate change. They will be expected to gain a critical understanding of research and practice on the interacting roles of technology, economics, human behaviour, social change and governance. Secondly, students will develop inter-disciplinary analytical, problem solving and communication skills, as applied to a complex socio-technical system in transition.  

Optional reading group  

This module will include a voluntary reading group on carbon markets, a major climate change mitigation and governance scheme, during weeks 3-6, led by various staff (see below).  

Module outline  

<table>
<thead>
<tr>
<th>Week/ Delivery</th>
<th>Description</th>
<th>Methods &amp; skills addressed</th>
<th>Staff</th>
</tr>
</thead>
</table>
| Week 1  
Intensive lecture series | Introduction to Climate Mitigation and Energy  
An introduction to energy systems, energy services, key sources of energy, and conversion technologies (covering demand, supply and infrastructures). Economic and social drivers of change, development issues, finance and innovation. | Chris Jardine, Nick Eyre, Sarah Darby and invited speakers |
<table>
<thead>
<tr>
<th>Week</th>
<th>Activity</th>
<th>Description</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Field trip to Centre for Alternative Technology</td>
<td>Understanding energy technologies in action: Key characteristics, performance and constraints of energy technologies and their use. Visit to renewable energy installations. Preparation for week 6 workshop.</td>
<td>Chris Jardine and others tbc</td>
</tr>
<tr>
<td>3</td>
<td>Lecture and discussion</td>
<td>Negative Emissions: With most decarbonisation scenarios featuring some aspect of negative emissions, this session covers the technologies and strategies for implementation</td>
<td>Prof Pete Smith and Climate group</td>
</tr>
<tr>
<td>4</td>
<td>2 hour lecture and discussion</td>
<td>Low Carbon Transport: Transport’s role in energy use and carbon emissions. Mobility demand and modal shift. Transport technologies and fuels.</td>
<td>Christian Brand</td>
</tr>
<tr>
<td>5</td>
<td>Lecture and discussion</td>
<td>Mitigating climate change locally: Local governance. Case studies from Oxfordshire and elsewhere. Local initiatives to decarbonise and reduce; the drivers of local action, role of local government.</td>
<td>Sarah Darby and local guest speakers</td>
</tr>
<tr>
<td>6</td>
<td>Group exercise</td>
<td>Project development practice: The technology, economics and practice of solar photovoltaics. Mock tendering exercise</td>
<td>Chris Jardine</td>
</tr>
<tr>
<td>7</td>
<td>Workshop</td>
<td>Challenges in moving to a renewable energy system: The challenge of integrating variable energy resources, including grid management, demand side response and battery storage. Features early outputs from ECI research.</td>
<td>Phil Grunewald</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>European environment policy: In advance of the Brussels field trip, the EU dimension of environment policy (see “Governing the Anthropocene” module).</td>
<td>Bill Gillett</td>
</tr>
</tbody>
</table>
Reading Group

<table>
<thead>
<tr>
<th>Week/ Delivery</th>
<th>Description</th>
<th>Methods &amp; skills addressed</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 3-6</td>
<td>Theory and practice of carbon markets. Critical appraisal from a range of perspectives.</td>
<td></td>
<td>tbc</td>
</tr>
</tbody>
</table>
| Reading group 2-4 x 1-2 hour sessions) | a. Theory of pricing – taxes and permits  
b. Kyoto mechanisms and EUETS,  
c. CDM and offsets  
d. Personal Carbon Trading  
Cross cutting with Environmental Governance | | |

Readings

Weeks 1 and 2


Week 3


Week 4


Week 5


Week 7


Special Section: Past and Prospective Energy Transitions - Insights from History

5.3 Methods and Techniques in Environmental Change

All Terms

In all terms you will learn cross-cutting, multidisciplinary methods and techniques for addressing and managing environmental change issues, as introduced throughout the core lectures, readings, field courses, workshops and other forums. Students also are encouraged to pursue innovative and mixed method approaches to environmental change and management problems through the elective programme, dissertation projects, and other outlets, as appropriate. The assessment covering Methods and Techniques in Environmental Management provides opportunities for students to apply and combine these methods and skills in integrative ways.

Key skills include the following (see the elective programme for other opportunities):

<table>
<thead>
<tr>
<th>METHODS &amp; SKILLS</th>
<th>Michaelmas Term</th>
<th>Hilary Term</th>
<th>Trinity Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental data collection &amp; field techniques</td>
<td>Biosphere; Earth Systems; Wytham &amp; Dorset FC</td>
<td>Energy &amp; CAT FC</td>
<td></td>
</tr>
<tr>
<td>Spatial analysis</td>
<td>Biosphere; Electives</td>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>Environmental surveying &amp; monitoring</td>
<td>Earth System; Biosphere Slapton or Dorset F.C.</td>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>Data analysis, statistics &amp; environmental problem solving</td>
<td>Economics; Human Systems; Earth Systems; Biosphere;</td>
<td>Sustainable Responses; Energy Systems; Quantitative skills</td>
<td>Lake District FC</td>
</tr>
<tr>
<td>Impact, risk, and integrated assessment</td>
<td>Earth System</td>
<td>Sustainable Responses</td>
<td></td>
</tr>
</tbody>
</table>
### Modelling Environmental Phenomena

<table>
<thead>
<tr>
<th>Michaelmas Term</th>
<th>Hilary Term</th>
<th>Trinity Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types &amp; uses of models, e.g. Climate, Ecosystem, Agent-based, Cultural</td>
<td>Earth System; Biosphere; Human Systems</td>
<td>Sustainable Responses; Quantitative skills; Electives</td>
</tr>
<tr>
<td>Model construction and validation</td>
<td>Earth System; Cultural Models WS</td>
<td>Sustainable Responses; Electives</td>
</tr>
<tr>
<td>Uncertainties and limitations</td>
<td>Earth System; Human Systems</td>
<td>Sustainable Responses; Governing the Anthropocene</td>
</tr>
<tr>
<td>Models in scientific and policy process</td>
<td>Earth System; Biosphere; Writing for Policy WS</td>
<td>Energy Systems; Sustainable Responses; Governing the Anthropocene</td>
</tr>
</tbody>
</table>

### Research Design

<table>
<thead>
<tr>
<th>Framing ECM problems and appropriate research questions</th>
<th>All modules and reading groups</th>
<th>Sustainable Responses; Governing the Anthropocene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Design</td>
<td>Biosphere; Earth Systems; Economics</td>
<td>Quantitative skills</td>
</tr>
<tr>
<td>Sampling design</td>
<td>Cultural Models WS</td>
<td>Soci Sci. Research Design WS</td>
</tr>
<tr>
<td>Risk assessment and ethics</td>
<td>Human Systems; Dissertation briefing</td>
<td>Research Methods WS</td>
</tr>
</tbody>
</table>

### Social Research Methods & Skills (qualitative & quantitative)

<table>
<thead>
<tr>
<th>Surveys &amp; questionnaires</th>
<th>Cultural Models WS</th>
<th>Soci Sci. Research Method WS; Quantitative skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert interviews; focus groups</td>
<td>Dorset FC</td>
<td>Research Methods WS</td>
</tr>
<tr>
<td>Policy analysis</td>
<td>Anthropocene; Human Systems; Brussels FC</td>
<td>All modules and Brussels FC</td>
</tr>
<tr>
<td>Participant observation</td>
<td>Human Systems</td>
<td>Research Methods WS</td>
</tr>
<tr>
<td>General social science techniques</td>
<td>Environmental Economics; Human Systems</td>
<td>Governing the Anthropocene</td>
</tr>
</tbody>
</table>

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### OTHER TRANSFERABLE SKILLS

<table>
<thead>
<tr>
<th></th>
<th>Michaelmas Term</th>
<th>Hilary Term</th>
<th>Trinity Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Communication</td>
<td>Essays</td>
<td>Writing for Policy WS; Pre-course assignment; Electives</td>
<td>Electives and module exercises; Exam preparation WS</td>
</tr>
<tr>
<td></td>
<td>Research proposals and business cases</td>
<td>Research Design WS</td>
<td>Energy Systems; Sustainable Responses; Dissertation Proposal</td>
</tr>
<tr>
<td></td>
<td>Briefs and blogs</td>
<td>Reading Groups; Human Systems; Writing for Policy WS</td>
<td>Field courses</td>
</tr>
<tr>
<td></td>
<td>Policy documents</td>
<td>Writing for Policy WS</td>
<td>Governing the Anthropocene; Energy Systems</td>
</tr>
<tr>
<td></td>
<td>Scientific papers; posters and multimedia</td>
<td>Biosphere</td>
<td>Governing the Anthropocene; Energy Systems</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>Presentations</td>
<td>Slapton &amp; Dorset FC; Biosphere; Human Systems; various WS</td>
<td>All modules</td>
</tr>
<tr>
<td></td>
<td>Simulations and role play</td>
<td></td>
<td>Energy FC; Governing the Anthropocene; Stakeholder engagement WS</td>
</tr>
<tr>
<td></td>
<td>Debates, argumentation and advocacy</td>
<td>Human Systems; Slapton FC</td>
<td>All modules &amp; FC</td>
</tr>
<tr>
<td>Other</td>
<td>Networking</td>
<td>Innovations Forum</td>
<td>Various events</td>
</tr>
<tr>
<td></td>
<td>Commercial Skills</td>
<td></td>
<td>Energy Systems</td>
</tr>
</tbody>
</table>
Quantitative skills module

Overview

We have designed this module to provide students with practical skills to perform both quantitative and qualitative analyses. The module is intended especially to help you choose the right methods and techniques for MSc dissertations and provide you with the necessary tools understand and critically assess published material with statistical analyses.

Students have very different backgrounds and bring different interests and prior knowledge on quantitative skills methods. While diversity is a strength, we will aim to ensure a basic minimal background on statistics during Michaelmas Term, that will serve as a basis for a series of more targeted methods sessions during Hilary Term.

Given the variety of student backgrounds and preparations, and the time limitations of the course, it is expected that students without prior quantitative skills preparation will cover material on their own time – we cannot teach you comprehensive statistics, but rather will guide you on how to learn those statistical techniques that may be most useful to your study of environmental change and management. We have suggested various readings, exercises, and online tutorials to guide your learning, and there will also be several lectures and classes to introduce key concepts and go through practical examples and exercises. Each lecture features a different aspect of environmental research and practice, so you will see examples which link to different core modules, including earth systems, ecosystems, and sustainable responses.

Also, we will use two different approaches for the module – all exercises will be provided via JMP®, but also through R scripts for students who have previous quantitative skills and wish to learn the basics of language programming.

Learning Objectives

- To critically examine the diverse quantitative and qualitative methods available for the range of topics covered at ECM
- To provide tools to analyse quantitative and qualitative data through probability distributions and extreme value analyses, econometrics, correlation and regression, categorical data and mixed methods.
- To develop sufficient knowledge and critical skills to interpret and evaluate published quantitative material presented in graphs, statistics, tables and other relevant means in diverse areas of ECM.

Teaching Approach

The module will be taught through a series on online tutorials, lectures, and worked exercises. During two sessions during Michaelmas Term, you will be provided the basics for statistical analyses, and software to be used during the lectures (JMP or R).

During Hilary Term, we will provide five sessions in which there will be a 45 minutes lecture following by worked examples in the topics covered.


**Introductory online courses**

The online tutorials are available at Lynda, for which the University has license and can be accesses though [https://help.it.ox.ac.uk/courses/lynda/index](https://help.it.ox.ac.uk/courses/lynda/index)

- Statistics Fundamentals – Part 2: intermediate

- Statistics Fundamentals – Part 3 – advanced (1.4 h)

If you have no prior knowledge of statistics, please also complete Statistics Fundamentals – Part 1

<table>
<thead>
<tr>
<th>Term/Week</th>
<th>Description</th>
<th>Methods and skills covered</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT – Week 3</td>
<td>Getting started with R and JMP</td>
<td>Overview on the online tutorials about statistics, JMP, and R</td>
<td>Imma Oliveras</td>
</tr>
<tr>
<td>Practical session Thurs 26th Oct</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT – Week 3</td>
<td>Probability distributions</td>
<td>Distributions</td>
<td>Linus Mattauch</td>
</tr>
<tr>
<td>Mon 29th Jan</td>
<td></td>
<td>Extreme value analyses</td>
<td></td>
</tr>
<tr>
<td>HT – Week 4</td>
<td>Hypothesis testing</td>
<td>Hypothesis testing</td>
<td>Imma Oliveras</td>
</tr>
<tr>
<td>Mon 5th Feb</td>
<td></td>
<td>Experimental design</td>
<td></td>
</tr>
<tr>
<td>HT – Week 5</td>
<td>Correlation and regression</td>
<td>Econometrics</td>
<td>Nial Farrel</td>
</tr>
<tr>
<td>Mon 12th Feb</td>
<td></td>
<td>Climate</td>
<td>Jacquelyn Pless</td>
</tr>
<tr>
<td>HT – Week 6</td>
<td>Linear modelling</td>
<td>Linear and mixed modelling</td>
<td>Imma Oliveras</td>
</tr>
<tr>
<td>Mon 19th Feb</td>
<td></td>
<td>Time-series analyses</td>
<td></td>
</tr>
<tr>
<td>HT – Week 7</td>
<td>Categorical data analyses</td>
<td>Social surveys</td>
<td>Mark Hirons</td>
</tr>
<tr>
<td>Mon 26th Feb</td>
<td></td>
<td>Mixed methods</td>
<td>Imma Oliveras</td>
</tr>
</tbody>
</table>

**Assessment**

This module will have a formative exercise during the Dorset course. There will a formative assessment at the end of HT for submission at the beginning of TT.

**Useful readings**

Goldacre (2009) *Bad Science*

An excellent pop-science book which will help you think critically about science, and recognise the importance of statistics in our everyday lives. Chapter 14 addresses statistics specifically.
Wilks (2006) *Statistical Methods in the Atmospheric Sciences*

Every atmospheric scientist’s stats bible. Most of the concepts are widely applicable and well explained. Chapter 1 gives a short introduction, and Chapter 2 and 4 are probably a good place to start understanding distributions. Chapter 6 and beyond for more advanced statistics such as Bayesian models.


Another very useful textbook, including a very useful table on p.289 to help you choose the right stats test. Available at: [http://sunsetridgembsbiology.wikispaces.com/file/view/Choosing+and+Using+Statistics.pdf](http://sunsetridgembsbiology.wikispaces.com/file/view/Choosing+and+Using+Statistics.pdf)

McDonald (2009) *Online Handbook of Biological Statistics*, University of Delaware Available at: [http://www.biostathandbook.com](http://www.biostathandbook.com)


Harte (1985) *Consider a spherical cow. A course in environmental problem solving* –

If you enjoy problem solving then this is your book. While the module will not cover exercises from it, we encourage students with more analytical skills to work on some of these problems and talk with the lecturers about working/learning with this book.

**R related books**


### 6. RESIDENTIAL FIELD COURSES

An integral and compulsory part of the MSc ECM is the short residential field courses. These are designed to illustrate aspects of the main course and in particular to introduce students to management issues and to professionals who are dealing with these issues in complex settings. The cost of the courses are covered by the ECI (except for the field visit to Brussels-see below). If students wish to stay at the destination after the fieldtrip they will have to pay for the costs of their return fare.

**Field courses for 2017-18**

**Friday 29th September - Sunday 1st October 2017**

*Slapton Field Centre, South Devon*

Management issues in a National Nature Reserve and along a changing coastline

**Friday 20th October 2017**

*Wytham Woods, Oxford*

Woodland ecology and management.
Environmental Change and Management MSc/MPhil Course Handbook

Friday 3rd November – Sunday 5th November 2017
Swanage Centre, Dorset

Marine ecology and management issues in environmentally sensitive coastal areas. Techniques in marine science and policy analysis.

Wednesday 24th – Saturday 27th January 2018
Centre for Alternative Technology, Machynlleth, Wales

Evaluating alternative energy sources and their impacts

Wednesday 14th March – Friday 16th March 2018
Brussels, Belgium

European environmental policy frameworks and initiatives; briefs by policy makers

NB: This field trip is voluntary and not paid for by the ECI. You may require a visa, and it is your responsibility to organise one for which ECI can offer a letter of support.

Tuesday 24th – Friday 27th April 2018
Blencathra Field Centre, Threlkeld, Cumbria

Environmental change and management issues in a National Park (Lake District)

7. GENERAL INFORMATION

7.1. Printing

5p per sheet for black and white

25p per sheet for colour

£20 for an A0 poster

The cost of paper is approx 0.33p per sheet – i.e. 33p for 100 sheets. The paper we use is recycled paper.

This SoGE price is set in order to cover the cost of toner, and of depreciation of the machines. Please note: it is much cheaper to print one colour copy on a networked printer and then to colour photocopy the document, than it is to print off several copies. Please also note that if one line of print = i.e., an email address - is in colour, then the whole page will be classed as a colour print. For further information on printing at SoGE please refer to the following webpage (IT FAQ’s) http://itfaq.ouce.ox.ac.uk/index_bak.php

7.2. ECI Library resources

7.2.1. Books

While the ECI has a small library of relevant books and journals, Radcliffe Science Library is the main source of relevant environmental change and management texts, articles and information.
7.2.2. Assessed Essays

The MSc ECM has a library of past assessed essays. Essays from recent years that have received distinctions are on WebLearn: [https://weblearn.ox.ac.uk/portal/hierarchy/socsci/geog/ecm/page/resources](https://weblearn.ox.ac.uk/portal/hierarchy/socsci/geog/ecm/page/resources).

7.2.3. MSc Dissertations

The MSc ECM now has a library of hundreds of past dissertations, available online through Weblearn.

Most MSc dissertations that earned a distinction may be viewed in hard copy at the Radcliffe Science Library.

7.3. The house rules

The SoGE is intended for the instruction of undergraduates and postgraduates, and for research carried out by postgraduate students, staff and authorised visitors. Please abide by the house rules, which you can review at the following link, once you log into the intranet: [https://intranet.ouce.ox.ac.uk/dept/house-rules.html](https://intranet.ouce.ox.ac.uk/dept/house-rules.html).

7.4. Health and safety, and Ethics

Safety information for fieldwork, laboratory and working in the SoGE is detailed on the website. You must read this section at the start of the course and can access this page once you log into the intranet: [http://www.ouce.ox.ac.uk/intranet/safety/](http://www.ouce.ox.ac.uk/intranet/safety/).

The Central University Research Ethics Committee web site ([http://www.admin.ox.ac.uk/curec/](http://www.admin.ox.ac.uk/curec/)) provides essential information on the University’s policy concerning the ethical review of research projects involving human participants or personal data, undertaken by staff and students, or on University premises. The form you must complete and have approved before conducting such research is available at: [http://www.admin.ox.ac.uk/curec/oxonly/checklistsandapplicationform/](http://www.admin.ox.ac.uk/curec/oxonly/checklistsandapplicationform/). For information on the departmental process, please see [https://intranet.ouce.ox.ac.uk/dept/curec.html](https://intranet.ouce.ox.ac.uk/dept/curec.html) on the SoGE intranet.

7.5. Parking

Postgraduate students are NOT allowed to park anywhere in the Science Area.

7.6. Out of hours access

The building can be accessed outside of normal hours, using the University card access system. Cards can be encoded at the SoGE reception desk. The out of hours entrance is to the left of the main doors. Please ensure that it is closed behind you if you enter or leave the building late.

Risk assessment for fieldwork

The Safety Committee of the SoGE, on the advice of the University Safety Office, has recommended that the School introduce risk assessments for all fieldwork undertaken by members of the SoGE.

This applies to all members of the School: undergraduates, postgraduates and staff; and applies to all forms of fieldwork whether undertaken individually or as part of a group.
For most of the fieldwork undertaken by members of the School, the risk assessments should be straightforward to complete. An example of the risk assessment form and guidelines on how to complete the form are available on the Intranet. This must be completed by all graduate students before undertaking field work. It will be required in order to arrange travel insurance for overseas trips. Failure to complete the form before a trip will be treated seriously. Please liaise with the MSc coordinator about this.

7.7. Personal development

Whilst at Oxford there are several resources which are available to you. Here are some:

- **Oxford University IT Services**
  This is based on Banbury Road and has a wide range of IT courses for postgraduate study. The most popular courses are Word: Managing your Thesis, and courses on statistics packages such as SPSS, PowerPoint or Excel. [www.it.ox.ac.uk](http://www.it.ox.ac.uk)

- **Careers Service**
  This is based at 56 Banbury Road, and aims to provide comprehensive information and impartial guidance to students and graduates of Oxford University. They have weekly emails, newsletters and events, and can also offer one-to-one guidance and careers advice. [www.careers.ox.ac.uk](http://www.careers.ox.ac.uk)
8. DISSERTATION PROCEDURE: REGULATIONS AND GUIDELINES

8.1. Timetable

Research Design exercises in Michaelmas Term are designed to stimulate your thinking about potential research topics and methods. By early Hilary Term, preliminary ideas should be discussed with your personal tutor in order to work out the practicality, feasibility and probable intellectual viability of your subject. ECM Alumni and LEAD (Leadership in Environment and Development) networks are good sources for fleshing out potential dissertation topics and logistics.

- A firm proposal of approximately 500 words to be handed in to the MSc Course Coordinator by 12 noon, Friday of Week 5 Hilary Term. It should include for following:
  - Aims (framed in terms of addressing a key ECM problem)
  - Objectives
  - Methodology
  - Work Plan (i.e. schedule)
  - Budget
  - Risk assessment details
  - Names and contact details for suggested supervisor/s
  - List of any references cited

- Once the topic is agreed a dissertation supervisor will be appointed.

- Candidates will be asked to give a formal public presentation on their topic of no more than 15 minutes on Thursday and Friday 0th week of Trinity. Note: all changes in topic or supervisor subsequent to this presentation must be approved by the Course Director.

- The Examiners shall retain one copy of the dissertation for possible deposit in an appropriate university library.

- Late submissions are considered a serious breach of regulations. In the event of a late submission the candidate must make application for consideration via the Senior Tutor of the candidate’s College to the University Proctors. Marks will be deducted for late submission. For further information see your copy of the Examination Regulations book.

8.2 Presentation

Full details on the required format and how to submit the dissertation can be found at: https://intranet.ouce.ox.ac.uk/msc/submission/dissertations.html
8.3. Referencing

A complete list of references limited to those works referred to in the text should be included at the end of the Dissertation. Most academic referencing and citation styles used in major environmental science, social science, or other academic journals are acceptable.

For basic information regarding referencing, see: https://www.cs.ox.ac.uk/files/4211/referencing.pdf.

See also:


Examples of referencing:

- a book:

- a chapter in a book:

- an article:

- References to web pages must include the date the website was accessed.

- References in the text. Whether for a book, chapter, or article, the name and date should be inserted at the appropriate place in the text, e.g. (Meggers, 1979); (Burgess, 1990). References to the work or opinions of another writer (or discussions with other persons who are prime sources of information) must always be acknowledged.

8.4. Important information – plagiarism

Oxford University imposes severe sanctions for cases of plagiarism. In the most extreme case, a student will be judged to have failed the course. These regulations are imposed by the University and if a student is suspected of plagiarism the matter is likely to pass to the Proctors who will rule on the matter independently of the OUCE. We expect students enrolled at Oxford to exhibit the highest standards of academic integrity and not knowingly submit any work or intellectual ideas that have been adapted from or copied from a third-party source without appropriate recognition (see below). In addition, we expect all assessed work you submit to represent new and original writing conducted during your relevant terms in Oxford. It is not acceptable to re-package essays presented for degrees elsewhere (i.e. self-plagiarism). Students found suspected of plagiarism will be referred to the Proctors and if plagiarism is confirmed, the student may be failed.
During Michaelmas term we will discuss these rules and expectations regarding plagiarism. You will be required to complete the University’s on-line course on the topic and sign a ‘plagiarism declaration’ form which accompanies each piece of submitted assessed work.

Please see guidelines at: [http://www.ox.ac.uk/students/academic/goodpractice/about/](http://www.ox.ac.uk/students/academic/goodpractice/about/)

### 8.5. The assessment of the dissertation

In general, the Examiners will be expecting a balanced and appropriately referenced piece of work, with a proper sequence of chapters which develop the argument, engage in its analysis, and come to a conclusion, all presented in an acceptable academic fashion.

- The appropriate methodology should be described and their use justified. A critical approach is expected. Appropriate use should be made of relevant techniques in the interpretation, analysis, and presentation of data, in an acceptable academic fashion. This applies to graphical, cartographical, and statistical techniques, computer programmes or field methods.
- It is expected that the best of the dissertations will be worthy of publication, and all should show originality and/or competent and creative scholarship. All dissertations will be judged on the degree to which they represent a logical, thorough, and intelligible report on a piece of work, of a standard expected of an Oxford Master's student.
- Examiners will assess dissertations under five broad headings: aims and concept, literature, argument (including methods), originality, and presentation. Examiners will then give a final overall assessment and conclusion based on a combination of the above.

### 8.6. Selecting a topic

There is no set pattern for a dissertation and variety is encouraged. To that extent the following notes are for guidance only:

The topic can be in any field of environmental change and/or its management. It is difficult to prescribe area and subject limits but limited rather than large areas, and highly focused rather than diffuse global topics are more likely to allow for adequate depth of study. Ideally, the dissertation uses a limited, focused study to say something of broader significance about an important environmental change and management issue or problem. Field experiments, analysis of specific data sources, laboratory analysis, interviews, are to be encouraged as evidence of first hand investigation and engaging with "primary" data and its interpretation, but they cannot be the exclusive content of the thesis. Thorough and critical reviews of a considerable literature on a clearly defined topic are also acceptable. Other possibilities are: the testing of theories, concepts and techniques and their application to a discrete environmental problem, or an evaluative report based on a placement with the management of a commercial organisation or voluntary agency.

### 8.7. Dissertation supervision advice

- Supervisors are usually appointed in May after a period of discussion between the student, potential
Supervisors are appointed to provide UP TO EIGHT HOURS OF TUTORIAL-TYPE SUPERVISION between May and the hand-in date in early September.

It is absolutely vital that the supervisor and student are clear about when the supervisor is available during that period and how contact will be maintained if either or both are not in Oxford.

Students should appreciate that supervisors are busy and appointments need to be made in good time to see them.

Supervisors must inform the Course Director if students are experiencing significant difficulties or are contemplating late-stage changes of direction in their dissertation.

Students should appreciate that they are responsible for their dissertation. Supervisors are there to offer advice and direction.

8.8. Viva information

Under extraordinary circumstances, a viva may be initiated as part of the examination process. A viva is an interview between the External Examiner and the candidate, and it takes place after all marks have been collated, when the Final Examination Board meets in late September. A viva interview will combine all aspects of your MSc course, and you should be prepared to discuss your essays, examinations and dissertation research. The objective of the interview is to confirm the final grade to be awarded. Under most circumstances a viva is not necessary. The examiner does, however, reserve the right to call any student to a viva examination.

Details will be posted on the notice board in the SoGE, at 3.30 p.m. on the day before the vivas. It is your responsibility to see if you are required for a viva, and you should make every effort to ensure that you are available on the date of the viva. If you must declare yourself unavailable for a viva, please give adequate notice in advance to the Environmental Change Institute office. The provisional date for vivas will be on the morning following the meeting of the Examination Board in late September.

Full Academic dress should be worn.
APPENDICES

Appendix 1: Core teaching staff

**Myles Allen** is interested in how human and natural influences on climate contribute to observed climate change. He recently contributed to discussion on whether climate change leads to extreme weather events such as storm Sandy.

**Pam Berry** is interested in modelling climate change impacts on species; the integrated assessment of climate change adaptation and mitigation actions and their effects on biodiversity; and how ecosystem services underpin much of human existence.

**John Boardman** is a geomorphologist working on land degradation issues, particularly in the Karoo, South Africa, and on soil erosion in southern England. He is a former director of the MSc.

**Jade Leung** works on the relationship between infrastructure and sustainable development, with a specific focus on developing methodologies for infrastructure planning and performance measurement that account for the complex interlinkages between infrastructure services and development outcomes.

**Simon Dadson** is interested in the processes that link climate, hydrology, and geomorphology. Prior to arriving at SoGE Simon was a Senior Environmental Modeller at the Centre for Ecology and Hydrology in Wallingford where he remains a CEH Fellow.

**Sarah Darby** is interested in how technologies are adopted and adapted. She analyses the interactions between new energy infrastructures, the rules and knowledge systems through which they operate, and the everyday practices of energy users.

**Imma Oliveras** is interested in plants traits analysis and researches the functional traits along forest-savanna transitions from a functional trait perspectives, at a number of sites in South America and Africa.

**Nick Eyre** is interested in the role of public policy in reducing energy demand and improving energy efficiency. He recently published an article which found that feed-in tariffs for energy saving might be a powerful tool for incentivising energy efficiency.

**Carolina Gueiros** is interested in the dynamics of policy change and policy innovation in Brazil in recent decades, especially the changes to the Brazilian Forest Code, and the introduction of market-based policy mechanisms in the country, such as Reducing Emissions from Deforestation and Forest Degradation (REDD+).

**Jim Hall** is interested in flood risk analysis and management, coastal cliff recession, and the impacts of climate change. In 2012 he contributed to a study on balancing the costs of erosion versus flooding. This work won the Lloyds Science of Risk Prize.
Clive Hambler is a generalist ecologist and researches a wide variety of environmental management problems and a wide range of types of organism. He focuses on the impacts of woodland and grassland management.

Peter Henderson is interested in population and community ecology with a particular focus on long-term studies of fish and crustacean populations, their stability and the effects of changing environments.

Cameron Hepburn works on economic solutions to long-term climate policy problems, such as the absence of a clear carbon price signal for business post 2012.

John Ingram is interested in the two-way interactions between global environmental change and food systems. His research aims to better manage food systems so as to enhance food security while reducing environmental impacts.

Rachel James researches change in African rainfall systems. She is interested in the role of human influence on climate, and how climate models can be used to provide information to stakeholders.

Daniel Adshead’s research addresses infrastructure system assessment and adaptation in the face of demographic, economic and climate pressures, with a focus on meeting sustainable infrastructure needs in the development context.

Chris Jardine studies technologies for greenhouse gas emission reductions. He focuses on renewable energy, especially the use of solar photovoltaics within the household and on commercial buildings.

Yadvinder Malhi is interested in the impact of global atmospheric change on terrestrial ecosystems. He recently won a European Research Council grant to study the role of tree diversity in the response of tropical forests to climate change.

Constance McDermott is interested in the effects of market globalisation on domestic forest policy, and the conflicts and synergies among local, national and international development and conservation objectives.

Monika Zurek is a senior researcher in the ECI Food Systems Programme.

Rob Hope is interested in economic theory and techniques in the measurement, design and evaluation of policies and interventions which promote improved environmental and social outcomes.

Friederike Otto is a senior researcher in the ECI Global Climate Science Programme. She is the ECI lead scientist on the international project World Weather Attribution.
Kate Raworth focuses on rethinking economic development for tackling the 21st century’s social and environmental challenges, exploring this theme through the lens of social and planetary boundaries.

Linus Mattauch is interested in climate change economics, public finance, welfare theory, theories of economic growth and low-carbon transport.

Thomas Thornton researches human ecology, adaptation, traditional ecological knowledge, conservation, space and place, and the political ecology of resource management among the indigenous peoples of North America and the circumpolar North.

Peter Watson is researching the impact of climate change on atmospheric dynamics and how this affects the occurrence of extreme weather events.

Danny Dorling is the Halford Mackinder professor of human geography and his research focuses on issues of housing, health, employment, education and poverty.

Mark Hirons is interested in forest governance, particularly on how it intersects with other spheres of concern, including climate change, agriculture, mining, poverty alleviation and equity. Most of his research has been conducted in Ghana and Ethiopia.

Dariusz Wójcik is an economic geographer, specializing in financial geography. His current research focuses on the global financial landscape emerging in the wake of the global financial crisis 2007-9.

William Gillett is a Visiting Research Associate with ECI, and is interested in energy strategy and policy.

Erik Gómez Baggethun is a Senior Visiting Associate at ECI and his research interests include ecological economics and global environmental change.

Kiron Neale researches the relationships between energy cultures and energy policies in tropical, small island states specifically in the context of solar energy’s mainstreaming relative to conventional fossil fuel-driven residential energy systems.

Dustin Garrick is the Co-Director, Smith School Water Programme and Co-Convener, Oxford Water Network. His work focusses at the interface of water and the economy, specializing in water allocation and markets as responses to climate change, urbanization and sustainable development challenges.

Mark Hirons is interested in forest governance, particularly on how it intersects with other spheres of concern, including climate change, agriculture, mining, poverty alleviation and equity. Most of his research has been conducted in Ghana and Ethiopia.
## Appendix 2: MSc Marking Criteria

<table>
<thead>
<tr>
<th>CLASS OR GRADE</th>
<th>MARK %</th>
<th>MARKING CRITERIA FOR EXAMS</th>
<th>MARKING CRITERIA FOR SUBMITTED ELECTIVE ESSAYS</th>
<th>MARKING CRITERIA FOR DISSERTATIONS</th>
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<td></td>
<td>70</td>
<td>Well-balanced and comprehensive answer to the question. Arguments are clear, analytical, sustained, structured. A good range and depth of material to support arguments. No significant errors of fact or misunderstandings of concepts. Demonstrates a clear awareness and understanding of current literature. Well-written, orderly, convincing and interesting to read.</td>
<td>A wide range of literature used diligently to support all aspects of the work. A clear awareness and understanding of up-to-date material. Well-balanced and complete answer to the specified question. Analytically strong, well-focused. Arguments are clear and insightful. No significant errors of fact or misunderstandings of concepts. Lucid, orderly, convincing and interesting to read. Well-founded well-reasoned conclusions.</td>
<td>A very well-focused piece of research. Identifies with a professional research approach. A well-balanced project, providing a full answer to the research question(s) posed. Demonstrates clear understanding of existing research problems. A very high standard of data collection. Arguments are clear, structured and sustained. Analytically strong, demonstrating depth of understanding in support arguments. No significant misunderstandings of data or concepts. Demonstrates a clear awareness and understanding of current literature. Well-written, orderly, convincing and interesting to read. Well-founded well-reasoned conclusions. High standards of presentation throughout.</td>
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<td>Degree</td>
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<tr>
<td>MSc PASS 65</td>
<td>Evidence of wider reading. Good breadth of knowledge demonstrated. Uses attributed examples to support the ideas advanced. Very good degree of clarity of explanation. Cautious and accurate interpretation of information. Minor gaps in background material and/or literature cited. Minor deviation in focus.</td>
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<tr>
<td>MSc PASS 60</td>
<td>Sound, well-presented and clearly structured. Addresses all aspects of the question directly. Clear understanding of core subject material demonstrated. Significant body of core subject literature well represented and referenced. Arguments and evidence presented within a logical framework. Basic but accurate use of examples and case studies. Occasional but significant gaps in background material and/or literature cited. Not all sections are well-focused on the question. Conclusions lack clarity.</td>
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<tr>
<td>MSc PASS 55</td>
<td>Reasonably well-focused on the question. Some well-argued points/perspectives, with some balanced discussion. The majority of relevant core lecture material is adequately used. Demonstrates a reasonably good understanding of the main points. Some reference to core (directed) literature/examples included. Some arguments are individually incomplete or rather pedestrian. Not all aspects of the question are adequately addressed. Some signs of confusion and/or small factual errors. The answer lists references and/or examples but fails to tie them together analytically. Occasional sections may be badly written, or might not support the main argument. Otherwise very good answers which are significantly unfinished.</td>
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<td>Clear signs of well-directed effort, and in particular evidence of deeper engagement with literature. Good breadth of knowledge demonstrated. Points of discussion are well-supported. High degree of clarity of explanation. Cautious and accurate interpretation of relevant material. Presentation is careful with few linguistic errors. Minor gaps in background material and/or literature cited. Minor deviation in focus.</td>
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<td>Clear signs of well-directed effort. Evidence of wider reading and broader understanding. Good methodological insight and careful application of techniques. Efficient and effective research design. Good degree of clarity of data presentation and explanation. Cautious and accurate interpretation of information. Conclusions are linked well to both main body and to existing literature. Presentation is careful with few linguistic errors. Minor gaps in background material and/or literature cited. Minor deviation in focus.</td>
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<td>Conception of project is clear and well defined. Data collection is careful, and appropriate for addressing the research question. Clear understanding of methods and analysis is demonstrated. Significant body of core subject literature well represented and referenced. Discussion linked well to evidence presented. Conclusions follow logically from the body of work. Good standard of presentation throughout. Occasional but significant gaps in background material and/or literature cited. Not all sections are well-focused on the question. Conclusions contain some degree of ambiguity and/or limitations in critical interpretation.</td>
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<td>Reasonably well-focused on the specified question. Demonstrates a reasonably good understanding of the topic area. A broad body of relevant literature is adequately used. Some well-argued points/perspectives, with some balanced discussion. Attempts are made to link discussions to the literature. The analysis of the literature is lacking in depth. Some arguments are individually incomplete or rather pedestrian. Not all aspects of the specified question are adequately addressed. Some signs of confusion and/or small factual errors. Occasional sections may be badly written, or might not support the main argument.</td>
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<td></td>
<td>Project execution is reasonably well-focused on the research question. Effort made to integrate the research with existing literature. Methods employed are appropriate. Some well-argued points/perspectives, with some balanced discussion. The majority of relevant data is adequately used. Demonstrates a reasonable understanding of the general research area. Attempts are made to draw conclusions based on the findings. Some arguments are individually incomplete or rather pedestrian. Not all aspects of the research question are adequately addressed • Some signs of confusion in methodology and/or interpretation. The discussion fails to adequately tie the findings together. Occasional sections may be badly written, or might be superfluous. Otherwise a good project, but which is lacking key components of analysis/interpretation/discussion.</td>
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<tr>
<td>MS PASS</td>
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<td>Answer is relevant in broad terms to the question set. Successfully uses some aspects of relevant core lecture material in constructing arguments. Contains several valid arguments OR, a well-constructed essay, but fails to directly address the specific question being asked. Relies almost entirely on lecture material. Large parts of the answer lack focus. Arguments lack adequate depth or support. Occasional errors of fact, which do not invalidate the main arguments. Several sections are poorly written.</td>
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<tr>
<td>Answer demonstrates engagement with a reasonable range of source material. Successfully uses some aspects of the material in constructing competent arguments. Contains at least some structured discussion. Attempts at directly linking conclusions to the question are made. A well-constructed essay, but fails to address the specified question. Narrow in scope. Treatment of the topic is rather superficial or unfocused in places. Too high a degree of description, without adequate analysis and interpretation. Arguments lack adequate depth or support. Occasional errors of fact, which do not invalidate the main arguments. Several sections are poorly written.</td>
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<td>Answer demonstrates competent engagement with a reasonable range of primary data. Achieves an acceptable level of proficiency in choosing and using research methods. Successfully uses part of the obtained material in constructing arguments. Contains several valid arguments. Provides some connection to the literature. Original conception of project is narrow, unrealistic or self-limiting in scope. Fails to adequately use data to directly address the research question. Treatment of the topic is superficial in places. Too high a degree of description, without adequate analysis and interpretation. Large parts of the project lack focus. Arguments lack adequate depth or support. Occasional errors in methodology or interpretation. Fails to give a full account of data collection/methods/analysis. Several sections are poorly written.</td>
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<th>FAIL</th>
<th>40</th>
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<tr>
<td>Achieves a minimal response to the question, revealing some basic knowledge of relevant material. Link between the arguments and the question set is present (but tenuous). Some attempt is made to organize material in to a coherent argument. Poorly organised and written. Very little sign of reading or deeper thought. Contains errors of fact or interpretation but which do not invalidate arguments. Much of the argument is underdeveloped and/or ill-focused. Conclusions indicate evidence of poor judgement.</td>
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<td>Achieves a very limited understanding of the topic area. Demonstrates some basic knowledge/understanding of background material. Simple analytical discussion is present. Conclusions are attempted. Fails to directly address the topic. Multiple inaccuracies in language. No evidence of significant engagement with literature. Significant errors of interpretation. Generally poorly written. Ineffective information gathering. Lacking in substantial analysis.</td>
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<tr>
<td>Achieves a minimal response to the research question. Reveals some basic understanding of methodology. Literature review includes some relevant material. Link between the methodology and the research question is discernible. Some attempt is made to organize material in to a coherent argument. Poorly organised and/or written. Little sign of deep/critical engagement with the literature or methods. Contains significant errors of fact and/or interpretation but these do not invalidate major arguments. Much of the argument is under-developed and/or ill-focused. Conclusions indicate some evidence of poor judgement.</td>
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<th>FAIL</th>
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<tr>
<td>Addresses question in rudimentary manner. Shows only minimal evidence of having understood the question. Multiple factual/ conceptual inaccuracies. No evidence of reading of relevant literature. Significant errors of interpretation. Generally poorly written. Fails to address significant portions of the question. Lacking in substantial organized argument. Contains overly bold unsubstantiated assertions.</td>
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<tr>
<td>Addresses research question in a highly rudimentary manner but coherent manner. Demonstrates some minimal effort in gathering data. Shows only minimal evidence of having understood the topic. Contains some superficially relevant information. Includes some sense of a coherent structure Information presented only in reduced (e.g. note) form, or unfinished. Very limited evidence of structured/focused research Information conveyed is largely irrelevant and superficial. Very little connection to the research topic literature.</td>
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<tr>
<td>Achieves a very limited understanding of the research topic. Demonstrates some basic knowledge/understanding of background material. Relatively simple analysis and discussion is present. Conclusions relating to the research question are attempted. Fails to directly address the topic. Very little substance to the majority of the work. Multiple inaccuracies in language. No evidence of reading or significant engagement with literature. Significant errors of interpretation. Generally poorly written. Ineffective information gathering and/or methodology. Lacking in substantial analysis. Conclusions are ill-founded.</td>
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<td>Grade</td>
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<tr>
<td>20</td>
<td>Contains some superficially relevant information. Progresses no further than introductory section (even if this is of good quality). Information presented only in note form. Very limited evidence of structure in the answer. Information conveyed is largely irrelevant and superficial. Very little connection to the question set.</td>
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<tr>
<td>0</td>
<td>Fails to answer the question or completely misunderstands the question. A very short answer. No understanding of basic course material demonstrated. No clear logically structured argument. Poorly-written, lacking general structure. No attempt made to link information directly to the question.</td>
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## School of Geography and the Environment
### MSC AND MPHIL INDUCTION

**Monday 2\textsuperscript{nd} – Tuesday 3\textsuperscript{rd} October 2017 (tbc)**

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<thead>
<tr>
<th>Monday 2\textsuperscript{nd} October</th>
<th>Event</th>
<th>Location</th>
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| 10.30am-11.00am                      | **Introduction to the School**  
Prof Heather Viles, Head of School  
Prof Robert Whittaker (DGS – taught courses) | Lecture Theatre |
| 11.00am-12.00pm                      | **Introduction to Research in the School**  
Physical – Professor David Thomas  
Human – Dr Ian Klinke  
Environmental Change Institute – TBA  
Smith School – Prof Gordon Clark, Director  
Transport Studies Unit – Dr Debbie Hopkins | Lecture Theatre |
| 12.00pm-12.10pm                      | **IFSTAL**  
Dr John Ingram, Food Systems Programme Leader | Lecture Theatre |
| 12.25pm-12.30pm                      | **Facilities for Graduate Students in the Department**  
Alex Black, Facilities and Services Manager | Lecture Theatre |
| 12.30pm-12.45pm                      | **Alumni**  
Alumni Relations Officer | Lecture Theatre |
| 2pm-4pm                              | **MSc Course Induction**  
ECM – Dr Tom Thornton, Course Director | Gottmann |

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<tr>
<th>Tuesday 3\textsuperscript{rd} October</th>
<th>Event</th>
<th>Location</th>
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| 10am-10.30am                         | **Computing Facilities in the Department**  
David Ford, IT Manager | Lecture Theatre |
| 10.30am-11am                         | **Oxford University IT Services** | Lecture Theatre |
| 11am-11.30am                         | **Library Facilities**  
Librarian | Lecture Theatre |
| 11.30am-11.50am                      | **Health and Safety**  
Alex Black, Facilities and Services Manager | Lecture Theatre |
| 1.30pm-5.30pm                        | **MSc Tours of Library**  
Librarian | Radcliffe Science Library |
ECM Welcome Reception              Thursday 28th September, 4pm, Herbertson Room, SoGE
Fieldtrip 1, Slapton Ley   Friday 29th September – Sunday 1st October
Department & College Induction   Monday 2nd October – Friday 6th October (Week 0)
ECI Welcome Event   Tuesday 10th October, 4:30 pm, SoGE
**Michaelmas Term begins**   Monday 9th October (Week 1)
‘Welcome to the Anthropocene’   Monday 9th October – Friday 13th October (Week 1)
Field trip 2, Dorset   Friday 3rd November – Sunday 5th November
**Michaelmas Vacation**   Sunday 3rd December – Saturday 14th January 2017
**Hilary Term begins**   Monday 15th January (Week 1)
Assessed Essay 1 hand in   Monday 15th January, 12 noon (Week 1)
Energy Module   Monday 15th January – Friday 26th January (Weeks 1 & 2)
Field trip 3, Wales (CAT)   Wednesday 24th January – Saturday 27th January
Dissertation proposal hand in   Friday 16th February (Week 5)
**Hilary Vacation**   Sunday 11th March – Saturday 22nd April
Field trip 4, Brussels (optional)   Wednesday 14th March – Friday 16th March
Dissertation proposal public presentations   Thursday 19th and Friday 20th April (Week 0 - Trinity Term)
**Trinity Term begins**   Monday 23rd April (Week 1)
Assessed Essay 2 hand in   Monday 23rd April, 12 noon (Week 1)
Field trip 5, Lake District   Tuesday 24th – Friday 27th April (Week 1)
Exam/Class Photo/MSc BBQ   Monday 14th – 25th May (TBC)
**Dissertation research period**   Saturday 26th May – Friday 31st August
Dissertation hand-in day   Monday 3rd September, 12 noon
Alumni Dinner   8th September (TBC)