HPSC0093 - Science Policy in an Era of Risk and Uncertainty

Course Syllabus

2021-22 session |Dr Carina Fearnley|c.fearnley@ucl.ac.uk

This module aims to bring together key thinkers, debates, and cutting-edge research on how society has, currently, and may engage with environmental uncertainty and risk. In addition a number of relevant research methodologies and interdisciplinary skills will be applied in a series of practicals to demonstrate the challenges we face in these large, global complex problems. This module aims to discuss the challenges of integrating interdisciplinary data sets, and the role of more deliberative and participatory engagement for stakeholders. The module will consist of lectures and seminars and will adopt a problem-based learning approach, whereby a topic of interest can be selected so to apply the knowledge learnt to the selected case study. Contemporary case studies will be explored throughout the course.

Basic course information

Moodle Web site:	https://moodle.ucl.ac.uk/course/view.php?id=38681
Assessment:	Project work in two parts: 20% - Poster Presentation (1,500 words) 20% - Group Debate (via video) 60% - Briefing Paper - (3,500 words or equivalent)
Timetable:	Tuesdays 11am-1pm GMT
Prerequisites:	No prerequisites
Required texts:	See reading list below and the online reading list.
Course tutor(s):	Course convenor: Dr Carina Fearnley
Contact:	c.fearnley@ucl.ac.uk
Web:	http://www.ucl.ac.uk/sts/staff/fearnley
Office location:	22 Gordon Square, Room 1.2a
Fearnley office hours:	TBC

Schedule (all to TBC)

UCL Week	Lecture / Seminar	Lecture Date	Lecture Topic	Activity / Guest Lecturer
20	1	11/01/22	What are the challenges for environmental sciences and society? Living in a post-normal science paradigm and developing policy	Outlining the case study for the module
21	2	18/01/22	Defining the environment and society	Guest lecture by Professor Deborah Dixon (Glasgow University)
22	3	25/01/22	The construction of scientific knowledge: the role of uncertainty and 'incertitude' in risk assessment	Guest lecture – Robert McAlister (prior Head of Civil Contingencies across Westminster). Concept of Operations
23	4	1/02/22	Our Risk Society 1: what does it mean to physical and social scientists	Guest lecture – Dr Simon Day (IRDR – UCL) Risk in practice: a case of the Tohoku tsunami 2011.
24	5	8/02/22	Our Risk Society 2: exploring man-made and human hazards	**Poster presentation and discussion – Moved to 15 February 2022**
25		15/02/22	Reading Week	
26	6	22/02/22	Making policy in the complex world: decision making and risk perception	Guest lecture by Alessandro Allegra (STS UCL) Engaging with UK science policy
27	7	1/03/22	Who is the expert anyway? Co-production in action	Guest lecture – Richard Gordon (Director of Bournemouth University Disaster Management Centre) Who is the expert?
28	8	8/03/22	Policy and Communication: citizen Science, public engagement, and the PUS	
29	9	15/03/22	Data collection and communication (translation) in multi-disciplinary problems	
30	10	22/03/22	**Group debate on case studies**	
Deadline for Final Briefing Paper 21/04/22				

Assessments

%	Description	Deadline	Word limit
20	Poster	Class on 22/02/22	Assessed in class – (lecture 5) 1,500 Words
20	Group debate	Class on 22/03/22	Assessed in class (lecture 10)
60	Briefing Paper	17:00 21/04/22	3,500 words

Coursework

Assessment 1: Poster (20%)
A poster will be designed and presented to provide varying perspectives around the case study, with an interactive session focused on viewing the posters and generating discussion and feedback half-way through the case study.

Assessment 2: Debate (20%) and Briefing (60%)
A group debate based on the case study. Each person is required to present their key findings and suggestions for policy development that will be discussed and debated within the group.

An individual briefing paper (a mini white document) to put forward essential advice on the problem case study.

Criteria for assessment
The departmental marking guidelines for individual items of assessment can be found in the STS Student Handbook. Individual marking criteria for each assessment will be made available on Moodle.

The Case Study

During 2020-21, the module case study will be proposing evidence and policy to address a mock or live inquiry by the Science and Technology Committee, UK Commons Select Committee. The case study will focus around the risk management of COVID-19 in the UK. This case study aims to generate and support cutting-edge research that addresses the challenges faced by the UK through the lecture materials, and supported by the activities, guest lectures, and students own research. Details will be released early in the module.

Aims & Objectives

Aims

This module aims to bring together key thinkers, debates, and cutting-edge research on how society has, currently, and may engage with environmental uncertainty and risk. In addition, a number of relevant research methodologies and interdisciplinary skills will be applied in a series of practical exercises to demonstrate the challenges we face in interpreting and managing these large, global complex problems. A wide range of case studies will be integrated from a number of global contexts.

Learning Outcomes

On completion of this module, students should be able to:

1. Describe and critically assess key theories and frameworks on the communication and management of scientific uncertainty, risk, and complexity (review essay)
2. Summarise the key issues and debates in science communication for a wide range of stakeholders that work within the field of environmental and hazard sciences
3. Evaluate the key issues that emerge within and between different areas of expertise, and the uncertainties involved
4. Synthesise and communicate possible solutions to real-world problems using: written reports, debate / discussion, and a variety of communication formats, including long essays, blogs, and multi-media packages
5. Implement and evaluate different research methodologies to address real-world issues to generate viable solutions

Reading List

Core readings include the below:

Good texts that provide a good overview:
Arnoldi, J. (2009). *Risk*. Polity.
Gigerenzer, G. (2015). *Risk savvy: How to make good decisions*. Penguin.
Lupton, D. (2013) Risk (2nd edition). London: Routledge.
Burgess, A., Alemanno, A., & Zinn, J. (2016). *Routledge Handbook of Risk Studies*. Routledge.

Specialist key texts:
Bammer, G., & Smithson, M. (Eds.). (2012). *Uncertainty and risk: multidisciplinary perspectives*. Routledge.
Beck, U. (1992). *Risk society: Towards a new modernity* (Vol. 17). Sage.
Jasanoff, S. (2011). *Designs on nature: Science and democracy in Europe and the United States*. Princeton University Press.
Nowotny, H. (2015). *The cunning of uncertainty*. John Wiley & Sons.
Slovic, P. E. (2000). *The perception of risk*. Earthscan publications.

Essential and other readings:

All essential readings will be listed on and available via Moodle, unless specified. Further details on readings for the module and assessments will be posted on Moodle.

You are encouraged to start your own research to find readings and sources that relate to the module materials, and to take a general interest in key public engagement debates, controversies, and breakthroughs throughout the module.

Key Online Journals:
Environmental hazards: http://www.tandfonline.com/loi/tenh20
Journal of Risk and Uncertainty: http://link.springer.com/journal/11166
Public Understanding of Science: http://pus.sagepub.com
Complexity: http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-0526
Environmental Science & Policy: https://www.journals.elsevier.com/environmental-science-and-policy/

Outline of lectures:

This section provides additional details of the materials addressed each week.

1. What are the challenges for environmental sciences and society? Living in a post-normal science paradigm

This lecture provides an overview of some the pressing environmental issues we face, from global warming, to increased flooding in the UK, to supervolcanic eruptions, to Chenobyl and Fukushima (nat-tech) disasters, that are drastically challenging our ability to manage effectively. Key theory will be outlined using traditional approaches to scientific problems, the limitations of causality, and the nature of mode-2 knowledge and Post-normal approaches to science. The module will adopt a problem based learning approach so the key case study will be introduced, along with an outline of the coursework, to be focused on a key issue of your choice.

Key readings

Gallopín, G. C., Funtowicz, S., O'Connor, M., & Ravetz, J. (2001). Science for the Twenty-First Century: From Social Contract to the Scientific Core. *International Social Science Journal*, *53*(168), 219-229.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. Sage.

Ravetz, J. R. (1999). What is post-normal science. *Futures*, *31*(7), 647-653.

Ravetz, J. R., & Sardar, Z. (1997). Rethinking science. *Futures*, *29*(6), 467-470.

2. Defining the environment and society

The challenges involved in managing environmental issues raise the question as to where the distinction between nature and society exists, and the role of science and art in understanding these distinctions. This guest lecture by Prof Deborah Dixon from Glasgow University explores conceptual approaches to understanding the interaction of society and nature such as by reviewing the sublime, and Actor Network

Theory (Latour). In addition, the importance of context is explored and the contradictions these pose in an ever-growing connected world.

Key readings

Dixon, D., Hawkins, H., & Ingram, M. (2011). Art: Blurring the boundaries. *Nature*, *472* (7344), 417-417.

Fearnley, C. J., McGuire, W. J., Davies, G., & Twigg, J. (2012). Standardisation of the USGS Volcano Alert Level System (VALS): analysis and ramifications. *Bulletin of volcanology*, *74*(9), 2023-2036.

Garcia, C., & Fearnley, C. J. (2012). Evaluating critical links in early warning systems for natural hazards. *Environmental Hazards*, *11*(2), 123-137.

Latour, B. (1996). On actor-network theory: A few clarifications. *Soziale welt*, 369-381.

Mileti, D. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Joseph Henry Press.

Vaughan, D. (1997). *The Challenger launch decision: Risky technology, culture, and deviance at NASA*. University of Chicago Press.

3. The construction of scientific knowledge: the role of uncertainty and 'incertitude' in risk assessment

The concept of uncertainty needs to be unpacked and there are a number of framework or models that can be used to engage with what uncertainty means, including that of 'Incertitude' devised by Andrew Stirling. Exploring uncertainty and its definition, risk, ambiguity, and the unexpected (black swans) demonstrates that when dealing with environmental issues there are numerous challenges in place when communicating scientific information to develop appropriate policy.

Guest lecture by Alessandro Allegra on UK Science Policy structures, practices, and issues.

Key readings:

Day, S., & Fearnley, C. (2015). A classification of mitigation strategies for natural hazards: implications for the understanding of interactions between mitigation strategies. *Natural Hazards*, *79*(2), 1219-1238.

Jamieson, D. (1996). Scientific uncertainty and the political process. *The Annals of the American Academy of Political and Social Science*, 35-43.

Spiegelhalter, D. J., & Riesch, H. (2011). Don't know, can't know: embracing deeper uncertainties when analysing risks. *Phil. Trans. R. Soc. A*, *369*(1956), 4730-4750.

Stirling, A. (2003). Risk, uncertainty and precaution: some instrumental implications from the social sciences. *Negotiating change*, 33-76.

Stirling, A. (2007). Risk, precaution and science: towards a more constructive policy debate. *EMBO reports*, *8*(4), 309-315.

4. Our Risk Society 1: what does it mean to physical and social scientists

Risk is a complicated word to define, and this lecture aims to review the many varying definitions and uses of 'Risk', from a theoretical perspective, such as Michael Foucault's governmentality, to anthropological approaches by Mary Douglas, to Ulrich Beck's Risk Society. Other perspectives include institutional definitions of risk by the United Nations, and those of mathematicians, scientists, and business (e.g. insurance). Understanding environmental risk definitions provide further insights into the challenges of conducing and communicating interdisciplinary work and the boundaries that exist between different disciplines as discussed by Gieryn.

Guest lecture by Robert McAlister (prior Head of Civil Contingencies across Westminster) on the Concept of Operations and the management of crises in the UK.

Key readings:

Douglas, M., & Wildavsky, A. (1983). *Risk and culture: An essay on the selection of technological and environmental dangers*. Univ of California Press.

Foucault, M. (2002). *The order of things: An archaeology of the human sciences*. Psychology Press (chapter 5 is most relevant).

Gieryn, T. F. (1983). Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists. *American sociological review*, 781-795.

Knight, F. (1921). Risk, Uncertainty and Profit. Chicago, Houghton Mifflin Company.

Mayo, D. G. (1996). Error and the growth of experimental knowledge. Chicago, University of Chicago Press.

Wisner, B. (2004). At risk: natural hazards, people's vulnerability, and disasters. London; New York, Routledge.

5. Our Risk Society 2: exploring the complex: man-made and natural hazards

This lecture builds on Our Risk Society 1 to explore risk and how it has been communicated for a number of different natural and man made hazards. The issues of chaotic and complex systems will be introduced, and the challenges involved in managing and communicating complex phenomena, as well as the challenges in understanding the social, cultural, politic, and economic agendas in environmental issues. Case studies will be used to demonstrate what is currently used to understand these phenomena and the issues relating to communicating this knowledge.

Key readings:

Pidgeon, N., & O'Leary, M. (2000). Man-made disasters: why technology and organizations (sometimes) fail. *Safety Science*, *34*(1), 15-30.

Mitchell, M. (2009). Complexity: a guided tour. Oxford; Oxford University Press.

Nowotny, H. (2005). The increase of complexity and its reduction: Emergent interfaces between the natural sciences, humanities and social sciences. *Theory, Culture and Society* 22(5): 15-31+269.

Sardar, Z. and J. R. Ravetz (1994). Complexity: Fad or future? *Futures* 26(6): 563-567.

Taylor, P. J. (2005). Unruly complexity: ecology, interpretation, engagement. Chicago, Ill., University of Chicago Press; Bristol: University Presses Marketing.

Urry, J. (2005). The complexity turn. *Theory, Culture and Society* 22(5): 1-14.

6. Making policy in a complex world: decision making and risk perception

There are significant challenges to devising policies on uncertain science, but there is a case history developing of both good and bad practices. This session reviews that challenges of formulating policy in complex and contested issues, and the sometimes-limited role science can play in changing policy. The decisions made, either in developing a policy or on an individual level are dependent on the individual's perception to risk and the enforcement of that policy.

Guest lecture by Dr Simon Day (Institute of Risk and Disaster Reduction, UCL) on managing risk in practice: a case of the Tohoku tsunami 2011.

Key readings:

Adey, P. and B. Anderson (2011). Event and anticipation: UK Civil Contingencies and the space - times of decision. *Environment and Planning A* 43(12): 2878-2899.

Burgess, J., et al. (2007). Deliberative mapping: a novel analytic-deliberative methodology to support contested science-policy decisions. *Public Understanding of Science* 16(3): 299-322.

Jasanoff, S. (2005). Designs on nature : science and democracy in Europe and the United States. Princeton, N.J., Princeton University Press.

Slovic, P., et al. (2007). Why study risk perception? *Risk Analysis* 2: 83-93.

7. Who is the expert anyway? Co-production in action

In an uncertain scenario, there is space for different expertise to emerge. Not only are there questions about scientists ability for expertise or authority, but also the need to integrate different experts from different disciplines to co-produce knowledge. This lecture reviews the role of co-production and different methodological approaches used to implement this production, as well as the conflicts this can raise when trying to communicate a key piece of scientific information, albeit uncertain yet with high stakes. Organisations such as the Science Media Centre act to bring together the media with relevant scientists in practice and provide guidance on how this could be done in practice.

Guest lecture by Richard Gordon (Director of Bournemouth University Disaster Management Centre)
On who is the expert? International examples will be used to explore the role of differing stakeholders.

Key readings:

Carolan, M. (2006). Science, expertise, and the democratization of the decision-making process. *Society & Natural Resources* 19(7): 661-668.

Collins, H. M. and R. Evans (2002). The third wave of science studies: Studies of expertise and experience. *Social Studies of Science* 32(2): 235-296.

Jasanoff, S. (2004). States of knowledge: the co-production of science and social order. London, Routledge.

Wynne, B. (1996). May the sheep safely graze? A reflexive view of the expert-lay knowledge divide. Risk, environment and modernity: towards a new ecology. S. Lash, B. Szerszynski and B. Wynne. London, Sage: 44-83.

8. Policy and Communication: citizen Science, public engagement, and the PUS

With challenges over who the expert is, and the need to make policy that integrates a wide range of values and perspectives, the role of science communication has become imperative, not only to justify its value as often seen in the global warming 'debate', but to make use of the science. This session looks at the importance of making science understood and integrated with society, and the tools to do this through public engagement and PUS. However, the public is a valuable source of information, as 'citizen science' becomes a growing research methodology. Social networking along with new adaptive management tools also aim to bring different voices and data to the debate resulting in a significant shift in attitudes towards the exclusivity of scientific knowledge.

Key readings:

Bradshaw, G. A. and J. G. Borchers (2000). Uncertainty as information: Narrowing the science-policy gap. *Conservation Ecology* 4(1).

Durant, J. R., et al. (1989). The Public Understanding of Science. *Nature* 340(6228): 11-14.

Hall, S. (1980). Encoding / decoding. Culture, media, language: working papers in cultural studies, 1972-79. Hall S, Hobson D, Lowe A, Willis P. London, Hutchinson in association with the Centre for Contemporary Cultural Studies, University of Birmingham**:** 166-176.

Rowe, Gene, and Lynn J. Frewer. A typology of public engagement mechanisms. *Science, technology & human values* 30.2 (2005): 251-290.

Shackley, S. and B. Wynne (1996). Representing uncertainty in global climate change science and policy: Boundary-ordering devices and authority. *Science Technology & Human Values* 21(3): 275-302.

Trumbull, Deborah J., et al. Thinking scientifically during participation in a citizen science project. *Science education* 84.2 (2000): 265-275.

9. Data collection and communication (translation) in multi-disciplinary problems

There are numerous different qualitative and quantitative data techniques that can be employed when looking at environmental issues however, there are many challenges to conducting interdisciplinary work. This lecture reviews new emerging techniques, such as multi-sited studies and participatory methods as ways to communicate large data sets across disciplines. Other technologies such GIS and social networking also provide innovate data collection and communication methodologies. The AHRC funded project 'Orkney: Beside the Ocean of Time' will be a core case study.

Key readings:

Burgess, J., et al. (2007). Deliberative mapping: a novel analytic-deliberative methodology to support contested science-policy decisions. *Public Understanding of Science* 16(3): 299-322.

Cronin, S. J., et al. (2004). Participatory methods of incorporating scientific with traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu. *Bulletin of Volcanology* 66(7): 652-668.

Marcus, G. E. (1995). Ethnography in / of the World System: The Emergence of Multi-Sited Ethnography. *Annual Review of Anthropology* 24: 95-117.

Nightingale, A. (2003). A feminist in the forest: situated knowledges and mixing methods in natural resource management. *ACME: International E-Journal for Critical Geographers* 2(1): 77-90.

10. Group Debate

Group debate based on the case study. Cases will be made by each student the session will provide a shared collective of examples and methodological approaches that can be discussed and debated. The presentations and debate itself will also be peer reviewed.

Important policy information

Details of college and departmental policies relating to modules and assessments can be found in the STS Student Handbook www.ucl.ac.uk/sts/handbook

All students taking modules in the STS department are expected to read these policies.