MSc/MPHIL ENVIRONMENTAL CHANGE AND MANAGEMENT

COURSE HANDBOOK

2019–2020
This handbook applies to students starting the MSc (by coursework) in Environmental Change and Management in Michaelmas Term 2019. Most of the information applies also to those commencing the MPhil version of the course, although where different, the information in the separate MPhil handbook takes priority. 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):
Lorraine.wild@ouce.ox.ac.uk

Disclaimer
The information in this handbook is accurate as at 1st October 2019, however it may be necessary for changes to be made in certain circumstances, as explained at 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
2019: version 1.0
For the latest version of this handbook please see https://www.eci.ox.ac.uk/msc/course-info.html

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WELCOME TO THE SCHOOL OF GEOGRAPHY AND THE ENVIRONMENT

I am delighted to welcome you to the School of Geography and the Environment. The School consists of the Department of Geography and three associated research centres: the Environmental Change Institute, the Transport Studies Unit and the Smith School of Enterprise and the Environment. Together, we are a unique hub in Oxford University for teaching and research on the interactions between people and environments. We aim to provide our undergraduates, MSc, MPhil and DPhil students with the combination of social and natural science skills to engage effectively with the big challenges of the twenty-first century: from environmental change to globalisation; 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 was recognised yet again in the latest national assessment exercise (REF 2014), and it underpins our teaching excellence. We believe that our learning environment will further hone your analytical and communication skills – with lifelong benefits to you and the contributions you will make to the wider world.

I hope that you will be very happy in the University of Oxford. I hope that you will flourish academically and personally. Within the School, I trust that you will become active participants and become engaged with the many events and activities that we host. The collegiate University also offers a diverse and enriching series of opportunities to learn new skills, and I encourage you to make the most of what is on offer. And when you graduate, I very much hope you will become an active member of our global alumni community.

Gillian Rose
Professor of Human Geography
Head, School of Geography and the Environment

AND TO THE INTERNATIONAL GRADUATE SCHOOL

As the Director of Graduate Studies (Taught Programmes), I am delighted to welcome you to the School of Geography and the Environment’s International Graduate School (IGS). The School is an intellectually demanding but supportive environment in which to study. We emphasise 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 highly competitive 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 IGS and to tackling new challenges and new ideas.

Dr Jamie Lorimer
Associate Professor,
Director of Graduates Studies (Taught Programmes)
... AND TO THE ENVIRONMENTAL CHANGE INSTITUTE

The Environmental Change Institute (ECI) is Oxford University’s interdisciplinary research institute on the complex nature, causes and impacts of global environmental change. More than 75 researchers from a very diverse range of backgrounds and at least the same number of students work on understanding the processes behind the changes we observe and explore and promote sustainable responses to achieve change for the. The ECI has 28 years of experience in building partnerships with researchers, governments, business, media and communities to understand and respond to the risks and opportunities of environmental change. We do this through classical research, thinking and studying, measuring, analysing, and modelling; and creative ways of thinking using art, new media and old, and talking and listening to people from all walks of life that need to make decisions in a changing environment. Engaging seriously with the challenge confronted by decision-makers is requires constant scrutiny of our approaches and innovation in our research, education and engagement.

As acting Director of the ECI, but also as a former student at a very different place, I would like to welcome you here, 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 MSc 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. This is sometimes difficult and sometimes even boring but more often exciting and a lot of fun. Our aim is to get you to learn about the issues but also to contribute to their resolution. This is a tough assignment.

Dr Fredi Otto,
Associate Professor, Climate Research Programme
Deputy Acting Director of the Environmental Change Institute

... AND FINALLY, TO THE MSC/MPHIL IN ENVIRONMENTAL CHANGE AND MANAGEMENT

It is a great pleasure and privilege to welcome you to the ECM MSc/MPhil programme. This course focuses on the complex interactions between environmental change and human society. These provide some of the most intellectually stimulating and important challenges of contemporary times. As Course Director, I am very much looking forward to journeying with you on this intense but remarkable one-year MSc. One of the most exciting things about being at the ECI is the opportunity to engage with the wonderful, creative mix of researchers, practitioners and students who come together to work on 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 are therefore 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 immediately start engaging with your fellow students, the team and the wealth of resources and opportunities available within and beyond the School of Geography and the Environment. This will further your learning and deepen your engagement with the challenges and opportunities that environmental change provides, this year and in the future.

Dr Mark Hirons
Course Director, Research Fellow

Welcome to the Environmental Change and Management Masters Programme, and to what I will guarantee will be one of the most stimulating, challenging and memorable years of your life. Throughout this year you will explore the challenge of understanding and tackling environmental change in multiple aspects, at scales from local to planetary, and from a range of perspectives. As a cohort you bring a wide range of backgrounds and experiences: one of the real pleasures of this course will be how much we all learn together as the year proceeds. Both in this course and in Oxford as a whole you will be exposed to a wide range of opportunities to listen, learn, engage and discuss some of the most important and urgent issues of our time. Make the most of these opportunities, but also enjoy the friendships, connections and memories the year will bring. We look forward to working with you as you embark on the journey and adventure of the year ahead.

Professor Yadavinder Malhi
Academic Director, Professor of Ecosystem Science
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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 Water Network (OWN) and the Oxford Centre for Tropical Forests (OCTF). 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, South America, 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](mailto: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 (https://www.geog.ox.ac.uk/research), 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 graduate teaching assistants (TAs) for the course, Carley-Jane Stanton and Marcus Spiegel, 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 GSR or Graduate Supervision Reporting. 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: https://academic.admin.ox.ac.uk/policies/paid-word-guidelines-graduate-students

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 Social Science Library is the primary port of call. Andrew Kernot is the geography librarian, based at the SSL, and leads workshops on library skills and resources during induction week.

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

1.5.5. Canvas
Canvas 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. [https://canvas.ox.ac.uk/](https://canvas.ox.ac.uk/)

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

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.

For more information, please visit [http://www.eci.ox.ac.uk/people/alumni/index.html](http://www.eci.ox.ac.uk/people/alumni/index.html) or email the Alumni Officer, [alumni@ouce.ox.ac.uk](mailto:alumni@ouce.ox.ac.uk). Alumni are always keen to hear what current students are up to – so do let the Alumni Officer know about projects, field trips and events you think might be of interest to them. We also offer interested ECM students the opportunity to link with alumni mentors with similar interests.
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

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 Training Better Leaders (TBL) 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

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 Dimensions of Environmental Change

Introduces relevant cross-cutting cognitive, social, economic, and human ecological concepts and frameworks, which can be applied in many different contexts – from academic research to action on the ground – in order to explore historical developments and address contemporary issues of wellbeing, power, resilience, sustainability, and transformation, in an increasingly populous and globalised society. Using interactive approaches, we ask questions about the relationship between human systems and ecological systems, and how the complexity, diversity, stratification, and resource management of human societies shape their contributions and responses to critical environmental parameters and challenges.

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 2019-20 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) (TBC)

IFSTAL is an interactive training programme is 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](http://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 2019</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>“Welcome to the Anthropocene” (Intensive Wk 1)</td>
<td></td>
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<tr>
<td>Economics of the Environment (Mon)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Skills (Tues)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Earth System (Wed)</td>
<td>✓</td>
<td></td>
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<tr>
<td>Human Dimensions of Environmental Change (Thurs)</td>
<td>✓</td>
<td></td>
<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>
</tr>
<tr>
<td>Governing the Anthropocene (Tues)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>Energy Systems &amp; Climate Mitigation (Wed, including Intensive Wk 1)</td>
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<td>✓</td>
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<tr>
<td>Course Descriptions</td>
<td>Yes</td>
<td>No</td>
<td>Notes</td>
<td></td>
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<td>------------------------------------------------------------------------------------</td>
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<td>----------------------------------------------------------------------</td>
<td></td>
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<tr>
<td>Global Change and the Biosphere (Thurs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>✓</td>
<td>✓</td>
<td>* MPhils take a third elective in their second year.</td>
<td></td>
</tr>
<tr>
<td>Field Trips (Courses)</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 Environmental Change (TBC)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissertation planning</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissertation research</td>
<td></td>
<td>✓</td>
<td>✓ Due by noon on the first weekday of September 2020</td>
<td></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. 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

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

The Examiners’ Report on the previous examinations may be found at: 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 GSR report (Graduate Supervision Reporting). These reports will be read by the Course Director and the DGS (Taught Programmes). The GSR 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. **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/](https://intranet.ouce.ox.ac.uk/msc/examination-conventions/)

These conventions are the definitive version to apply to examinations in 2020.
4. ASSESSMENT COMPONENTS

There are four areas of formal assessment: written examinations, assessed coursework for Methods and Techniques for Environmental Management, 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 two three-hour and one two-hour written examinations in Trinity Term. In addition, a 1600 word piece of assessed coursework must be submitted for the Methods and Techniques for Environmental Management theme. 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/
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 20\textsuperscript{th} January 2020)
Hilary Term essay: 1st Monday of Trinity Term Monday by 12 noon (Monday 27\textsuperscript{th} April 2020)
Note: There are no elective modules in Trinity Term.

**Research dissertation**
By 12 noon on first weekday of September (1\textsuperscript{st} September 2020).

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](http://www.ox.ac.uk/students/academic/guidance/skills/plagiarism)

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

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: https://www.ox.ac.uk/students/life/student-engagement?wssl=1

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 Student Advice Service provided by Oxford SU, 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), Dr Jamie Lorimer. 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 Gillian Rose. 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, see: 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, see: https://www.ox.ac.uk/students/academic/complaints

4.8. Key Departmental Contacts

- DGS (Taught Programmes): Dr Jamie Lorimer
- Academic Director: Professor Yadwinder Malhi
- Course Director: Dr Mark Hirons
- Course Coordinator: Faith Opio
- Academic Administrator: Dr Lorraine Wild
- Head Administration and Finance: Richard Holden
- Disabilities Officer: Claire Hann

4.9. Key Dates

**Term dates**

<table>
<thead>
<tr>
<th>Term</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michaelmas 2019</td>
<td>Sunday, 13 October</td>
<td>Saturday, 7 December</td>
</tr>
<tr>
<td>Hilary 2020</td>
<td>Sunday, 19 January</td>
<td>Saturday, 14 March</td>
</tr>
<tr>
<td>Trinity 2020</td>
<td>Sunday, 26 April</td>
<td>Saturday, 20 June</td>
</tr>
</tbody>
</table>

**Assessment Dates**

- 1st elective submission: 12 noon first Monday of Hilary Term
- 2nd elective submission: 12 noon first Monday of Trinity Term
- Dissertation submission: 12 noon 1st September 2020
- Provisional dates for examinations: Week 4 in Trinity Term (to be confirmed)
5. COURSE MODULES

5.1 Understanding Environmental Change

Michaelmas Term 2019

Understanding Environmental Change consists of four core lecture modules—The Earth System, Global Change and the Biosphere, Human Dimensions of 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 Leader: Dr Mark Hirons*

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.

*Details within this week are subject to change – please see online course calendar for updates.*

<table>
<thead>
<tr>
<th>Day in Week 1</th>
<th>Location (tbc)</th>
<th>Lecture</th>
<th>Teaching Staff</th>
<th>From module</th>
</tr>
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<tbody>
<tr>
<td>Mon 14 Oct 09:00-11:00</td>
<td>Beckit</td>
<td>The concept of the Anthropocene</td>
<td>Mark Hirons</td>
<td>All/Global Change</td>
</tr>
<tr>
<td>Mon 14 Oct 11:00-13:00</td>
<td>Beckit</td>
<td>Redefining human prosperity</td>
<td>Kate Raworth</td>
<td>Human Dimensions</td>
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<td>Mon 14 Oct 14:00-16:00</td>
<td>SoGE Auditorium</td>
<td>The Economics of Environmental Change</td>
<td>Cameron Hepburn</td>
<td>Economics of the Environment</td>
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<tr>
<td>Tue 15 Oct 09:00-11:00</td>
<td>Beckit</td>
<td>Anthropogenic influence upon the climate</td>
<td>Fredi Otto</td>
<td>The Earth System</td>
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<td>Tues 15 Oct 11:00-13:00</td>
<td>Beckit</td>
<td>History of Environmental Policy</td>
<td>Anju Sharma and Lisa Schipper</td>
<td>Human Dimensions</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Location</td>
<td>Topic</td>
<td>Instructor(s)</td>
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<tr>
<td>Tue 15 Oct</td>
<td>14:00-16:00</td>
<td>Beckit</td>
<td>Responding to climate change/Social Dimensions of Climate Change</td>
<td>Lisa Schipper and Anju Sharma</td>
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<td>Tue 15 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 16 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 16 Oct</td>
<td>13:00-15:00</td>
<td>SoGE Auditorium</td>
<td>Intergenerational equity and the prospects for transitioning towards a restorative society</td>
<td>Michael Obersteiner</td>
</tr>
<tr>
<td>Wed 16 Oct</td>
<td>15:00-17:00</td>
<td>Beckit</td>
<td>Energy discussion</td>
<td>Sarah Darby</td>
</tr>
<tr>
<td>Thu 17 Oct</td>
<td>09:00-11:00</td>
<td>Beckit</td>
<td>Governance in the Anthropocene</td>
<td>Connie McDermott</td>
</tr>
<tr>
<td>Thu 17 Oct</td>
<td>11:00-13:00</td>
<td>Beckit</td>
<td>Water risks and insecurity</td>
<td>David Grey</td>
</tr>
<tr>
<td>Thu 17 Oct</td>
<td>14:00-16:00</td>
<td>Beckit</td>
<td>Population</td>
<td>Danny Dorling</td>
</tr>
<tr>
<td>Fri 18 Oct</td>
<td>09:00-11:00</td>
<td>Beckit</td>
<td>Thinking in Systems Workshop</td>
<td>Kate Raworth</td>
</tr>
<tr>
<td>Fri 18 Oct</td>
<td>11:00-13:00</td>
<td>Beckit</td>
<td>Communicating in the Anthropocene</td>
<td>James Painter</td>
</tr>
<tr>
<td>Fri 18 Oct</td>
<td>14:00-15:30</td>
<td>SoGE Auditorium</td>
<td>Prospects for global food (in)security</td>
<td>John Ingram</td>
</tr>
<tr>
<td>Fri 18 Oct</td>
<td>16:00-18:00</td>
<td>Beckit</td>
<td>Capstone Event– A manifesto for the Anthropocene (Followed by pub)</td>
<td>Mark Hirons and Staff</td>
</tr>
</tbody>
</table>
Overview Readings (see also Week 1 Readings for individual MT module lectures)

The Anthropocene epoch: scientists declare dawn of human-influenced age:


Stern, Lord Nicholas, 2015. Lecture: Why are we waiting? The logic, urgency, and promise of tackling climate change
http://www.oxfordmartin.ox.ac.uk/videos/view/509

I. Economics of the Environment

Module Leaders: Dr Stefania Innocenti and Dr Linus Mattauch

Teaching staff: Professor Cameron Hepburn and Professor Douglas Gollin

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 policy responses to them, spanning from climate change, biodiversity loss to water scarcity and service delivery.

The Economics of the Environment module equips MSc students in SoGE with the foundational concepts, methods and analytical tools to examine economic approaches to environmental and related policy issues across a range of contexts, scales and issues.

Module structure

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

PHASE I - FOUNDATIONS (weeks 1-4) covers the foundations of economics and the environment, examining the economic analysis of and responses to environmental issues. It also provides a survey of economic approaches to environmental policy ranging from instrument choice to property rights.

PHASE II (weeks 5-8) 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 issues relevant to students in the MSc in Environmental Change and Management (ECM).

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

PHASE II, OPTION A) Qualitative policy analysis for economics of the environment (Policy hereafter), featuring a case-oriented approach to understand the role of economics in policy design and evaluation.

Or

PHASE II, OPTION B) Modelling economic policy of the environment (Modelling hereafter) featuring formal approaches and quantitative analysis (choose this option by default if you are familiar calculus).

Learning outcomes

This module will enable 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 allocation 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 four 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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</thead>
</table>
| Week 1 14 Oct | **Economics of the Environment**  
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. | Prof Cameron Hepburn |
| Week 2 21 Oct | **Markets and the Environment**  
This session examines how markets allocate scarce resources. It identifies the sources of market failures that contribute to environmental and resource management problems. | Dr Stefania Innocenti |
| Week 3 TBA | **Discussion Group** | |
| Week 3 22 Oct | **Governing the Commons**  
This session reviews the theory and evidence regarding collective action and the commons. It compares different approaches to resource allocation, including markets, states and communities. The session draws on concepts and tools in the fields of institutional economics and political economy, including game theory, property rights and transaction costs. | Dr Linus Mattauch |
<table>
<thead>
<tr>
<th>Week 4</th>
<th>4 Nov</th>
<th>Instrument choice: regulation and pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></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.</td>
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</tbody>
</table>

Students in ECM will choose between two options:
A. *Qualitative policy analysis for economics of the environment* (Policy hereafter)
B. *Modelling economic policy of the environment* (Modelling hereafter) (prerequisite: calculus)

<table>
<thead>
<tr>
<th>Week 5</th>
<th>11 Nov</th>
<th>Environmental Policy Evaluation and Cost-Benefit Analysis</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>A. Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
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<tr>
<td></td>
<td></td>
<td>B. Modelling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This session covers cost-benefit analysis as a means of policy evaluation and project assessment, introducing concepts and critiques of discounting, valuation, and uncertainty analysis. It introduces students to the theory of general equilibrium and the welfare theorems. It gives mathematical examples of project evaluation as well as to various cost-benefit analyses of the economics of climate change.</td>
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<table>
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<tr>
<th>Week 6</th>
<th>18 Nov</th>
<th>Development Economics</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>A. Policy</td>
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<tr>
<td></td>
<td></td>
<td>This session examines the economics of development, from both a micro- and a macroeconomic perspective: it discusses key concepts in development economics such as economic growth and structural change, environment and poverty in developing countries.</td>
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<tr>
<td></td>
<td></td>
<td>B. Modelling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This session examines the economics of development, from both a micro- and a macroeconomic perspective: it discusses key concepts in development economics such as economic growth and structural change, environment and poverty in developing countries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discussion session including mathematical exercises <em>(Friday, 2-3 pm tbc)</em></td>
</tr>
</tbody>
</table>
### Behavioural Economics and Environmental Policy

<table>
<thead>
<tr>
<th>Week 7</th>
<th>25&lt;sup&gt;th&lt;/sup&gt; Nov</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Policy</strong></td>
<td>This session will first introduce students to behavioural economics. Then it will review some of the most common behavioural regularities and their implications for environmental policy design.</td>
</tr>
<tr>
<td><strong>B. Modelling</strong></td>
<td>This session examines the impact of behavioural economics for environmental policy design 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.</td>
</tr>
</tbody>
</table>

**Discussion session** including mathematical exercises *(Friday, 2-3 pm tbc)*

<table>
<thead>
<tr>
<th>Week 8</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Policy</strong></td>
<td>This session will investigate the relation between environmental policies and other macroeconomic policy goals. It will specifically look into the relationship between pollution and per capita income and trade. The effects of environmental taxation will also be analysed.</td>
</tr>
<tr>
<td><strong>B. Modelling</strong></td>
<td>This session uses modelling and quantitative analysis to examine links between public finance, macroeconomics and environmental taxation. It covers a basic approach to trade, the double dividend of environmental taxation, local public finance and selected issues from economic growth.</td>
</tr>
</tbody>
</table>

### Public Finance, Macroeconomics and the Environment

<table>
<thead>
<tr>
<th>Week 8</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Policy</strong></td>
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<tr>
<td><strong>B. Modelling</strong></td>
<td>This session uses modelling and quantitative analysis to examine links between public finance, macroeconomics and environmental taxation. It covers a basic approach to trade, the double dividend of environmental taxation, local public finance and selected issues from economic growth.</td>
</tr>
</tbody>
</table>

### Reading Expectations

Each session in the Foundations (Phase I) will have two to three key readings, addressing the following elements:

- *recommended* reading for each week, examining the intersection of economics and the environment
- *optional*, supplementary reading providing an in-depth application relevant for each course often more advanced than the recommended texts.

Readings in Phase II are customised to each specialised track.

**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.
There are two required texts for the Phase I of the course.

1. **Keohane and Olmstead** (2nd edition, 2016; details below). 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.


**Module Readings**

**PHASE I, FOUNDATIONS**

**Week 1: Economics of the Environment**


**Optional further reading for ECM:**


**Week 2: Markets and Market Failure**


Optional further reading for ECM:


**Week 3: Governing the Commons, Revisited**


Optional further reading for ECM:


**Week 4: Instrument Choice**

*Chapters 8 (139-167) and 9 (168-198) in Keohane and Olmstead, 2nd Edition, 2016.*


Optional further reading for ECM:


**Phase I, Other Additional Recommended Readings**


Phase II, OPTION A: POLICY TRACK

Week 5: Environmental Policy Evaluation and Cost-Benefit Analysis


Week 6: Development Economics


Week 7: Behavioural Economics and Environmental Policy


Week 8: Public Finance, Macroeconomics and the Environment


Phase II, OPTION B: MODELLING TRACK

Week 5: Environmental Policy Evaluation and Cost-Benefit Analysis


Week 6: Development Economics


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, and Dr Lisa Wedding

Course Animator: Imma Oliveras

Thursday, 2-4 pm (Hilary Term)

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>
<thead>
<tr>
<th>Week/Delivery¹</th>
<th>Description</th>
<th>Concurrent methods &amp; skills sessions</th>
<th>Staff</th>
</tr>
</thead>
</table>
| Week 2 2 hour Lecture and discussion | The metabolism of a human-dominated planet
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. | | Professor Yadvinder Malhi |

¹ The lectures will be held on Thursday afternoons in the Hilary Term.
| Week 3 | 2 hour Lecture and discussion | **Metrics for human impacts on the biosphere**  
This lecture will explore different approaches and metrics for human impacts on the biosphere, and the debates surrounding various metrics. How do we measure human impacts on the biosphere and what are the challenges? 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. | Professor Yadvinder Malhi |
| Week 4 | 2 hour Lecture and discussion | **Tropical forests and global change**  
The lecture will present a more detailed assessment multifaceted 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. | Professor Yadvinder Malhi |
| Week 5 | 1 hour Lecture, and 1 hour Lab and discussion | **Global change and the ocean biosphere**  
This lecture will explore the challenges the ocean biosphere faces in the Anthropocene, with a focus on coral reef ecosystems. The lecture will examine the footprint of human activity evident on coral reefs at all trophic levels. There will be examples of global human-induced ocean warming, acidification, overfishing, and other local stressors that are transforming coral assemblages. We will learn to explore remotely sensed data sets to identify mass coral bleaching events and discuss how we can use geospatial information to inform marine conservation policy and management in practice. | Dr Lisa Wedding |
| Week 6 | 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 |
| Week 6 Friday (TBC) |  | **Friday fieldtrip to Wytham Woods**  
This field trip will address key questions of forest ecology in the context of global change. We will learn about methods to assess | Prof. Y Malhi & Dr Mike Morecroft |
plant species composition, diversity and carbon stocks. Wytham Woods has a rich history of ecological research. We will visit research plots to learn about the active ecosystems research going on.

<table>
<thead>
<tr>
<th>Week 7</th>
<th>2 hour Lecture and discussion</th>
<th>Modelling the global biosphere in the Anthropocene</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>This week will describe how the terrestrial biosphere, and its interaction with economic and social systems, is represented in the context of Integrated Assessment Models of the biosphere. It looks at different scenarios of future pathways for the biosphere, and the biosphere’s potential role in climate change mitigation.</td>
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<tr>
<td></td>
<td></td>
<td>Professor Michael Obersteiner</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 8</th>
<th>Capstone: Humanity and the Biosphere in the Anthropocene</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>The module will end with an 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.</td>
</tr>
<tr>
<td></td>
<td>Professor Yadvinder Malhi/Dr Mark Hirons</td>
</tr>
</tbody>
</table>

Introductory readings


Week 1: The concept of the Anthropocene

Key Readings


Malhi (2017) The concept of the Anthropocene, Annual Reviews in Environment and Resources

Supplementary


Week 2: The metabolism of a human-dominated planet

Key Readings


Supplementary


Week 3: Metrics for human impacts on the biosphere

Key Readings


Week 4: Tropical forests in the Anthropocene

Key Readings

Malhi et al (2014) Tropical forests in the Anthropocene


**Supplementary**


**Week 5: Coral Reefs in the Anthropocene Key Readings**


**Supplementary**


**Week 6: Climate change and biodiversity**

**Key Readings**


**Supplementary**


**Week 6: Friday field trip to Wytham Woods**


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 7: Case studies of global change in the tropics**

**Supplementary**


III. The Earth System

Module Leader: Professor Myles Allen

Teaching Staff: Professor Yadvinder Malhi, Dr Friederike Otto and Dr Jian Peng

Course Animator: Dr Karsten Haustein

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 Karsten Haustein. 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>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Anthropogenic influence upon the climate: past observations and future prospects</td>
<td></td>
<td>Friederike Otto</td>
</tr>
<tr>
<td>15 Oct</td>
<td>Part of the “Welcome to the Anthropocene” series. Greenhouse gas emissions</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>and implications for global temperatures and the Earth System.</td>
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</tr>
<tr>
<td>Week 2</td>
<td>How CO(_2) emissions cause global warming</td>
<td></td>
<td>Myles Allen</td>
</tr>
<tr>
<td>23 Oct</td>
<td>The Earth’s radiation budget. The Greenhouse Effect and enhancement from</td>
<td></td>
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<tr>
<td></td>
<td>anthropogenic emissions.</td>
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<tr>
<td>Week 3</td>
<td>The biosphere in the Earth System</td>
<td>Q&amp;A sessions begin</td>
<td>Yadvinder Malhi</td>
</tr>
<tr>
<td>30 Oct</td>
<td>The main regions of the biosphere and their key properties and differences.</td>
<td>(Karsten Haustein)</td>
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<tr>
<td></td>
<td>The cycles of energy, water, carbon, nitrogen, and phosphorus in the</td>
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<tr>
<td></td>
<td>terrestrial biosphere.</td>
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<tr>
<td></td>
<td>Carbon, nitrogen, phosphorus budgets and future prospects.</td>
<td></td>
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</tr>
<tr>
<td>Week 4</td>
<td>Understanding 21st century global temperature change</td>
<td></td>
<td>Myles Allen</td>
</tr>
<tr>
<td>6 Nov</td>
<td>Climate sensitivity, the transient climate response, and the role of the</td>
<td></td>
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<td></td>
<td>oceans. Introduction to simple climate models</td>
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<tr>
<td>Week 5</td>
<td>The carbon cycle</td>
<td>Exercise: Simple climate modelling 1</td>
<td>Myles Allen</td>
</tr>
<tr>
<td>13 Nov</td>
<td>Components of the carbon cycle. Influence of the carbon cycle on 21st</td>
<td>Encode a climate equation in a</td>
<td></td>
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<td></td>
<td>century climate change. Cumulative carbon and the role of short lived</td>
<td>spreadsheet. Analyse sensitivity</td>
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<td></td>
<td>climate forcings.</td>
<td>to parameters (Karsten Haustein)</td>
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<tr>
<td>Week 6</td>
<td>Beyond global temperature</td>
<td>CAULDRON game: role play exercise</td>
<td>Friederike Otto</td>
</tr>
<tr>
<td>20 Nov</td>
<td>How much do we know about changes in other variables and at regional scales?</td>
<td>focusing on attribution of extreme</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Can we attribute extreme weather events to climate change?</td>
<td>weather events. (Karsten Haustein)</td>
<td></td>
</tr>
<tr>
<td>Week 7</td>
<td>Implications for climate change mitigation policy</td>
<td>Exercise: Simple climate modelling 2</td>
<td>Myles Allen</td>
</tr>
<tr>
<td>27 Nov</td>
<td>What does our understanding of rising global temperatures mean for</td>
<td>Spreadsheet carbon budget with</td>
<td></td>
</tr>
<tr>
<td></td>
<td>climate policy? What are the implications of the 1.5°C goal?</td>
<td>sources and sinks. Sensitivity</td>
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<td>analysis around the effects of future</td>
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</table>
**Week 8**
28 Nov
Lecture and discussion

**The hydrological cycle, land surface interactions and hydrological modelling**

**Exercise: Climate changes in your region**
Analysis of future climate change projections
(Karsten Haustein)

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**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](http://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)


Klien, N. (2014) This Changes Everything: Capitalism vs. the Climate, Simon and Schuster, New York [because your lecturer vehemently disagrees with almost all of it]

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


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<table>
<thead>
<tr>
<th>Week 8</th>
<th>Lecture and discussion</th>
<th>The hydrological cycle, land surface interactions and hydrological modelling</th>
<th>Exercise: Climate changes in your region</th>
</tr>
</thead>
</table>

Jian Peng
On the greenhouse effect


Your lecturer’s attempt to explain climate science in an hour to a San Francisco courtroom: https://www.eci.ox.ac.uk/news/2018/0410.html

David Archer’s MODTRAN model (to play around with the impact of CO₂ on outgoing radiation): http://climatemodels.uchicago.edu/modtran/

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


On attribution

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

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/

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 since 1999, most recently as Coordinating Lead Author on the IPCC Special Report on 1.5°C. 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 founded the [www.climateprediction.net](http://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](http://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’.

**Jian Peng** is a Research Fellow in Earth Observation and Hydroclimate.

**Karsten Haustein** is a Research Fellow on the World Weather Attribution project.
IV. Human Dimensions of Environmental Change

Module Leaders: Dr Kate Raworth and Dr Lisa Schipper

Teaching Assistant: Carley-Jane Stanton
Thursday, 2-4 pm

Overview

This module introduces relevant cross-cutting cognitive, social, economic, and human ecological concepts and frameworks, which can be applied in many different contexts – from academic research to action on the ground – in order to explore historical developments and address contemporary issues of wellbeing, power, resilience, sustainability, and transformation, in an increasingly populous and globalised society. Using interactive approaches, we ask questions about the relationship between human systems and ecological systems, and how the complexity, diversity, stratification, and resource management of human societies shape their contributions and responses to critical environmental parameters and challenges.

Objectives and competencies

The module aims to assist students in gaining a critical understanding of the interactions between human society and environmental change in an interdisciplinary context. Major topics and methods include: the role of worldviews and culture in defining the human-environment relationship; concepts of resilience, adaptation, development, transformation, power and identity; and evolving notions of human, economic, and sustainable development. Students will be expected to master a set of core concepts and skills for analysing the development, dynamics, and sustainability of complex social-ecological systems, drawing on both historical and contemporary examples. Students will additionally apply these skills to design innovative research, compose policy briefs, and engage in debates on contemporary social-ecological challenges.

Skills sessions and reading group

Skills sessions and reading group discussions will be led by 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 Systems Thinking workshop, led by Kate Raworth and Carley-Jane Stanton, introduces the core concepts of systems-thinking in an engaging and interactive way, making systems dynamics visible in the room through our own interactions.

The Writing for Policy Influence workshop, led by Kate Raworth, presents a highly effective step-by-step approach to communicating research and policy recommendations so that they can reach and influence diverse audiences including 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.
The Reading Group, led by Carley-Jane Stanton, will deepen discussion and debate around themes that have emerged within the module, and that are proposed by students for further exploration. The number and range of reading group sessions will respond to the scale and diversity of interest within the student group.

The Innovating in the Anthropocene workshop, led by Kate Raworth and Lisa Schipper, creates a playful opportunity to work in teams and draw together many of the concepts explored throughout the module, applying them in a fictional but practical context. It offers the chance to invent, to synthesize, and to grapple with social-ecological complexity.

**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 14 Oct</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 and responding to environmental change.</td>
<td>Friday workshop: Core Concepts in Systems Thinking (Kate Raworth &amp; Carley-Jane Stanton)</td>
<td>Kate Raworth</td>
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<tr>
<td>Week 1 15 Oct</td>
<td><strong>History of Environmental Policy</strong>&lt;br&gt;Part of the “Welcome to the Anthropocene” series.&lt;br&gt;An overview of environmental policy since the 1960s, with a justice and equity lens. Fundamental knowledge for understanding contemporary challenges of addressing environmental problems.</td>
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<td>Anju Sharma</td>
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<tr>
<td>Week 1 15 Oct</td>
<td><strong>The Debate: Negotiating Climate Change in 2019</strong>&lt;br&gt;Part of the “Welcome to the Anthropocene” series.&lt;br&gt;The group will be divided into different interest groups so that we can debate climate change and explore the challenge of ‘leaving no one behind’ when taking action</td>
<td></td>
<td>Lisa Schipper</td>
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<tr>
<td>Week 2 24 Oct</td>
<td><strong>Social-Ecological Systems and Resilience</strong>&lt;br&gt;How has understanding of humanity’s relationship to the rest of the living world evolved over time, and with what implications for responding to environmental change? How do the concepts of social-ecological systems and resilience enrich or compromise social analysis?</td>
<td>Writing for policy influence workshop (Kate Raworth)</td>
<td>Kate Raworth</td>
</tr>
<tr>
<td>Week 3 31 Oct</td>
<td>Lecture and discussion</td>
<td>Framing and worldviews</td>
<td>Lisa Schipper</td>
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<td>The way we see the world, as individuals or as researchers and professionals, also influences the way that we identify, frame and address problems. This lecture addresses issues of subjectivity, perceptions, worldviews, beliefs, culture, performativity. We will touch on how disciplinary distinctions often drive the way research questions are asked and examined.</td>
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<tr>
<td>Week 4 7 Nov</td>
<td>Lecture and discussion</td>
<td>Analysing power and identity</td>
<td>Lisa Schipper</td>
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<td>Often we trace environmental problems back to humans – humans with power. Power is complex and not directly evident. Gender relations and constructs offer an accessible subject for study of power, and demonstrate how socio-cultural norms drive power dynamics.</td>
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<tr>
<td>Week 5 14 Nov</td>
<td>Lecture and discussion</td>
<td>Lens on Equity: Vulnerability and Adaptation to Climate Change</td>
<td>Lisa Schipper</td>
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<td>The concept of vulnerability is crucial for understanding how natural hazards become risks, and allows us to ask questions about human agency and equity in risk. Through readings we will explore key issues of contention in the discussion on vulnerability and adaptation to climate change and natural hazards.</td>
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<tr>
<td>Week 6 21 Nov</td>
<td>Lecture and group exercise</td>
<td>Beyond sustainability: regenerative and circular design</td>
<td>Kate Raworth</td>
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<td>Is it possible to aim beyond ‘sustainability’ to create regenerative industries, communities, and cities, and how does technological change alter the feasibility of doing so? What are the social implications of regenerative design and what are the implications for the design of business itself?</td>
<td></td>
</tr>
<tr>
<td>Week 6 21 Nov</td>
<td>Reading Group</td>
<td>Themes to be explored in the reading group will be those proposed by students during the course of the module.</td>
<td>Carley-Jane Stanton</td>
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<tr>
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<td>First reading group with subsequent meetings and times (tbc)</td>
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<tr>
<td>Week 7 28 Nov</td>
<td>Lecture and discussion</td>
<td>Transformations</td>
<td>Kate Raworth</td>
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<td>Can transformations in social-ecological systems be brought about and, if so, how? What diversity of insights and strategies do different conceptual frameworks of transformation offer, and how might they be applied in practice?</td>
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<tr>
<td></td>
<td></td>
<td>Friday workshop: Innovating in the Anthropocene (Kate Raworth and Lisa Schipper)</td>
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</tbody>
</table>
Debates in the Anthropocene

Critical dilemmas: can humanity thrive in the Anthropocene?
Controversial motions to be chosen and debated in teams.

Week 8  
5 Dec  
Capstone debate

Kate Raworth  
and Lisa Schipper

Readings

Week 1: Redefining human prosperity


On Canvas: questions to prepare for class discussion and additional readings (Wk1-Raworth-discussion.doc).

*Supplementary for other W2A week lectures:*


**Friday Workshop: Core concepts in systems thinking:**


*Supplementary*

Raworth, K. 2017 *Doughnut Economics*, Penguin Random House, Ch. 4 (pp. 129-162)

Week 2: Social-ecological systems and resilience


Lansing, S. ‘Perfect order – recognising complexity in Bali’ TEDx video (15 mins) available at: https://www.youtube.com/watch?v=kZLLGCaz74M

On Canvas: questions to prepare for class discussion (Wk3-Raworth-questions.doc).

**Week 3: Framing and worldviews**

**Activity:** Worldview exercise

**Readings**


Bracken L E and Oughton E A 2006 ‘What do you mean?’ The importance of language in developing interdisciplinary research *Transactions of the Institute of British Geographers* 31 371–82


**Week 4: Analyzing Power and Identity**


**Week 5: Lens on Equity: Adaptation and Vulnerability to Climate Change**


**Week 6: Beyond sustainability: regenerative and circular design**

Reed, B. 2007, Shifting from ‘sustainability’ to regeneration, Building Research and Information, 35(6) 674-680


Benyus, J. ‘Biomimicry’ video (20 mins) at https://www.youtube.com/watch?v=sf4oW8OtaPY&t=20s

On Canvas: select a case study to investigate, read the relevant additional sources, and prepare for class discussion (Wk6-Raworth-questions.doc)

**Week 7: Transformations**

Geels, F. 2011, The multi-level perspective on sustainability transitions: responses to seven criticisms, Environmental Innovation and Societal Transitions 1 (1) 24-40

Meadows, D. 2010. Leverage points: places to intervene in a system. Solutions 1 (1) 41-49

Sharpe, B. et al, 2016, Three Horizons: a pathways practice for transformation, Ecology and Society 21 (2) 47 – also see on Canvas a 7 minute video summary of Three Horizons by Kate Raworth

On Canvas: questions and case studies to prepare for class discussion (Wk7-Raworth-questions.doc).

**Week 8: Capstone Debates in the Anthropocene**

Readings to be determined by each team’s chosen debating motion.
Teaching Staff

**Kate Raworth** is a Senior Teaching Associate at ECI, author of *Doughnut Economics: seven ways to think like a 21st century economist* (Penguin Random House), and co-founder of the Doughnut Economics Action Lab. Her work focuses on turning the concepts of regenerative and distributive design into transformative practice in cities, in business, in education, and in policymaking. She has spent over 25 years working in development research and practice, as senior researcher at Oxfam, as economist and co-author of UNDP’s Human Development Report, and as a fellow of the Overseas Development Institute, based in the Ministry of Trade and Industry, Zanzibar. She holds a masters in Economics for Development from Oxford University and an honorary doctorate from Business School Lausanne. She is a senior associate of the Cambridge Institute for Sustainability Leadership, and an advisory board member of the ECI’s International Advisory Board, the Stockholm School of Economics Global Challenges Programme, and the University of Surrey’s Centre for the Understanding of Sustainable Prosperity.

**Dr Lisa Schipper** is Environmental Social Science Research Fellow at ECI with disciplinary home in development studies and many years of experience working on climate change, both following policy development as well as researching the linkages between climate change and development. Her work focuses on the drivers of social vulnerability to climate change and natural hazards in developing countries, and the role that adaptation can play in reducing that vulnerability. Her research has three themes: (1) the linkages between adaptation to climate change and development; (2) socio-cultural drivers of vulnerability to climate change and natural hazards (particularly religion and gender); and (3) migration and climate change. She is currently Co-ordinating Lead Author for the chapter on ‘Climate-Resilient Development Pathways’ in the upcoming IPCC 6th Assessment Report (Working Group 2) and Co-Editor of the journal *Climate and Development*. 
5.2 Responding to Environmental Change

Hilary Term 2020

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

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.
I. Sustainable Responses to Environmental Change

_Module Leaders: Professor Jim Hall and Dr Linus Mattauch_

_Teaching Assistant: Marcus Spiegel_

_Monday, 2-4pm_

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 that is interpreted in very different ways 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. Furthermore, decision theory relies upon the capacity to value costs, benefits and impacts. We therefore present tools for environmental decision making in Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), lifecycle analysis and Integrated Assessment Modelling (IAM). 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 and cost-benefit analysis. 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
  - Risk
  - Decision making under uncertainty

- Ability to critically apply the following methods and techniques:
  - Multi-criteria analysis
o Risk analysis
o Cost-benefit analysis
o Simple integrated assessment modelling
o Environmental Impact Assessment and Strategic Environmental Assessment
o Life-cycle analysis and resource modelling

• Appreciation of the practicalities of environmental decision making in a variety of different settings, including:
  o Government policy
  o Regulation
  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 risk analysis, cost-benefit analysis and integrated assessment
• 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>
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</thead>
<tbody>
<tr>
<td><strong>Week 2</strong></td>
<td><strong>Sustainability</strong></td>
<td>Jim Hall</td>
</tr>
<tr>
<td>27 Jan</td>
<td>Introduction to the course</td>
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<tr>
<td>2-4pm</td>
<td>Definitions and concepts of sustainability</td>
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<tr>
<td>Monday Lecture</td>
<td>History of development of sustainability theory and practice</td>
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<td></td>
<td>Sustainable Development Goals</td>
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<tr>
<td></td>
<td>Introduction of the capstone exercise</td>
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<tr>
<td><strong>Week 3</strong></td>
<td><strong>Making decisions</strong></td>
<td>Jim Hall</td>
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<tr>
<td>3 Feb</td>
<td>Valuation and preferences</td>
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<tr>
<td>2-4pm</td>
<td>Single and multi-objective decision making</td>
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<tr>
<td>Monday Lecture</td>
<td>Decision making under uncertainty</td>
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<td></td>
<td>Aggregation and social choice</td>
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<tr>
<td><strong>Week 3</strong></td>
<td><strong>Sustainability reading group</strong></td>
<td>Linus Mattauch</td>
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<tr>
<td>5 Feb</td>
<td>Versions of sustainability</td>
<td>and Marcus Spiegel</td>
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<tr>
<td>11-1pm</td>
<td>Reading Group</td>
<td></td>
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<tr>
<td><strong>Week 3</strong></td>
<td><strong>Corporate sustainability officer</strong></td>
<td>Francis Sullivan</td>
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<tr>
<td>8 Feb</td>
<td>Role of the corporate sustainability officer</td>
<td>(TBC)</td>
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<tr>
<td>10-12pm</td>
<td>Investment and finance decisions</td>
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<tr>
<td>Friday Workshop</td>
<td><strong>Analysis of environmental risks</strong></td>
<td>Jim Hall</td>
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<tr>
<td>10 Feb</td>
<td>Definitions of risk</td>
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<tr>
<td>2-4pm</td>
<td>Qualitative and risk ranking methodologies</td>
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<tr>
<td>Monday Lecture</td>
<td>Quantitative risk assessment</td>
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<td>Risk perception and risk management</td>
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<tr>
<td><strong>Week 4</strong></td>
<td><strong>Practical session (computer room)</strong></td>
<td>Jim Hall</td>
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<tr>
<td>12 Feb</td>
<td>CBA</td>
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<tr>
<td>11-1pm</td>
<td>Multi-criteria analysis</td>
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<tr>
<td>Practical session</td>
<td>Quantified risk analysis</td>
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<tr>
<td><strong>Week 4</strong></td>
<td><strong>Feedback on proposals for capstone exercise</strong></td>
<td>Jim Hall, Linus</td>
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<tr>
<td>14 Feb</td>
<td>Workshop session in which students present proposals for</td>
<td>Mattauch and Marcus</td>
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<tr>
<td>10-1pm</td>
<td>“sustainability business case” and obtain initial feedback</td>
<td>Spiegel</td>
</tr>
<tr>
<td>Practical session</td>
<td><strong>Scenarios and integrated assessment</strong></td>
<td>Linus Mattauch</td>
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<tr>
<td>17 Feb</td>
<td>Cost-Benefit Analysis and Cost-Effectiveness Analysis</td>
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<tr>
<td>Monday Lecture</td>
<td>Integrated Assessment models of climate change</td>
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<td>Mitigation pathways and the role of economic growth, critiques of</td>
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<td>Integrated Assessment</td>
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<tr>
<td><strong>Week 5</strong></td>
<td><strong>Practical session (computer room)</strong></td>
<td>Linus Mattauch</td>
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<tr>
<td>19 Feb</td>
<td>Uncertainty, discounting and decision making in IAMs</td>
<td>and Richard Millar</td>
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<tr>
<td>10-12 pm</td>
<td>Friday workshop</td>
<td>(tbc)</td>
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<tr>
<td>Week 6</td>
<td>24 Feb</td>
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<tr>
<td>Week 6</td>
<td>26 Feb</td>
<td>10-12pm</td>
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<td>Week 6</td>
<td>28 Feb</td>
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<td>Week 7</td>
<td>2 Mar</td>
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<tr>
<td>Week 7</td>
<td>6 Mar</td>
<td>2-5pm</td>
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</tr>
<tr>
<td>Week 8</td>
<td>9 Mar</td>
<td>2-5pm</td>
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</tbody>
</table>

A revision session will be arranged during Trinity Term.

Readings

**Week 2: Sustainability**

**Key Readings**


- 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


**Supplementary**


**Week 3: Decision making**

**Key Readings**


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


Supplementary

Department of Communities and Local Government, 2009 Multi-criteria analysis: a manual, [168 pages, manual]
- 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


### Week 4: Risk analysis

**Key Readings**


**Supplementary**


**Week 5: Integrated Assessment**

**Key Readings**


**Supplementary**


Week 6: Adaptation decisions

Key Readings


Supplementary


**Weeks 6 and 7: 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]


II. Governing the Anthropocene

Module Leaders: Dr Constance McDermott with Dr Mark Hirons

Teaching Assistant: Carley-Jane Stanton

Tuesday, 2-4pm with additional workshops and discussion groups

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

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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>Part I: Core Lectures</td>
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<tr>
<td>Welcome to the Anthropocene Week Thurs, Oct 17</td>
<td>Governance in the Anthropocene Whose steering and where are we headed?</td>
<td></td>
<td>Constance McDermott</td>
</tr>
<tr>
<td>Week 2 Tues, Jan 28</td>
<td>Intro to Governance I: Locating governance in the Anthropocene Why/what/where is governance in the</td>
<td>Social science research design workshop 1: Research questions(^3)</td>
<td>Constance McDermott</td>
</tr>
</tbody>
</table>

\(^2\) The precise order of the lectures is subject to change.

\(^3\) 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>Tues, 4 Feb</th>
<th>2 hour Lecture and discussion + 2 hour methods and skills session</th>
<th>Intro to Governance II: Contrasting theories of governance</th>
<th>Social Science Research Design Workshop 2</th>
<th>Constance McDermott</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Anthropocene?</td>
<td>This lecture will explore the rising eminence of the term ‘governance’, drawing on examples from the forest sector and beyond.</td>
<td>(developed over MT-HT break)</td>
<td>(C McDermott and staff)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(developed over MT-HT break)</td>
<td>(C McDermott and staff)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 4</td>
<td>Tues, Feb 11</td>
<td>2 hour Lecture and discussion + 2 hour methods and skills session</td>
<td>Resilience, adaptive governance and polycentricity – understanding the buzzwords</td>
<td></td>
<td>Mark Hirons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The politics of knowledge in environmental governance</td>
<td>Examining and critiquing how contrasting theories and approaches to governance are employed in popular concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 5</td>
<td>Tues, Feb 18</td>
<td>2 hour Lecture and discussion + 2 hour methods and skills session</td>
<td>The politics of knowledge in environmental governance</td>
<td></td>
<td>Mark Hirons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Why ‘listening to the scientists’ is more difficult that it seems</td>
<td></td>
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</tr>
<tr>
<td><strong>Part II: Guest lectures</strong></td>
<td></td>
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</tr>
</tbody>
</table>
### Course Field Trip*

<table>
<thead>
<tr>
<th>Week 9</th>
<th>Environmental Governance in the EU</th>
<th>Field trip</th>
<th>18 – 20 March 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-day field trip to Brussels</td>
<td>Field-based study of EU institutions for environmental governance and management.</td>
<td></td>
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</tr>
</tbody>
</table>

*The running of this course may be influenced by Brexit so all plans are currently provisional.*

### Elective Activities (all TBC)

<table>
<thead>
<tr>
<th>Seminar</th>
<th>COP23 Katowice</th>
<th>Benito Muller et al.</th>
</tr>
</thead>
<tbody>
<tr>
<td></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>

<table>
<thead>
<tr>
<th>Seminar</th>
<th>Climate Justice and the IPCC</th>
<th>Chuks Okereke</th>
</tr>
</thead>
</table>
Readings

Welcome to the Anthropocene Lecture (Michaelmas term)


Supplementary


Week 2 Lecture

Key readings


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


Supplementary


Research Design Workshop I:

Key Readings


Supplementary

Week 3 Lecture

Key Readings


Week 4 Lecture

Key Readings


Supplementary


Week 5 Lecture

Key Readings


Supplementary


Research Design Workshop II:

Key Readings


Methods bibliography: (To be deposited in Canvas).

Guest Lectures

Week 6 Lecture

Key Readings


**Supplementary**


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

**Week 7 Lecture**


**Optional Activities**

**Practicing Participatory Governance workshop**


**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.

Mark Hirons is the ECM course director and 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.
III. Energy Systems and Mitigating Climate Change

Module Leaders: Dr Chris Jardine, Dr Sarah Darby, Dr Phil Grunewald

Course Animator: Dr Chris Jardine

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>
<tbody>
<tr>
<td>Week 1</td>
<td><strong>Introduction to Climate Mitigation and Energy</strong></td>
<td></td>
<td>Chris Jardine, Nick Eyre, Sarah Darby and invited speakers</td>
</tr>
<tr>
<td>Intensive</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td><strong>Understanding energy technologies in action</strong></td>
<td>Presentations; simulations and role play; argumentation and advocacy.</td>
<td>Chris Jardine and others tbc</td>
</tr>
<tr>
<td>Field trip to</td>
<td>Key characteristics, performance and constraints of energy technologies and their use. Visit to renewable energy installations. Preparation for week 6 workshop.</td>
<td></td>
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<tr>
<td>Centre for</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Alternative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td><strong>Negative Emissions</strong></td>
<td></td>
<td>tbc</td>
</tr>
<tr>
<td>Lecture and</td>
<td>With most decarbonisation scenarios featuring some aspect of negative emissions, this session covers the technologies and strategies for implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 3</td>
<td><strong>Low Carbon Transport</strong></td>
<td></td>
<td>Debbie Hopkins</td>
</tr>
<tr>
<td>Lecture and</td>
<td>Transport’s role in energy use and carbon emissions. Mobility demand and modal shift. Transport technologies and fuels.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 4</td>
<td><strong>Mitigating climate change locally</strong></td>
<td></td>
<td>Sarah Darby and others tbc</td>
</tr>
<tr>
<td>2 hour lecture</td>
<td>Local governance. Case studies from initiatives to decarbonise supply and reduce demand; drivers of local action, role of local government.</td>
<td></td>
<td></td>
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<tr>
<td>and discussion</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Week 5</td>
<td><strong>Project development practice</strong></td>
<td>Data analysis; economic analysis; commercial skills</td>
<td>Chris Jardine</td>
</tr>
<tr>
<td>Lecture and</td>
<td>The technology, economics and practice of solar photovoltaics. Mock tendering exercise</td>
<td></td>
<td></td>
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<tr>
<td>discussion</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Week 6</td>
<td><strong>Challenges in moving to a renewable energy system</strong></td>
<td></td>
<td>Phil Grunewald</td>
</tr>
<tr>
<td>Group exercise</td>
<td>The challenge of integrating variable energy resources, including grid management, demand side response and battery storage. Features early outputs from ECI research.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workshop</td>
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</tbody>
</table>
Week 8

**European environment policy**
In advance of the Brussels field trip, the EU dimension of environment policy (see “Governing the Anthropocene” module).

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**Reading Group (if there is a demand for this)**

<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>Tina Fawcett</td>
</tr>
<tr>
<td>Reading group</td>
<td>a. Theory of pricing – taxes and permits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Kyoto mechanisms and EUETS,</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>c. CDM and offsets</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Personal Carbon Trading</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cross cutting with Environmental Governance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Readings**

**Weeks 1 and 2**


http://www.rmi.org/Amory_Lovins_presentation_Reinventing_Fire_Launch


http://www.green-alliance.org.uk/page_73.php

Week 3


Week 4


Week 5


Week 7


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

MSc/MPhil ECM Course Handbook 2019–20
<table>
<thead>
<tr>
<th>ENVIRONMENTAL CHANGE</th>
<th>Michaelmas Term</th>
<th>Hilary Term</th>
<th>Trinity Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modelling Environmental Phenomena</td>
<td>Types &amp; uses of models, e.g. Climate, Ecosystem, Agent-based</td>
<td>Earth System; Human Systems</td>
<td>Biosphere; Sustainable Responses; Quantitative skills; Electives</td>
</tr>
<tr>
<td></td>
<td>Model construction and validation</td>
<td>Earth System; Human Systems</td>
<td>Sustainable Responses; Electives</td>
</tr>
<tr>
<td></td>
<td>Uncertainties and limitations</td>
<td>Earth System; Human Systems</td>
<td>Sustainable Responses; Governing the Anthropocene</td>
</tr>
<tr>
<td></td>
<td>Models in scientific and policy process</td>
<td>Earth System; Writing for Policy WS</td>
<td>Biosphere; Energy Systems; Sustainable Responses; Governing the Anthropocene</td>
</tr>
<tr>
<td>Research Design</td>
<td>Framing ECM problems and appropriate research questions</td>
<td>All modules and reading groups</td>
<td>Sustainable Responses; Governing the Anthropocene</td>
</tr>
<tr>
<td></td>
<td>Experimental Design</td>
<td>Earth Systems; Economics</td>
<td>Biosphere; Quantitative skills</td>
</tr>
<tr>
<td></td>
<td>Risk assessment and ethics</td>
<td>Human Systems; Dissertation briefing</td>
<td>Research Design WS; Risk/safety briefing</td>
</tr>
<tr>
<td></td>
<td>Expert interviews; focus groups</td>
<td></td>
<td>Research Methods WS</td>
</tr>
<tr>
<td></td>
<td>Policy analysis</td>
<td>Anthropocene; Human Systems;</td>
<td>All modules and Brussels FC</td>
</tr>
<tr>
<td></td>
<td>Participant observation</td>
<td>Human Systems</td>
<td>Research Methods WS</td>
</tr>
<tr>
<td></td>
<td>General social science techniques</td>
<td>Environmental Economics; Human Systems</td>
<td>Governing the Anthropocene</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Research Methods WS</td>
</tr>
<tr>
<td>OTHER TRANSFERABLE SKILLS</td>
<td>Michaelmas Term</td>
<td>Hilary Term</td>
<td>Trinity Term</td>
</tr>
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<td>---------------------------</td>
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</tr>
<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></td>
<td>Biosphere; Governing the Anthropocene; Energy Systems</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>Presentations</td>
<td>Slapton FC; Human Systems; various WS</td>
<td>Biosphere; 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>

FC = Field course; WS = Workshop
Research Skills module

Module Leaders: Dr Imma Oliveras and Dr Mark Hirons

Teaching Assistants: Marcus Spiegel and Carley-Jane Stanton

Tuesday, 2-5pm (Michaelmas Term)

Overview

We have designed this module to provide students with practical skills to perform both quantitative and qualitative research. The module is intended 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. Students have very different backgrounds and bring different interests and prior knowledge on research skills methods. While diversity is a strength, we will aim to ensure a basic minimal background on research skills and analysis that will serve as a basis for a series of sessions targeted towards developing dissertations in other modules (e.g. Governing the Anthropocene) 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 skills in a particular area will cover material on their own time – we cannot teach you comprehensive data analysis skills in the time available, but rather will guide you on how to learn those research 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 other core modules. The sessions will generally consist of 2 50-minute lectures followed by a 1-hour practical session, in which students will be split in two groups: one group will learn how to do relevant analysis in R, a powerful programming language (recommended for those with prior experience in quantitative analysis and coding, since to specifics about R language will be taught) and the other group will learn how to do the relevant analysis in a more ‘user-friendly’ software package called JMP® (which is similar in format to Excel). N.B. There is no advantage in terms of assessment in either stream.

Intended learning Objectives

- To critically examine the diverse quantitative and qualitative methods available for the range of topics covered at ECM
- To provide a foundation for developing the skills analyse quantitative and qualitative data and to engage with mixed methods approaches.
- 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. Introductory online courses

Please take these courses before the session in week 3.

The online tutorials are available at Lynda, for which the University has license and can be accessed through https://help.it.ox.ac.uk/courses/lynda/index

- Statistics Fundamentals – Part 1 (it is not necessary to take this if you have any prior knowledge of statistics)

- Statistics Fundamentals – Part 2: intermediate

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

<table>
<thead>
<tr>
<th>Term/Week</th>
<th>Description: Methods and skills covered</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT – Week 2</td>
<td>Introduction Experimental Design, Research Questions and Hypothesis; Theory, Conceptual Frameworks</td>
<td>Imma Oliveras</td>
</tr>
<tr>
<td>(2 hours)</td>
<td></td>
<td>Mark Hirons TAs</td>
</tr>
<tr>
<td>MT – Week 2</td>
<td>Introductory online courses: Fundamentals of statistics (Online in students in own time)</td>
<td></td>
</tr>
<tr>
<td>MT – Week 3</td>
<td>Hypothesis testing; Descriptive statistics; distributions; Understanding qualitative data</td>
<td>Imma Oliveras</td>
</tr>
<tr>
<td>(3 hours)</td>
<td></td>
<td>Mark Hirons TAs</td>
</tr>
<tr>
<td>MT – Week 4</td>
<td>Correlation and regression Qualitative data analysis</td>
<td>Imma Oliveras</td>
</tr>
<tr>
<td>(3 hours)</td>
<td></td>
<td>Mark Hirons TAs</td>
</tr>
<tr>
<td>MT – Week 5</td>
<td>Mixed methods (Descriptive statistics; Hypothesis testing; Qualitative data coding)</td>
<td>Mark Hirons</td>
</tr>
<tr>
<td>(3 hours)</td>
<td></td>
<td>Imma Oliveras TAs</td>
</tr>
<tr>
<td>MT – Week 6</td>
<td>Econometrics Qualitative data representation</td>
<td>François Cohen</td>
</tr>
<tr>
<td>(3 hours)</td>
<td></td>
<td>Mark Hirons TAs</td>
</tr>
<tr>
<td>MT – Week 7</td>
<td>Ecological methods and evaluating social science research</td>
<td>Sami Rifai</td>
</tr>
<tr>
<td>(3 hours)</td>
<td></td>
<td>Mark Hirons Dan Adshead</td>
</tr>
<tr>
<td>MT – Week 8</td>
<td>Capstones and quantitative skills exam preparation</td>
<td></td>
</tr>
</tbody>
</table>

Assessment

This module will be assessed through exams and the dissertation.
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.


- Excellent overview of statistics.

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 advances 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://sunsetridgemsbiology.wikispaces.com/file/view/Choosing+and+Using+Statistics.pdf](http://sunsetridgemsbiology.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)


- 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*


(Readings continue next page)
Social Science and Mixed methods books


- Both excellent and useful overview of quantitative and qualitative and mixed social science methods.


- Relatively accessible and a useful overview of social theories, why they are important and how to use them.


- Essential reading if you are doing any type of case study (which in environmental social science, you probably are).

Miles, and Huberman (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.

- Qualitative analyst’s bible.


- Excellent guide if you are undertaking social science fieldwork.
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 is 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 2019 – 20

Friday 4th - Sunday 6th October 2019
Slapton Field Centre, South Devon
Management issues in a National Nature Reserve and along a changing coastline

November 2019 (dates and details TBC)
(Oxfordshire et al.)
Food systems and debates in Environmental Change

Friday 28th February 2020 (TBC)
Wytham Woods, Oxford
Woodland ecology and management.

Wednesday 29th January– Saturday 1st February 2020
Centre for Alternative Technology, Machynlleth, Wales
Evaluating alternative energy sources and their impacts

Wednesday 18th – Friday 20th March 2020
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. Also, we hope that Brexit will not interfere with our ability to run this trip, but it may do.

Tuesday 28th April – Friday 1st May 2020
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: https://intranet.ouce.ox.ac.uk/it/printing.html

7.2. ECI Library Resources

7.2.1. Books

While the ECI has a small library of relevant books and journals, Social 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 Canvas.

7.2.3. MSc Dissertations

The MSc ECM now has a library of hundreds of past dissertations, available online through Canvas. Most MSc dissertations that earned a distinction may be viewed in hard copy at the Social 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

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: https://intranet.ouce.ox.ac.uk/safety/
The Central University Research Ethics Committee web site (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/. For information on the departmental process, please see 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.

7.7. 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.

7.8. 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
- 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
8. DISSERTATION PROCEDURE: REGULATIONS AND GUIDELINES

***See dissertation handbook for more details***

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. It is your responsibility to get an informal agreement with a potential supervisor, this will then be formally confirmed around the Easter break.

- 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 Formatting and Submission

Full details on the required format and how to submit the dissertation can be found at:

https://intranet.ouce.ox.ac.uk/msc/
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/

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 supervisor/s and the Course Director.
- 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.
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.

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.

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.

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.

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.

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.

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.

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

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.

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.

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.

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.

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

Carley-Jane Stanton is interested in economic and social change following natural disasters. She researches how capitalism, colonialism, and social practices are experienced by mushroom foragers in wildfire-affected areas of Canada.

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

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

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.

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.

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.

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

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.

Lisa Schipper is interested in the drivers of social vulnerability to climate change and natural hazards in developing countries, and the role that adaptation can play in reducing that vulnerability.
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.

Marcus Spiegel is interested in the response and feedbacks of tundra ecosystems to climate change, particularly how they are influenced by herbivory in the Siberian Arctic.

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.

Jian Peng is a Senior Research Associate in Hydrological Modelling. His main research interest is using satellite-based remote sensing to monitor the Earth's water cycle and to understand the variability of hydrological processes over multiple space and time scales.

Karsten Haustein is a Research Fellow on the World Weather Attribution project. His research focuses on the rapid attribution of extreme weather events around the world. This is linked with research into understanding the interaction between climate change and altered atmospheric circulation patterns.

Stefania Innocenti is a Research Associate at the Smith School of Enterprise and the Environment and she is interested in behavioural and experimental economics, institutional economics, applied econometrics, development economics, mathematical and computational models of social interactions.
## APPENDIX 2

### School of Geography and the Environment

**MSC AND MPHIL INDUCTION**

**Monday 7th – Tuesday 8th October 2019 (TBC)**

<table>
<thead>
<tr>
<th>Monday 7th October</th>
<th>Event</th>
<th>Location</th>
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| 10.30am-11.00am    | **Introduction to the School**  
Professor Gillian Rose (Head of School)  
Prof Danny Dorling (DGS Research Degrees)  
Dr Jamie Lorimer (DGS Taught Degrees) | Lecture Theatre |
| 11.00am-12.00pm    | **Introduction to Research in the Human**  
**Human Geography – TBA**  
**Physical Geography – TBA**  
**Smith School – Prof Cameron Hepburn, Director**  
**Environmental Change Institute – Dr Friederike Otto**  
**Transport Studies Unit – Dr Tim Schwanen (Director)** | Lecture Theatre |
| 12.00pm-12.15pm    | **Facilities for Graduate Students in the**  
**Department/Health and Safety**  
Alex Black, Facilities and Services Manager | Lecture Theatre |
| 12.15pm-12.30pm    | **Alumni**  
Alumni Relations Officer | Lecture Theatre |
| 2.30pm- 4pm        | **MSc/MPhil Course Induction**  
*ECM – Dr Mark Hirons, Course Director* | Beckit Room |
| 4pm – 5pm          | **IEMA Student and Graduate Presentation**  
Laura Archer | Beckit Room |

<table>
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<tr>
<th>Tuesday 8th October</th>
<th>Event</th>
<th>Location</th>
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</table>
| 9.45am-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**  
Andrew Kernott – Librarian | Lecture Theatre |
| 11.30am-11.40am    | **IFSTAL**  
Dr Roger Sykes, Food Systems Programme | Lecture Theatre |
| 1.30pm-5.30pm      | **MSc/MPhil Tours of Library**  
Librarian | Social Science Library |
### IMPORTANT DATES 2019 – 2020

<table>
<thead>
<tr>
<th>Event</th>
<th>Dates</th>
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<tbody>
<tr>
<td>ECM Welcome Reception</td>
<td>Thursday 3&lt;sup&gt;rd&lt;/sup&gt; October, 4pm, Beckit Room, SoGE</td>
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<tr>
<td>Fieldtrip 1, Slapton Ley</td>
<td>Friday 4&lt;sup&gt;th&lt;/sup&gt; October – Sunday 6&lt;sup&gt;th&lt;/sup&gt; October</td>
</tr>
<tr>
<td>Department &amp; College Induction</td>
<td>Monday 7&lt;sup&gt;th&lt;/sup&gt; October – Friday 11&lt;sup&gt;th&lt;/sup&gt; October (Week 0)</td>
</tr>
<tr>
<td><strong>Michaelmas Term begins</strong></td>
<td><strong>Monday 14&lt;sup&gt;th&lt;/sup&gt; October</strong> (Week 1)</td>
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<tr>
<td>‘Welcome to the Anthropocene’</td>
<td>Monday 14&lt;sup&gt;th&lt;/sup&gt; October – Friday 18&lt;sup&gt;th&lt;/sup&gt; October (Week 1)</td>
</tr>
<tr>
<td>ECI Welcome Event</td>
<td>Tuesday 15&lt;sup&gt;th&lt;/sup&gt; October, 4:30 pm, SoGE</td>
</tr>
<tr>
<td>Fieldtrip 2</td>
<td>November 2019 (dates and details TBC)</td>
</tr>
<tr>
<td><strong>Michaelmas Vacation</strong></td>
<td><strong>Sunday 8&lt;sup&gt;th&lt;/sup&gt; December – Sunday 19&lt;sup&gt;th&lt;/sup&gt; January 2020</strong></td>
</tr>
<tr>
<td><strong>Hilary Term begins</strong></td>
<td><strong>Monday 20&lt;sup&gt;th&lt;/sup&gt; January</strong> (Week 1)</td>
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<tr>
<td>Assessed Essay 1 hand in</td>
<td>Monday 20&lt;sup&gt;th&lt;/sup&gt; January, 12 noon (Week 1)</td>
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<tr>
<td>Energy Module</td>
<td>Monday 20&lt;sup&gt;th&lt;/sup&gt; January – Friday 24&lt;sup&gt;th&lt;/sup&gt; January (Weeks 1 &amp; 2)</td>
</tr>
<tr>
<td>Field trip 3, Wales (CAT)</td>
<td>Wednesday 29&lt;sup&gt;th&lt;/sup&gt; January – Saturday 1&lt;sup&gt;st&lt;/sup&gt; February</td>
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<tr>
<td>Dissertation proposal hand in</td>
<td>Friday 21&lt;sup&gt;st&lt;/sup&gt; February (Week 5)</td>
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<tr>
<td><strong>Hilary Vacation</strong></td>
<td><strong>Sunday 15&lt;sup&gt;th&lt;/sup&gt; March – Saturday 25&lt;sup&gt;th&lt;/sup&gt; April</strong></td>
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<tr>
<td>Field trip 4, Brussels (optional)</td>
<td>Wednesday 18&lt;sup&gt;th&lt;/sup&gt; March – Friday 20&lt;sup&gt;th&lt;/sup&gt; March</td>
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<tr>
<td>Dissertation proposal</td>
<td>Thursday 23&lt;sup&gt;rd&lt;/sup&gt; and Friday 24&lt;sup&gt;th&lt;/sup&gt; April (Week 5 - Trinity Term) Public presentations</td>
</tr>
<tr>
<td><strong>Trinity Term begins</strong></td>
<td><strong>Monday 27&lt;sup&gt;th&lt;/sup&gt; April</strong> (Week 1)</td>
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<tr>
<td>Assessed Essay 2 hand in</td>
<td>Monday 27&lt;sup&gt;th&lt;/sup&gt; April, 12 noon (Week 1)</td>
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<tr>
<td>Field trip 5, Lake District</td>
<td>Tuesday 28&lt;sup&gt;th&lt;/sup&gt; April – Friday 1&lt;sup&gt;st&lt;/sup&gt; May (Week 1)</td>
</tr>
<tr>
<td>Exam/Class Photo/ MSc BBQ</td>
<td>18&lt;sup&gt;th&lt;/sup&gt; – 22&lt;sup&gt;nd&lt;/sup&gt; May &amp; 26&lt;sup&gt;th&lt;/sup&gt; – 29&lt;sup&gt;th&lt;/sup&gt; May (TBC)</td>
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<tr>
<td><strong>Dissertation research period</strong></td>
<td><strong>Saturday 30&lt;sup&gt;th&lt;/sup&gt; May – Monday 31&lt;sup&gt;st&lt;/sup&gt; August</strong></td>
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<tr>
<td>Dissertation hand in</td>
<td>Tuesday 1&lt;sup&gt;st&lt;/sup&gt; September, 12 noon</td>
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<tr>
<td>Alumni Dinner</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; September (TBC)</td>
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MSc/MPhil ENVIRONMENTAL CHANGE AND MANAGEMENT

Academic Director: Prof Yadvinder Malhi
Course Director: Dr Mark Hirons

CONTACTS:
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E: msc-coordinator-ecm-wspm@ouce.ox.ac.uk
W: www.eci.ox.ac.uk/teaching/msc/

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