



The human dimensions of environmental change and sustainability - Course Plan

Location

- Lectures: Lecture Room A, Peter Wilson Building, KB
- Reading groups: Lecture Room A, Peter Wilson Building (2 groups), John Muir Room and Room 304 (both Crew Building), KB

Rationale

The course will provide an introduction to a range of important environmental change issues from a human and societal perspective. This will provide the necessary background to understanding the policies, politics, governance and ethics, and the human decision processes that underpin environmental change. The course will adopt a thematic approach covering the following issues:

- climate change and energy;
- water resources and quality;
- agricultural production and world food trade;
- land use and land cover change, ecosystem services and biodiversity;
- coastal processes and degradation
- urban development and sustainable cities.

The themes will provide the context for an exploration of the sustainability issues that surround different challenges for society. Case studies will be used as much as possible. Analysis will include international policy agreements and organisations such as the UN Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC), the World Trade Organisation (WTO) and the Convention on Biological Diversity (CBD), as well as European policy such as the Common Agricultural Policy (CAP) and the Water Framework Directive (WFD).

The course will be founded on a series of lectures/seminars given by experts in each environmental change issue drawn from across the School of Geosciences and the University of Edinburgh. There will also be an opportunity for students to work together in small discussion groups and to communicate their findings to others through seminars.

Overall approach

Thematic modules exploring and illustrating different aspects of the "Human Dimensions of Environmental Change", within the broader, cross-cutting domains of: sustainability, ecosystem services, resource use and governance. The course is executed through formal taught based content, insights and research from literature, and avenues for constructive debate and discussion. It is developed as an 'option' course, contributing to other master's level programmes.

Objectives

- To introduce the fundamental concepts of environmental change and sustainability;
- To explore a range of topical environmental change issues through case studies;
- To encourage the capacity to critically appraise conflicting arguments in the sustainability debate.

Activities

- *Lectures* (See table)
- *Readings* (see list below)
- *Written abstracts* (6 individual write ups from readings; max 1 page each)
- *Student discussion* from readings (3-4 person team leaders). These sessions will be facilitated by a small team of students. The aim is to draw out the main issues from the assigned reading and to highlight points of contention and uncertainties in the conclusions. The facilitators will need to identify a limited number of key questions that will form the basis of the discussion that they will lead.
- *Focused case study presentations* (small groups of 3-4). Working in small groups, students will be allocated a case study that relates either to the rural environment or to the coastal-marine environment. Each group will explore their case study throughout the semester culminating in a seminar presentation by the group during one of the last two sessions of the course. The case studies are given at the end of this document.
- Final written examination

Grading

- Readings abstracts (30%); Case study presentations (30%); Written examination (40%)

Teaching team

- Mark Rounsevell: Course organiser; environmental change and sustainability principles; climate change; rural environments, built environment.
- Gabi Hegerl: Climate change impacts and adaptation; IPCC.
- Andy Kerr: Carbon trading and climate policy.
- Stewart Russell: Energy policy and technology innovation.
- Dave Reay: Energy and public engagement; water resource policy.
- Meriwether Wilson: Coastal and marine environments.
- Tom Slater: Urban environments; Gentrification; social inequalities.

Reading

Discussion papers

Paper 1 – IPCC (2007). *IPCC Summary for Policy makers*, Cambridge University Press. (www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf)

Paper 2 – Roberts & Thumin (2006). A Rough Guide to Personal Carbon Trading. Centre for Sustainable Energy, DEFRA (Nov 06).

Paper 3 – Russell, S. & Bunting, A. 'What Sustains Unsustainability? Examining Context, Explaining Obstacles, Devising Strategies for Renewables', paper to Solar '97 Australian and New Zealand Solar Energy Society (ANZSES) conference, Canberra ACT, 1-3 Dec 1997

Paper 4a - Galloway, J.N., Townsend, A.R., Erisman, J.W., Bekunda, M., Cai, Z., Freney, J.R., Martinelli, L.A., Seitzinger, S.P. Sutton, M.A. (2008). Transformation of the Nitrogen Cycle: Recent Trends, Questions, and Potential Solutions. *Science*, **320**, 889-892

Paper 4b – Reay, D.S., Dentener, F., Smith, P., Grace, J. and Feely, R.A. (2008). Global nitrogen deposition and carbon sinks. *Nature Geoscience*, in press

Paper 5 – Busch G. (2006) Future European agricultural landscapes-What can we learn from existing quantitative land use scenario studies? *Agriculture, Ecosystems and Environment*, **114** 121-140

Paper 6a – Palumbi, S.R., et. al. (2008). Ecosystems in Action: Lessons from Marine Ecology about Recovery, Resistance and Reversibility. *Bioscience* **58**, 1

Paper 6b - Jackson, J.B.C., et. Al. (2001). Historical over-fishing and the recent collapse of coastal ecosystems. *Science*, **293**, 27 July 2001.

Background reading

Middleton, N. (2003). *The Global Casino: An Introduction to Environmental Issues*. 3rd Edition, Arnold, London. ISBN: 0340809493.

<http://www.hodderheadline.co.uk/index.asp?url=bookdetails.asp&book=40784>

Millennium Ecosystem Assessment (2005). *Current State & Trends Assessment*. Island Press, pp. 946 (ISBN: 1-55963-228-3). <http://www.millenniumassessment.org/en/index.aspx>

Reay, D. (2006). *Climate Change Begins at Home. Life on the Two-Way Street of Global Warming*. Macmillan Science. <http://www.macmillanscience.com/0230007546.asp>

Programme

Timetabled session: Semester 1 (22 September – 28 November 2008), Friday 9h-13h (20 credits)

WK	DATES	THEME	LEADERS	ACTIVITIES
1	26.9	Introduction: Course overview + process (0.5 hr) Film: <i>The Earth Summit Debate</i> and discussion on Environmental Change Issues (1.5 hr) Environmental change issues and sustainability principles (1 hr)	Rounsevell Students Rounsevell	<ul style="list-style-type: none"> Lecture on sustainability Film/discussion on environmental change Paper distributed on Climate Change (paper 1)
2	3.10	The science of climate change and the IPCC Process (0.75 hr) Climate change impacts and adaptation (0.75 hr) Film: <i>The Sceptical Environmentalist</i> and discussion (1.5 hr)	Hegerl Rounsevell Students/Hegerl	<ul style="list-style-type: none"> Lectures on Climate Change Film/discussion on Climate Change Paper distributed on climate change mitigation (paper 2)
3	10.10	International and local climate policy (1 hr) Facilitated discussion on readings (1 hr) Carbon Trading (1 hr)	Kerr Students Kerr	<ul style="list-style-type: none"> Lectures on Climate Change mitigation Discussions on Climate Change mitigation Paper distributed on Energy (paper 3)
4	17.10	Energy policy and technology innovation issues (1 hr) Facilitated discussion on readings (1 hr) Communicating environmental change: public engagement, politicians, business and the media (1 hr)	Russell Students Reay	<ul style="list-style-type: none"> Lectures on Energy Discussion on Energy Papers distributed on Water (paper 4)
5	24.10	Water policy: the nitrogen story and joined up policy making (1 hr) Facilitated discussion on readings (1 hr) Public participation in water planning and recycling (1 hr)	Reay Students Russell	<ul style="list-style-type: none"> Lectures on water Discussion on water Paper distributed on Rural Issues (paper 5)
6	31.10	Land use, agricultural policy and world food trade (1 hr) Facilitated discussion on readings (1 hr) Ecosystem services and valuation, (1 hr)	Rounsevell Students Rounsevell	<ul style="list-style-type: none"> Lectures on rural environments Discussion on rural Paper distributed on Marine issues (papers 6a and 6b)
7	07.11	Coastal-Marine: Coastal processes and degradation	Wilson	<ul style="list-style-type: none"> Lectures on coastal-marine

Coastal-marine environments I	Facilitated discussion on readings Coastal-Marine: Conservation Strategies, Restoration Opportunities	Students Wilson	
8	14.11 Urban Sprawl and sustainable cities, land use planning Film: <i>Gentrification in urban environments</i> Gentrification and inequalities in urban environments	Rounsevell Slater Slater	<ul style="list-style-type: none"> Lectures on urban environments Film/discussion on gentrification
9	21.11 Rural environment case study presentations (1 hr/case x 3)	Student Groups	<ul style="list-style-type: none"> Case Studies/seminars
10	28.11 Coastal-marine case study presentations (1 hr/case x 3)	Student Groups	<ul style="list-style-type: none"> Case studies/seminars
*	05.12 Exam preparation time		

Course content

Introduction – M. Rounsevell

- The course aims and programme
- The principles of environmental change and sustainability (sustainability as a concept, environmental change drivers and scenarios, impact and adaptation assessment methods, vulnerability and resilience)

Climate change issues – G. Hegerl & M. Rounsevell

- The science of climate change and the IPCC process
- Climate change impacts and adaptation

Climate change mitigation A. Kerr

- International and local climate policy (UNFCCC)
- Carbon trading

Energy – S. Russell & D. Reay

- Policy and innovation issues in energy technologies
- Public engagement in energy issues and the role of education

Water resources and quality – D. Reay & S. Russell

- European water policy – the Water Framework Directive
- Water planning and recycling

Rural environments – M. Rounsevell

- Agricultural policy and world food trade
- Land use and land cover change (including biofuels)
- Terrestrial ecosystem services biodiversity (CBD) and valuation

Coastal and marine environments I: coastal processes and degradation- M. Wilson

- Overview of coastal-shoreline dynamics and settings (beaches, wetlands, rocky shores)
- Shifting baseline of human influences in coastal settings over time (incremental to episodic; direct and indirect)
- Nature by design: Hard versus soft engineering as adaptive responses to sea level rise, ecosystem recovery.

Coastal and marine environments II: coastal-marine protected area considerations – M. Wilson

- Rationales for establishing conservation areas
- Varying spatial and temporal approaches based on life histories, networks, corridors
- Integrating longer-term conservation strategies with project-driven restoration and mitigation
- Policy Instruments: Convention on Biodiversity, EU Habitats Directive, parks and zoning

Urban environments – M. Rounsevell & T. Slater

- Urban sprawl, sustainable cities and land use planning policy
- Gentrification and inequalities in urban environments

Case study themes

Rural environment case studies:

- I. *The role of biofuels in landscape change and food security* – How has the recent push to produce energy from agriculture worldwide affected global trade in agricultural commodities and food security?
- II. *Agriculture and biodiversity – What are the positive and negative affects of agriculture on biodiversity?* What opportunities exist for improving the role of agricultural land management in ecological conservation?

- III. *The rural-urban interface in Europe* – What are the changing relationships between cities and the countryside? How has urban expansion affected rural life? What role has spatial planning policy played in the quality of rural landscapes?

Coastal-marine environment case studies:

- I. *Vulnerability of Small Island Ecosystems and Societies to Sea Level Rise* - Expanding marine conservation governance to both enhance fisheries stocks and address climate change through preservation of shoreline ecosystems.
- II. *The Paradox of Tourism's Incremental Impact on Coastal-Marine Seascapes* - A case of seduction and destruction between species and society.
- III. *Re-Thinking the Urban Marine Edge* - Restoration of coastal near shore ecosystems in post-industrial coastal cities through ecologically and socially inspired waterfront development.

Indicative background material for case studies

Marine Protected Areas

- Palumbi, S. 2003. *Marine Reserves - A Tool for Ecosystem Management and Conservation*. Pew Oceans Commission. (http://www.pewtrusts.org/our_work_detail.aspx?id=130)

Small Island, Coasts and Climate Change

- Thomkins, E., et. al., 2005. *Surviving Climate Change in Small Islands - A Guidebook*. Tyndall Center, East Anglia. (<http://www.tyndall.ac.uk/publications/surviving.pdf>)
- Intergovernmental Panel on Climate Change - Working Group 2: Climate Change Impacts, Adaptation and Vulnerability (<http://www.ipcc-wg2.org/>)
 - CHAPTER 6: Coastal Systems and Low Lying Areas
 - CHAPTER 16: Small Islands
 - Cross Chapter Case Studies (C-2: Coral Reefs; C-4 Indigenous Knowledge)

Loss of Critical Natural Capital in Coastal Marine Context

- Reid, W.V. and M.C. Trexler, 1991. *Drowning the Natural Heritage: Climate Change and U.S. Coastal Biodiversity* (World Resources Institute) (<http://www.wri.org/publication/drowning-national-heritage-climate-change-and-u-s-coastal-biodiversity>)
- Millenium Ecosystem Assessment, Reid, W.V. 2005, See selected sections on coastal-marine.

Coastal Processes and Social Perceptions - Natural and Built Environment Solutions to Hazards and Environmental Change

- Ocean BluePrint for the 21st Century, Final Report of the US Ocean Commission on Ocean Policy (http://oceancommission.gov/documents/full_color_rpt/welcome.html)
 - Part IV: Living on the Edge: Economic Growth and Resource Conservation Along the Coast.
 - Chapter 9. Managing Coasts and Their Watersheds
 - Chapter 10: Guarding People and Property Against Natural Hazards
 - Chapter 12: Managing Sediment and Shorelines
- *Human Links to Coastal Disasters, 2002*. The Heinz Center (<http://www.heinzctr.org/publications/index.shtml#majorreports>)
- *A Survey of Climate Change Adaptation Planning, 2007*. The Heinz Center (http://www.heinzctr.org/publications/PDF/Adaptation_Report_October_10_2007.pdf)
- Cities - A Science Special Issue, series of articles and perspectives: 8 FEBRUAR2008 VOL 319 SCIENCE