



Past Actions, Present Woes,  
Future Potential:  
Rethinking History in the Light of  
Anthropogenic Climate Change

*A Model University Syllabus for History and  
Related Subjects (HEA)*

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## INTRODUCTION

Today, historical consciousness as it relates to environmental issues means realising, above all else, that the current economic system is utterly unlike anything that has ever existed before in history: in a *single* year, this economy burns and vents into the atmosphere fossil fuels that took a million years to create, without comprehending- let alone managing - the full consequences of these processes. The origin of this great turning point is already found in the transition to the age of coal. Yet the full unleashing of the unsustainable economy did not occur until the twentieth century; in fact, much of it has taken place so recently that this period has yet to take on clear contours of historical scholarship.

Joachim Radkau, *Nature and Power* (2008), 250.

Historians usually like to have a controversial statement to get their teeth into, and for our purposes that by the environmental historian, Joachim Radkau, is as good as any place to begin. In this single paragraph there seem to be a whole panoply of propositions which one might wish to further debate, even possibly contest. Does the advent of the fossil-fuel based society make its economic underpinnings so very different from what came before? And if so, is rupture—not continuity—really the dominant modern historical mode? By the same token, is non-sustainability (inviting the question: what do we mean by 'sustainable'?) very recent, or actually embedded in the historical experience? If so, how deep do we need to go to get to the roots of the problem? Moreover, when can 'we' know to assess an historical epoch? Is it simply that we are too close to the period of the recent past, which denies us grounds for a clear sight of what Radkau is describing? Or is it rather than 'the full unleashing' has been so monumental - and perhaps so grotesque - that it defies any possibility for a safe assessment?

Perhaps this outpouring of open-ended questions might in itself offer an explanation as to why *most* historians have yet to engage in a disciplinary sense with climate change. The subject is just too big, too all-encompassing, and too demanding of our time and energies when we might be getting on with matters for which we feel better and more properly equipped. In recent decades most academic history writing - and consequently teaching - has become a very specialised matter. Each of us tend to have our own subject areas which we carefully nurture, where we read (where we can!) the relevant literature, and where we ultimately, perhaps, propose to make our own small, or not so small contribution. If environmental historians want to delve into climate change all well and good. But to have the subject thrust upon us, to be told that we must *all* become environmental historians now, nay, that we need to radically rethink the very assumptions upon which we operate as history researchers and teachers—and this as a consequence of something entirely extraneous to our discipline—that surely is neither justified nor realistic.

Moreover, where is the good reason why we need to change course? Radkau, above, does not even mention climate change. Earth science is surely the proper disciplinary area for understanding its patterns, processes, morphology and causation. Just as finding solutions is a matter for the engineering block. Yet, does not Radkau at the very least give an implicit clue as to why we cannot simply leave the matter there? The climate change of the here and now which most matters is a consequence of the harnessing of sequestered solar energy from millions of years ago: energy which has enabled the entire gamut of, economic, technological and socio-cultural practices which are not simply fundamental to, but taken together entirely normative aspects of our present international, globalised, interdependent

human system. Thus, not only is it this dependency on an ultimately finite source of yesterday's sunshine—which Radkau correctly observes to be non-sustainable—but the manner in which we have used it rapidly to asset strip the remainder of Earth's natural and mineral resources which is directly *relational* to the increasing carbon dioxide, and other greenhouse gas, concentrations in the atmosphere.

In short, whether we like it or not, recent and current global warming is a primary facet of historical development. Certainly, that would seem to beg the almost imponderable question how far back do we need to go to arrive at its source, though perhaps, we might more precisely grapple with the conundrum by asking how much is the recent trajectory towards large-scale atmospheric pollution prefigured in earlier human practices? In which case the contemporary situation represents either the quickening of a long-term process, or alternatively, a quite unprecedented shift, suggesting the emergence, as Radkau implies, of an entirely novel—and one might crucially add Western-led, capitalist—formation. Whatever the historical verdict the fact remains that we humans have become akin, in Naomi Oreskes words, 'to geological agents, changing the most basic physical processes of the earth.' Hence, the critical adjective *anthropogenic* when we speak of climate change for which humans are first cause. And so the further, albeit controversial term, Anthropocene, coined not by a historian but Paul Crutzen and Eugene Stoermer, two earth scientists, to denote a new epoch in earth history in which humans have been its chief terrestrial determinants.

Might one propose that it is the nature of this overwhelming human—as geological—impact on the planetary environment, and its long-term ramifications far into the future which is the decisive issue demanding the historian's full attention? Since the end of the Last Glacial Maximum, climate has always been the key background factor enabling or disabling humanity's proclivity to spread and survive across the face of the Earth. All history, in other words, has been about our changing climate. However, since the advent of the Anthropocene—which Crutzen and Stoermer proposed began with the Industrial Revolution on the one hand, the simultaneous change from *relatively* stable concentrations of global carbon concentrations in the atmosphere (as associated with the last ten to twelve thousand years of the Holocene), to one of cumulative increase it has become not a question of what the climate has done to, or for humankind but what humankind is doing to the climate.

The science now is very clear, robust and consensual that anthropogenic climate change is accelerating fast. There is less scientific consensus on what this exactly means in terms of danger. This is largely because the science is very complex; as we will further note in unit 1, dependent on models which cannot by their nature be more than forecasts; and, perhaps critically, is uncertain about how earth feedback processes will themselves react to radiative forcing. At this moment in time, for instance, the possibility that these earth systems, singly or in combination, might take us to a threshold, or tipping point, beyond which there is an irreversible shift in the global climate is speculative if very serious science. Clearly, too, most of the hard analysis involved in this sort of modelling is beyond the ken or competence of historians.

However, if instead we were to translate these speculations into descriptions of flood, fire, drought, famine, death, destruction and pestilence we would be on thoroughly familiar if altogether dread historical—as indeed contemporary—ground. The one irony of any such *future* scenario of this kind might be that in having so successfully changed the biosphere upon which we fundamentally depend our power to prevent planetary Nemesis may be precisely nil. The term apocalyptic comes to mind. The very fact that this is not a scientific term yet one used repeatedly to evoke global catastrophe may be a reason for keeping to the much more opaque scientific jargon. Yet equally, could it be that human responses to past catastrophe, including the desire to describe events as apocalyptic might actually be a

resource to draw upon in our *own* time of crisis? Historians of religion, after all, will know that the original, proper meaning of apocalypse denotes the disclosing of something hidden, or, put another way, a prophetic revelation of what will happen if states and societies persist in a particularly self-destructive mode. Perhaps, then, dealing with climate change is not simply a matter of being aware of the scientific evidence but of recognising the entire spectrum of human strategies and methods by which disaster has been alerted and, or, averted *in the past*. Indeed, without students of the past, to help the rest of us work through and be aware of such responses, we are all likely to be the poorer, as the need for practical - and perhaps spiritual - action becomes all the greater and more urgent.

Of course, a further irony about situations of crisis is that another historical tendency can equally become the dominant one: denial that crisis is impending at all. It is rather significant that at this given moment, despite the reams of peer-reviewed scientific data on the dangers, and the international imprimatur given to this very work through the United Nations Framework on Climate Change (UNFCCC) and its efforts to negotiate multilateral carbon emission reductions, the desire to pretend the whole thing away has become, especially in the rich Western world, both prevalent and persistent. Certainly, several of the units in this model syllabus over and above the one which tackles the denial question head on, return to the theme, suggesting that denial and scepticism as inertial drags on practical mitigation, or even adaptation to climate change, is very much on contributors' minds.

Again, it is more likely that students of the human condition, rather than of the wider physical world, will be able to offer keener insight into what is going on here. One can perhaps begin with a certain sort of historically-informed question. How long does it take culturally, or psychologically, for a danger to become acknowledged and then acted upon by a society? Think of the some forty years for the hard, scientific evidence on the links between cigarette-smoking and cancer to both percolate into wider public consciousness while also leading to a national policy shift. And think, too, of all the reasons why it was so difficult to bring about this change, not just as a result of the unwillingness of smokers to give up smoking but all the corporate business interests associated with the tobacco industry who went to such efforts, including extensive media and advertising disinformation campaigns, to sabotage the truth.

Perhaps we can gain some small comfort from an example such as the decline in smoking, as indeed from the efforts to clean up this country's atmospheric pollution as a result of 'dirty' coal burning—considered or noted to at several points in this syllabus—to have grounds for hope that the same can happen for climate change. The grounds against that relate very much to the facts Radkau stated at the outset. To halt, let alone reverse global warming will not be simply a matter of some clever tinkering involving smart energy-efficient technologies; it will require a wholesale move from the carbon economy, to something more sustainable. The science is quite clear that this *has to* happen, and indeed, very fast, if humanity's medium-term future is to be assured. But as Jared Diamond has noted, the 'sunk-cost effect', in other words, the degree to which societies invest financially, politically, and indeed, emotionally, in a particular modus operandi - even when it is shown to be redundant—is likely to act as the principle barrier to the necessary transformation.

Have students of history, and human society more generally, a role in helping to make this happen? The purpose of this syllabus is to answer with a resounding yes. But that requires a little more explanation of where it is coming from, what it seeks to do, and how it might be applied to the teaching of university students in undergraduate History and related disciplines.

## WHO IS THIS SYLLABUS FOR: WHAT IS IT INTENDED TO DO?

These are surely the central and most legitimate questions one would seek to ask of any new proposal. But perhaps we need to approach these questions in a slightly different way by explaining something about how the idea of a history syllabus on climate change emerged.

The ten contributors to this project are all involved in the Rescue!History network, an informal association of academics and independent researchers, founded in 2006. The purpose of Rescue!History, from the very beginning was not only to bring together individuals who shared a foreboding about the direction in which our 'civilisation' is taking itself (the clearest manifestation of which comes from the changing climate), but who believe that understanding the human record—whether very recent, or very deep—can help us respond more roundly and wisely to the challenge posed by global warming. Ultimately, therefore, our interest is not simply an intellectual one founded on the pursuit of knowledge for its own sake. Rather, it is firmly grounded in ways and means by which people can firstly be made aware of the danger to our own 'future' history if we do not tackle the damage we are causing to the planet and secondly, towards individual, communal and societal mobilisation in favour of amelioration of this situation. To be sure, this does not mean we have a set programme for how this might be done. Indeed, as the individual units implicitly suggest, there may be *many* historically-informed possibilities as to how we might respond to our current predicament. But as we do have a form of campaigning agenda this may explain why Rescue!History emerged at the margins of the historical profession, not at its core.

However, the very fact that we are now working with the Higher Education Academy to present this syllabus suggests that there is a wider and growing acknowledgement that the climate change issue can no longer be avoided: that it is, indeed, a—if not *the*—central point upon which the future wellbeing of our species (and indeed all species on this planet) turns. From this would come the proposition that *all* students at universities—not just those studying earth sciences—need to be properly attuned to its significance both for their future lives and the world they will inherit.

To return, then, to the matter in hand, this model history syllabus has been formulated as a guide to university teachers and students wanting to develop an understanding and knowledge base on the relationship between history and anthropogenic climate change. It is especially geared towards teachers and their undergraduate students in history and related subjects. It does so without the requirement for specialist environmental or other scientific knowledge. It is not posited as an advertisement for environmental history by another name. This is not to deny the importance of environmental history—many of our contributors, indeed, are environmental historians. However, the main purpose of this syllabus is not to breed more of the same—good as that might be—but rather to get the whole gamut of historians, whatever their expertise, thinking *with their students* about the connections between their own subject areas and the climate factor, and how the latter might enable them to 'rethink' their classes accordingly.

There is nothing, however, written in stone about this syllabus. We have attempted to formulate it collectively, raising a variety of issues and themes which relate to the present day climate crisis and its likely impact on the future human trajectory but by way of placing these issues and themes in a historical context. One might say this is very much 'work in progress'. There may be already in existence history courses like this—as developed by far-sighted academics—and there are certainly some avant-garde courses in the wider Humanities field of a similar nature and purpose. That said, we developed this course largely through our own imaginations. We considered what we felt were key issues and then tried to develop 12 units—equivalent to a rather heavy-duty semester module—around them.

As readers will quickly gather, the result is very wide-ranging, both chronologically and thematically. Even then, we would wholly agree that more could have been developed in some areas. For instance, there is no specific unit on historical relationships between climate change and violence. Where it is considered, it is implicit rather than explicit. By the same token, what one might call Malthusian relationships between population, food supply and climate change as strongly articulated in unit 3, do not reappear thereafter. An issue for syllabus users to consider, thus, is how does one build on themes introduced early on, but which are not necessarily restated or developed later. A further issue of debate would be a chronological one. We felt it important to introduce an element of deep history into this course. As a result Unit 2 focuses on the Neolithic period and the relationship between a changing climate and the advent of sedentary, agricultural communities. Yet Unit 3, whose frame of reference is 13<sup>th</sup> and 14<sup>th</sup> century Europe—clearly a very significant moment, on the cusp of the 'Little Ice Age' - is several millennia on from the previous discussion! The weighting of the course towards the modern, even contemporary is clearly commensurate with the advent of a very recent 'Anthropocene'. Equally, the heavily Western, even British focus we have developed is appropriate to a course seeking to understand the origins of an international political economy founded on the industrial utilisation of fossil fuels.

Yet at the same time we would have to acknowledge that this is far from satisfactory or sufficient, leaving out, as it does, vast realms of time and space within which human interactions with nature have been both productive *and* destructive. The syllabus in other words should be treated not as the final word on the subject, but rather as an initial starting point from which teachers will take what they feel is appropriate to either develop their own bespoke courses, or add elements to pre-existing ones. In this manner no ancient or medieval historian, or historian of Africa, Asia, the Americas or Antipodes need feel excluded. On the contrary, it is exactly these historians who can contribute to further attempts at a reformed syllabus down the line, which is less ethnocentric, more temporally and spatially rich and, hence, more fully rounded. In the same way, we would like to anticipate that those *long duree* historians who work on local or regional histories will see the syllabus as a goad to developing what they probably do already, but sideways on, to include *more* of the environmental or climate element. What particularly may be second nature to them, especially in terms of looking at the practical skill-base, self-reliance, resource conservation and spiritual as well as physical resilience of communities across time and space, may provide grist to the later inclusion of *more* material which is celebratory of humanity's ability to work with the natural world, rather than as its predatory asset-stripper.

One small example comes to mind. In unit 9 we have sought to introduce the whole fraught subject of technologies and the degree to which historical evidence might suggest that their deployment in the face of an environmental or other challenge has made matters worse, not better. But technologies, or perhaps more accurately techniques, come in all shapes and size. Take, for instance, the pre-Colombian practice of *terra preta*, begun long before the advent of our Christian era. By applying charcoal mixed with large quantities of human and animal organic matter to the soil, the peoples of the Amazon basin not only turned its infertile soils into a luxuriant black earth but, paradoxically, produced the conditions for much larger, sustainable populations in the region than there are today. The low temperature burn of biomass which the charcoal process—biochar—involves has one further practical advantage of enormous contemporary relevance: it both sequesters carbon dioxide in the soil—actually improving water quality in the process—yet at the same time releases oxygen just as coal formation did naturally millions of years ago. In other words, biochar, the essential ingredient of *terra preta* soils, also represents a notably low-tech answer to global warming. It also just happens to give rural communities a greater chance to grow more of their own food and so provide a prophylactic against deforestation.



This does not mean that biochar is the answer to global warming, simply that there are manifold techniques from the past which offer themselves as potentially sustainable practices for the present. It is perhaps, above all, this notion that there are lateral ways of approaching climate change, including the revival not only of ancient, often localised techniques for soil and water conservation, the production of renewable energy methods but even forms of heterarchic, socio-economic organisation— which we have otherwise assumed to be surplus or irrelevant to the requirements of the here and now— which provide pointers as to how history can come to the assistance of our beleaguered present. But it is up to the historian to disseminate such information, and dispute with students as to its relevance, durability or purposefulness.

### HOW HAVE WE ORGANISED THIS COURSE?

While some of the subject matter for this course may be novel, indeed radical, we have followed a much more standard remit in terms of pedagogic practice. Each of the twelve units, thus, broadly responds to a template as follows:

- a) Introduction and Learning Outcomes: setting out the broad issues, and where appropriate, the historical context, at stake
- b) Case Study: a specific historical (or related) example or examples which more closely develops the issue under discussion
- c) Student-Centred Exercise: illustrated through textual, pictorial or other material to assist students in seminars to further consider, evaluate and debate the theme under discussion
- d) Resources: bibliographical and/or other material designed to develop teacher and student knowledge of the subject area for use in the specific Unit and more broadly in this course.

Unit	Title	Contributor
1	How do we know the Climate is Changing? An Historical Outline	Vladimir Jankovic
2	Climate Change and the Emergence of Human 'History': The Development of Agriculture in the Old World	Kate Prendergast
3	Climate Change as Harbinger of Disaster: Population, Famine and Disease in the 14 <sup>th</sup> Century	Jim Galloway
4	The Coming of the Anthropocene	Jim Galloway
5	Capitalism and the Organization of Nature	Tim Cooper
6	The Acceleration of the Anthropocene: Oil	Jean-Francois Mouhot
7	Dealing with Climate Change, The Economic Dimension	Vladimir Jankovic
8	Dealing with Climate Change, The National and International Arena	Jan Oosthoek
9	Dealing with Climate Change, The Drive to Technological 'Solutions'	Dave Webb
10	Dealing with Climate Change, Discourses of Denial	Teresa Ashe
11	Transcending Climate Change? Religion, Spirituality and Redefining the Human-Nature Relationship	Sharla Chittick
12	Transcending Climate Change? A Return to Politics	Tim Cooper

## WHAT SORTS OF QUESTIONS ARE IMPLICIT IN THIS COURSE?

Throughout this syllabus we are trying to ask questions about the present and future, by reference to the past. Behind them there are, perhaps, some even more fundamental questions of which teachers and students might wish to be aware. They may, indeed, want to add more of their own. Our 'core' questions may not have immediate answers, or at least easy answers. But they may be helpful in facilitating seminar discussion.

Here are two handfuls of the big ones:

- In the light of what we know today about the importance of changing climates, to what degree should we make it at the heart of historical study?
- Is the *anthropogenic* impact on our climate, very recent or very long term? How might that change our view of history?
- What is the historical causation for the present planetary crisis? How should we seek to describe and analyse it?
- To what extent does knowledge of anthropogenic climate change and its potential consequences disrupt standard historiographies—in other words, our own historical version of 'business as usual'?
- According to a study published in *Nature* in 2004 it is estimated that by 2050, fully 25 per cent of the planet's species could be extinct or on the road to extinction, as a consequence of climate change, or the wider anthropogenic degradation of the biosphere. Is this a matter which is relevant to the historian?
- If the threat from anthropogenic climate change is as bad as many scientists say it is—that is, that it could also spell the end of human existence. Does that mean that we ought to be writing about the past differently from the way we have been doing so to date?
- How does knowledge of climate change, change our understanding of the 'philosophy of history' and hence our teaching and studying of it?
- Is the study of history of any practical use given the scale of the challenge before us?
- Do historians have any responsibility to convey the urgency of the issue?
- Karl Marx famously said 'the philosophers have only interpreted the world in various ways: the point however is to change it'. Do you agree?

## RESOURCES

Throughout this syllabus we try and give pointers to where teachers and students might wish to read or view further to make historical connections with climate change. Below are some possible starting points, designed to do no more than whet readers' appetites to continue on this challenging path.

### SOME GENERAL READING ON CLIMATE CHANGE

There is now a vast range of accessible writing on anthropogenic climate change, much of which is developed in the resources in unit 1. Good introductions for the layperson include:

Tim Flannery, *The Weather Makers: The History and Future Impact of Climate Change* (Penguin, 2005).

George Monbiot, *Heat: How we can stop the planet burning* (Penguin, 2006).

Mark Lynas, *Six Degrees, Our Future on a Hotter Planet* (Harper Perennial, 2007).

Fred Pearce, *The Last Generation: How Nature will take her Revenge for Climate Change* (Transworld, 2006).

Elisabeth Kolbert, *Field Notes from a Catastrophe, Man, Nature and Climate Change*, (Bloomsbury, 2006).

### FOR MORE RADICAL VIEWS OF THE THREAT POSED BY GLOBAL WARMING SEE ESPECIALLY

Kevin Anderson and Alice Bows, 'Reframing the climate change challenge in light of post-2000 emission trends', *Philosophical Transactions of the Royal Society*. 366:1882 (2008), pp. 3863–3882.

David Wasdell, 'Radiative Forcing, Climate Sensitivity & Boundary Conditions of Runaway Climate Change', December 2008,  
[http://www.crisisforum.org.uk/events/Workshop1\\_presentations/wasdell\\_talberg\\_revised.php](http://www.crisisforum.org.uk/events/Workshop1_presentations/wasdell_talberg_revised.php)

Also idem, 'Radiative Forcing & Climate Sensitivity,' Tällberg Consensus Project : 'The Tipping Points We Cannot Cross: Defining the Boundary Conditions for Planetary Sustainability,' 25- 26 June 2008  
<http://www.jimhadams.com/eco/RadiativeForcingEd3.doc>

WWF report, *Climate change, faster, stronger, sooner* (WWF, 2008).  
[http://www.wwf.org.uk/research\\_centre/index.cfm%3FuNewsID%3D2289](http://www.wwf.org.uk/research_centre/index.cfm%3FuNewsID%3D2289).

### PUTTING THE CLIMATE CHANGE ISSUE INTO WIDER CONTEMPORARY SOCIAL, POLITICAL, TECHNOLOGICAL AND ENVIRONMENTAL CONTEXT SEE

Mike Hulme, *Why we Disagree about Climate Change* (Cambridge University Press, 2009).

David Cromwell and Mark Levene, eds., *Surviving Climate Change, The struggle to avert global catastrophe* (Pluto Press, 2007).

Melanie Jarman, *Climate Change* (Pluto Press: Small Guides to Big Issues), 2007.

Anthony Giddens, *The Politics of Climate Change* (Polity, 2009).

Slavoj Zizek, *Living in the End Times* (Verso, 2010).

James Lovelock, *The Ages of Gaia, A Biography of our Living Earth* (Oxford University Press, 1988),

Idem., *The Revenge of Gaia, Why the Earth is Fighting Back* (Penguin 2006).

Martin Rees, *Our Final Century, Will Civilisation Survive the 21<sup>st</sup> Century?* (Arrow Books, 2004).

Bill McKibben, *The End of Nature* (Penguin, 1990).

Donatella Meadows, *Thinking in Systems: A Primer* (Earthscan, 2009)

Meadows was also lead author of The 1972 classic, *The Limits to Growth* which forecast–pre-the climate change debate– the inevitability of 'ecological overshoot' on the basis of the then (and now accelerating) asset-strip of the biosphere. See Donatella Meadows, et al., *The Limits to Growth: The Thirty Year Update* (Earthscan, 2004).

Michael Klare, *Rising Powers, Shrinking Planet* (Oneworld, 2008).

Vandana Shiva, *Soil not Oil, Climate Change, Peak Oil and Food Insecurity* (Zed, 2009).

FOR WIDER HISTORICAL CONTEXT, LINKING PRESENT DANGER WITH LONGER-TERM ANTHROPOGENIC DEGRADATION

Jared Diamond, *Collapse, How Societies Choose to Fail or Survive* (Penguin, 2005).

Roderick Mackintosh et al. eds., *The Way the Wind Blows, Climate, History and Human Action* (Columbia University Press, 2000).

Joachim Radkau, *Nature and Power, A Global History of the Environment*, trans. Thomas Dunlap (Cambridge University Press, 2008).

Ian Whyte, *World Without End? Environmental Disaster and the Collapse of Empires* (I.B.Tauris, 2008).

Joseph A. Tainter, *The Collapse of Complex Societies* (Cambridge University Press, 1988).

William F. Ruddiman, *Plows, Plagues and Petroleum, How Humans Took Control of Climate* (Princeton University Press, 2005), for an environmental scientist's historical overview.

J.R. McNeill, *Something New under the Sun: An Environmental History of the 20<sup>th</sup> century World* (Norton, 2000)

Idem. and W.H. Neill, *The Human Web* (New York: Norton, 2003).

Robert Constanza et al. eds., *Sustainability or Collapse, An Integrated History and Future of People on Earth* (Dahlem University Press, 2007).

READING CLIMATE AND ITS IMPACT ON HUMAN SOCIETIES IN THE PAST

H.H. Lamb, *Climate, History and the Modern World* (Methuen, 1982).

Mike Davis, *Late Victorian Holocausts, El Nino Famines and the Making of the Third World* (London and New York: Verso, 2001)

Brian M. Fagan, *Floods, Famines and Emperors, El Nino and the Fate of Civilisations* (Basic Books, 1999)

Idem, *The Little Ice Age How Climate Change Made History, 1300-1850* (Basic Books, 2000).

FOR DEBATES ON THE EMERGENCE OF AND CONSEQUENCES OF THE 'ANTHROPOCENE'

Paul J. Crutzen, and Eugene F. Stoermer, "The 'Anthropocene,'" *Global Change Newsletter* 41(2000), pp. 17-18.

Dipesh Chakrabarty 'The Climate of History: Four Theses,' *Critical Inquiry* 35 (Winter 2009), pp. 197-222. Available at: <http://www.stanford.edu/~jonallan/Chakrabarty.pdf>

Dipesh Chakrabarty, *Between Globalization and Global Warming: The Long and the Short of Human History*. Available at [http://depts.washington.edu/uwch/katz/20092010/dipesh\\_chakrabarty.html](http://depts.washington.edu/uwch/katz/20092010/dipesh_chakrabarty.html)

Mark Levene, [with Rob Johnson and Penny Roberts], eds., *History at the End of the World? History, Climate Change and the Possibility of Closure* (Troubador, 2010).

Mark Levene, 'Historians for the Right to Work: We Demand a Continuing Supply of History', *History Workshop Journal*, 67 (2009), 69-81 <http://www.rescue-history.org.uk/> for an alternative historical trajectory on the cusp of the anthropocene as corrective to present-day assumptions founded on the 'technical fix'.

E.A. Wrigley, *Energy and the English Industrial Revolution* (Cambridge University Press, 2010).

Paul Dukes, *The Doomsday Clock and the Arc of History, The Anthropocene Era, 1763 to the Present Day* (Anthem, forthcoming)

#### USING HISTORY TO DEBATE THE DIRECTION OF PRESENT AND FUTURE SOCIETY

Arnold Toynbee, *Mankind and Mother Earth, A Narrative History of the World* (Oxford University Press, 1976).

Brian M. Fagan, *The Great Warming, Climate Change and the Rise and Fall of Civilisations* (Bloomsbury, 2008).

Kenneth Pomeranz, 'The Great Himalayan Watershed: Agrarian Crisis, Mega-Dams and the Environment', *New Left Review* 58 (2009), 5-39.

James Howard Kunstler, *The Long Emergency, Surviving the Converging Catastrophes of the 21<sup>st</sup> century* (Atlantic Books, 2005).

Rob Hopkins, *The Transition Handbook, From oil dependency to local resilience* (Green Books, 2008), the

Thomas Homer-Dixon, *The Upside of Down, Catastrophe, Creativity and the Renewal of Civilisation* (Souvenir Press, 2007).

Richard Heinberg, *Party's Over: Oil, War and the Fate of Industrial Societies* (Clairdown, 2007).

Lester Brown, *Plan B 2.0, Rescuing a Planet under Stress and a Civilisation in Trouble* (W.W. Norton and Company, 2006).

Stefan Skrimshire ed., *Future Ethics, Climate Change and Apocalyptic Imagination* (Continuum, 2010).

#### WHEN HISTORY IS NOT ENOUGH

It may be that there are limits to 'standard' history as a route to 'imagining' our way out of the 21<sup>st</sup> century emergency. Supplementary inspiration, thus, might be useful by way of novels, or religious texts. One science-fiction-style novel with an implicit historico-religious underpinning particularly stands out:

Doris Lessing *Shikasta* (1979, Flamingo ed. 2002).

See also Peter Middleton, 'How Novels can Contribute to our Understanding of Climate Change', in Levene, *History at the End?* 218-33.

#### FILM MATERIAL

'Man on Earth', 4 part TV series shown late 2009-2010 on Channel 4.

<http://www.channel4.com/programmes/man-on-earth/episode-guide>

Fronted by Tony Robinson, 'Man on Earth' examines the 200,000 global history of *homo sapiens'* relationship with climate change. Elements of Jared Diamond's *Collapse*, with wide-ranging historical and archaeological illustration, robust science and wonderful images.

'Age of Stupid' (2009), dir. Franny Armstrong, Spanner films, looks back from 2055 to our present time to understand the causation of a world devastated by climate change.  
[http://www.spannerfilms.net/the\\_film](http://www.spannerfilms.net/the_film)

'The Secret of El Dorado' (2002) BBC Horizon series, considers the latest evidence on ancient Amazonian civilisation based on *terra preta*. The Lost  
<http://www.bbc.co.uk/science/horizon/2002/eldorado.shtml>

'The Lost Gods of Easter Island,' (2010) BBC-documentary, fronted by David Attenborough, which runs with the Diamond thesis about the creation of a human-made environmental cul-de-sac in historical microcosm. <http://topdocumentaryfilms.com/lost-gods-easter-island/>

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## UNIT 1: HOW DO WE KNOW THE CLIMATE IS CHANGING? AN HISTORICAL OUTLINE

### GENERAL THEME

The scientific knowledge about the nature and causes of anthropogenic climate change has a rich tradition and varied origins. The modern formulation of the issue can be identified in documents produced as early as the late seventeenth century and the debates about the extent and severity of the problem were very prominent during the eighteenth and nineteenth centuries. It is only in the last fifty years, however, that a scientific consensus has been forming about the physical mechanisms responsible for the observed change in the global atmospheric environment.

In this unit we look at the history of scientific ideas and observations leading to the current understanding of the anthropogenic signal in climatic record. Who have been the key actors in this complex history and what were the main social and political moments shaping research and public advocacy based on the greenhouse theory of global warming? More generally, what role did science play in creating the public and political discourse on climate change?

Climate change is not a problem per se. The statistical definition of climate does not prohibit the possibility of its change nor does the physical basis of climate systems exclude their gradual change and modification. Furthermore, the astronomical concept of solar climate takes climatic variations as a given, as something produced by the changing planetary parameters and solar activity. Climate change, however, does present a problem when seen as an agency - with potentially devastating effects on the natural, social and economic environments. This is a different way of looking at climate. Yet it has been as central to human society in the past as it is today.

Our knowledge about climate has ancient roots. Greek philosophers such as Parmenides, Eratosthenes and Aristotle reflected on climate and its effects. The term 'climate' comes from the Greek word ('klinein'), which means 'inclination' (of the sun above the earth's surface). Ancient writers also took into account the climatic effects of local topography, oceans, winds and seasons. This geographical reading of climate predominated until the advance of modern science. Climate was a feature of a place and its influences upon its inhabitants were claimed to shape local economy, political rule, cultural traditions and racial character.

Since the early modern period, settlers, travellers, colonists, and armed forces required reliable knowledge of climate to avert risk from extreme weather events. In agriculture, for example, if a local production of goods was in some measure dependent on climate, then planning of seasonal activities connected to such production would be susceptible to one's knowledge of expected weather conditions. It is not surprising that whenever a series of colder (or warmer) years affected the crops and health, people asked about the causes of such a 'climate change.' Was it natural? Was it temporary or permanent? What caused it: urbanization, drainage, deforestation, reclamation of land, or natural forces?

By the early nineteenth century, European naturalists enlarged the notion of climate to include all physical properties (including water and land) characterizing the natural and socio-cultural features of a region. Alexander von Humboldt, a German polymath and traveller, produced an early system of climatology arguing that climate included 'all changes in the atmosphere which noticeably affect the human organs.' This anthropocentric reading was influential among medical professionals such as



William Scoresby Jackson, who followed Humboldt in defining climate as ‘the sum of all those physical forces which by their operation upon the constitutions of organized beings prohibit their permanent migration from one region of the earth’s surface to another.’ Lions are not found on icebergs; people born in the tropics do not migrate to Iceland; permanent acclimatization is impossible.

The idea of stable climates as guarantors of prosperity in this way downplayed the emphasis on a climate as the ‘average weather’ to be measured independently of social and economic impact. Humboldtian sciences represented climate as something with social meaning and an historical role in the rise and fall of civilization. Stable climates were understood as *enabling*; their changes as *disabling*. Civilization was synonymous with settlement and stability as quasi-permanent climates sustained human development: a view as pertinent then as it is today. Will Durant once summed this up in saying that: ‘Civilization exists by consent of geology, subject to change without notice.’

Paralleling these ideas was the nineteenth century discovery of ice ages. Geological evidence such as the existence of isolated boulders in the Scottish mountains suggested the past existence of massive ice sheets moving across the land. The anatomical reconstruction of extinct animals led the American geologist Louis Agassiz to propose that some time in a distant past, ‘a sudden intense winter, that was also to last for ages, fell upon our globe; it spread over the very countries where these tropical animals had their homes, and so suddenly did it come upon them that they were embalmed beneath masses of snow and ice, without time even for the decay which follows death.’ Scientists were becoming aware that the earth climate did (and could) experience drastic changes even as they remained in the dark as to the causes. Some proposed terrestrial forces such as volcanoes, others, astronomical forces such as changing solar activity or orbital variations.

Simultaneous to these were the new developments in atmospheric chemistry which led to the early formulation of theories linking meteorology and atmospheric gas concentrations. The thermodynamic properties of certain gases—such as carbon dioxide—were known since the experiments of John Tyndall in the 1860s. By the end of the century, many others became involved in assessing the effects of carbon dioxide on the thermal (and other) properties of atmospheric air. The Swedish physicist Svante Arrhenius forecast rising temperatures due to growing carbon dioxide emissions in 1897. Others regarded such predictions unfounded.

During the 1930s, the English engineer Guy Stewart Callendar discovered a rise in the temperature of the Northern hemisphere and argued that it was due to the heat captured by the increasing concentration of carbon dioxide. Again, not all shared his opinion. Climatologists believed that regional variations in temperature and rainfall reflected temporary changes of weather patterns, not a long-term *climatic* change. One of leading climatologists of the day, Helmut Landsberg, argued in 1946: ‘There is no scientific reason to believe that our climate will change radically in the next few decades. Good and poor years will occur with approximately the same frequency as heretofore.’ Such views were only strengthened by the fact that the pre-war warming trend came to a halt during the 1940s. Stagnating and even falling temperatures for the next thirty years, precisely at the time of economic growth and soaring energy consumption and carbon dioxide release, did not sit well with Callendar’s greenhouse explanation of the warming trend. Was he wrong?

The answer to the question began to unfold during the 1950s. Spurred by a growing concern over the medical and economic consequences of air pollution and the nuclear arms race, physicists and

atmospheric chemists explored the thermal effects of atmospheric carbon dioxide. The threat of nuclear weapons had raised the legitimacy of the idea that humans could change the climate, and US Federal nuclear programs supported the first institutionalized research on the topic. In the early 1950s, scientists like John von Neumann thought of nuclear weapons and climate change as comparable threats to civilization. In 1953, the physicist Hans Suess first estimated that the average amount of carbon dioxide in the atmosphere had increased by approximately 10% since the beginning of the century. He believed that this increase reflected the releases from artificial coal combustion. In a landmark paper from 1956, Gilbert Plass wrote that 'if at the end of this century measurements show that the carbon dioxide content has risen appreciably and at the same time the temperature has continued to rise, it will be firmly established that carbon dioxide is an important factor in causing climatic changes.' Plass estimated that fossil fuel burning was spewing six billion tons of carbon per year to the atmosphere, with more being added by deforestation and other activities.

It should be remembered that it took some time before such statements would attract widespread attention. Even after the appearance of the famous Keeling curve in 1958 the scientific community was slow in taking such results to indicate a major process in the atmosphere. And in many instances, especially from the agricultural point of view, the prospect of steady warming was considered a boon.

How did perceptions change? One of the pivotal moments was the 1965 conference on 'Causes of Climate Change' at the National Center for Atmospheric Research in Boulder, Colorado. Climate change, participants agreed, was a real threat and could be explained by the greenhouse theory. The conference was a critical point after which climatologists more actively engaged in communicating risks to politicians and the public. The developments in climate science during subsequent decades were regularly reported in scientific meetings but also in the media. Popularization of ideas such as 'nuclear winter' mobilized world attention as much as extreme weather events. Climate change research during the 1970s, for example, could be seen as feeding into a growing public, professional and institutional awareness of environmental ideas. But it could also be seen, more specifically, as an attempt to understand global weather disasters and their agricultural consequence during the 1970s. Since 1988, however, the Intergovernmental Panel on Climate Change (IPCC) has been charged to deliver reports on the issue and their Reports have since become the scientific basis of all subsequent discussions on the issue.

## CASE STUDY - MODELLING

*'[T]here are certain similarities between a work of fiction and a model: [J]ust as we may wonder how much the characters in a novel are drawn from real life and how much is artifice, we might ask the same of a model; how much is based on observation and measurement of accessible phenomena, how much is based on informed judgment, and how much is convenience?'* (Oreskes et al., 1994)

Virtually everything we know about future climate scenarios is based on climate models. No political decision in relation to climate change can be made without the use of predictions derived from climate models. For 2010, the US National Foundation of Science allocated over \$3 billion to research on climate modelling. Our perceptions of environmental futures and our decisions on how to adjust to them is almost entirely predicated on what these models tell us.

But what are climate models? How are they made? Why are they expensive? Are they reliable? Modellers generally agree that the climate system is chaotic in both real and methodological senses, making short-term predictions worthless beyond a few weeks. But they also think that certain forecasts can be made for the climate system, and that the models can predict overall tendencies. For example, increasing concentrations of the atmospheric carbon dioxide will result in net warming rather than cooling. Nevertheless, there are many remaining uncertainties. Some of these are quantifiable, while others represent unquantifiable, irreducible epistemological limits related to inductive reasoning and to the nature of model-based global science.

The reliability of long-term models in describing future climate conditions can be determined by running the models for past periods, and comparing the simulations against data. This 'historical forecasting' is limited in the sense that can access only limited amounts of standardized and reliable observations against which to check the models' output. Climatologists also use intra-model comparisons in which they look for scenarios derived from different models. But as many models replicate the same physical equations, the agreement among them may say relatively little about their realism.

Furthermore, as modellers cannot use data from everywhere in the atmosphere, they divide the atmosphere into 'boxes' and determine meteorological factors for each of those (c.100 to 500 km wide). However, the processes taking place at scales smaller than these boxes cannot be modelled—cloud formation for example. Instead, they have to be 'parameterized' which means that they are given some predetermined value based on the best available knowledge—something like a best guess. How best to parameterize various processes is a contentious subject among modellers. In addition, faced with unknown processes, climatologists construct models so that their results conform to the 'expected' behaviour of the climate. These adjustments, tweakings, and corrections are not based on the knowledge of how the climate system really behaves but on the expectations that such corrections will give better results.

These and other limitations in the construction of climate scenarios have been long known. Yet the growing concerns and urgency over the future of climate, in addition to policy pressures, have sometimes resulted in overconfidence in models that cannot be justified by the actual state of knowledge. 'People are mixing up qualitative realism with quantitative realism,' writes the well known modeller Syukuro Manabe. More controversially, climate contrarians have used these model uncertainties to argue against the scientific consensus as based on too many unknowns. Modelling is

thus both scientifically and politically charged and will remain one of the key elements in all social and political assessment of current and future effects of anthropogenic climatic change.

## STUDENT-CENTRED EXERCISE

One of the objectives of this unit—and this exercise—is to show that the ideas about changing climate do not have a linear history. In scientific disciplines ranging from natural history and climatology to medicine and geography, climate has been defined in different terms, some stressing the quantifiable and physical elements, other favouring the social and economic ones. As a result, these definitions—and the debates about whether climates are stable or changing—have not evolved as a response to a single question (such as ‘is there anthropogenic global warming?’) Rather the key question is: what are the concerns which drive the scientific (and public) interest in climate? And if these concerns are different at different times and places, how do they relate to the views of what constitutes climate change? Answering such questions has implications about how we view the present climate crisis: as *one* of many such crises, or as a *unique* development with no past precedents.

To understand this point, we look at an early document about climate change, Thomas Jefferson’s discussion from his *Notes of the State of Virginia* (1781). Jefferson provides an outline of the climate of Virginia and then moves on to discuss phenomena which he thinks indicate a relatively recent change in climate:

A change in our climate however is taking place very sensibly. Both heats and colds are become much more moderate within the memory even of the middle-aged. Snows are less frequent and less deep. They do not often lie, below the mountains, more than one, two, or three days, and very rarely a week. They are remembered to have been formerly frequent, deep, and of long continuance. The elderly inform me the earth used to be covered with snow about three months in every year. The rivers, which then seldom failed to freeze over in the course of the winter, scarcely ever do so now. This change has produced an unfortunate fluctuation between heat and cold, in the spring of the year, which is very fatal to fruits. From the year 1741 to 1769, an interval of twenty-eight years, there was no instance of fruit killed by the frost in the neighbourhood of Monticello. An intense cold, produced by constant snows, kept the buds locked up till the sun could obtain, in the spring of the year, so fixed an ascendancy as to dissolve those snows, and protect the buds, during their development, from every danger of returning cold. The accumulated snows of the winter remaining to be dissolved all together in the spring, produced those overflowings of our rivers, so frequent then, and so rare now (Notes on the State of Virginia, 1781). For full version see <http://bit.ly/aIRK7W>

Note what evidence Jefferson uses to establish a ‘change in climate.’ Even though he had access to thermometers and statistics, Jefferson discusses the matter descriptively, from the memory of elders and in relation to agriculture. This indicates that climate has always been considered to be not *only* about the weather and exact measurements, but also about phenomena and ways of knowing that have social roots.

This is how geographer Mike Hulme and his colleagues explain this difference:

The climatologists and meteorologists of the 19th century, using standardised instruments and a series of formal statistical rules, therefore turned the idea of climate into something that could be measured and quantified. And the dominant understanding of climate today, certainly from an analytical perspective, remains the statistical one. Thus the World Meteorological Organisation (WMO) insists that the climate of a place or region can only be robustly defined once it is compiled from at least 30 years of meteorological measurement. This is how the idea of climate continues to be put into operation in the physical and mathematical sciences and has opened up possibilities for predicting future climate (in this statistical sense). Individuals and communities, in contrast to climatologists, construct their ideas of climate differently. Living in particular places and particular cultures, climate is constructed as a function of their experiences and memories of past weather events, and what is socially learned from previous generations. These climates may often be reified through paintings or photographs of physical markers, such as a flood, drought or a rare snowfall. These retrospective horizons are also synthesised to yield considered views about expectations of future climate (Hulme, Dessai, Lorenzoni, and Nelson, 2009). For full access, see <http://bit.ly/cYvX4e>

In this exercise, students are asked to reflect on this historical difference and consider the following key question. How do we, as individuals, experience the current climate change? The question can be split into more specific ones: How do we base our judgment on the extent and intensity of current climate change? Would we consider Jefferson's evidence and argument sufficient for policy purposes? Is our experience mediated through scientific reports, political initiatives and the media? Finally, can we agree with Hulme and his colleagues that there are different understandings of climate and, if so, how would they influence current policies?

## RESOURCES

### READINGS

Thomas Jefferson, Notes on the State of Virginia <http://bit.ly/aIRK7W>

Mike Hulme, Suraje Dessai, Irene Lorenzoni, Donald Nelson, 'Unstable Climates: exploring the statistical and social constructions of 'normal' climate,' *Geoforum* 40 (2009), 197-206.

### GENERAL READINGS ON THE EVOLUTION OF CLIMATOLOGICAL PROBLEMS INCLUDE

James R. Fleming, *Historical Perspectives on Climate Change* (Oxford, 1998)

Spencer Weart, *The Discovery of Global Warming* (Cambridge, Mass., 2003)

Jeremy Leggett, *Global Warming: The Greenpeace Report* (Oxford, 1990)

Jessica T. Mathews *Greenhouse Warming: Negotiating a Global Regime* (Washington, 1999)

Stephen H. Schneider, *Global Warming: Are We Entering the Greenhouse Century?* (New York, 1990)

George Monbiot, *Heat: How to Stop the Planet Burning* (London, 2006)

William K. Stevens, *The Change in the Weather: People, Weather, and the Science of Climate* (Delacorte, 2001)

Jeremy Leggett, *The Carbon War: Global Warming and the End of the Oil Era* (New York, 2001)

John Kutzbach, 'Steps in the evolution of climatology,' in James R. Fleming (ed.), *Historical Essays on Meteorology, 1919-1995* (Boston, 1996)

Tim Flannery, *The Weather Makers: the history and future impact of climate change* (London, 2006)

### FINE AND EASY READS BY AN AUSTRALIAN ZOOLOGIST

Ross Gelbspan, are *The Heat is On* (New York, 1998) and *Boiling Point* (New York 2004)

Richard Sommerville, *The Forgiving Air* (Berkeley, 1996)

### A more general treatment of disasters

Piers Blaikie, *At Risk: natural hazards, people's vulnerability, and disasters* (London, 1994)

Christof Mauch and Christian Pfister, eds. *Natural Disasters, Cultural Responses: Case Studies in Global Environmental History* (Lanham, MD., 2008)

### Larger environmental trends

J.R. McNeill, *Something New under the Sun: An Environmental History of the Twentieth-Century World* (New York, 2000)

### Historical climatology

Helmut H. Lamb, *Climate History and the Modern World* (London, 1995)

F. Baer, et al., eds. *Climate in Human Perspective: A Tribute to Helmut F. Landsberg*. (Dordrecht, 1991)

Clarence Glacken, *Traces on the Rhodian Shore* (Berkeley, 1967)

Emanuel Le Roy Ladurie, *Times of Feast, Times of Famine: A History of Climate Since the Year 1000* (London, 1972)

H. H. Lamb and M.J. Ingram, 'Climate and History,' *Past and Present* 88 (1980), 136-141.

More specific studies on historical climatology

Kenneth Thompson, 'Forests and Climate Change in America: Some Early News,' *Climatic Change* 3 (1980): 47-64

R.A. Bryson and C., Padoch, 'On the climates of history,' *Journal of Interdisciplinary History* 10:4 (1980), 583-597. This volume is devoted to the topic of climate and history and should be consulted if you plan to discover the complexities of the issue

J. Grattan and M. Brayshay, 'An amazing and portentous summer: environmental and social responses in Britain to the 1783 eruption of an Iceland volcano,' *The Geographical Journal* 161:2 (1995), 125-134.

D. Justin Shove, 'The climatic fluctuation since A.D. 1850 in Europe and the Atlantic,' *Quarterly Journal of the Royal Meteorological Society* 76:328 (April 1950), 147-165

R.J. McIntosh, J.A. Tainter, S. K. McIntosh (eds.), *The way the wind blows: climate, history and human action* (New York, 2000)

T.M.L. Wigley, M.J. Ingram, G. Farmer (eds.), *Climate and history. Studies in past climates and their impact on man.* (Cambridge, 1981); John Kington, *The weather of the 1780s over Europe* (Cambridge, 1988)

#### GREENHOUSE THEORY BEFORE THE 1950S

An extensive bibliography is provided by Spencer Weart on his website, available at <http://www.aip.org/history/climate/bib.htm>

W. W. Kellogg, 'Mankind's Impact on Climate: The Evolution of an Awareness,' *Climatic Change* 10 (1987), 113-136.

James Fleming, *The Callendar Effect: The Life and Work of Guy Stewart Callendar (1898-1964)* (Boston, 2007)

Spencer Weart, *The Discovery of Global Warming* (Cambridge MA, 2003), chapters 1, 3

Nico Stehr, and Hans von Storch, eds. *Edward Brückner -- the Sources and Consequences of Climate Change and Climate Variability in Historical Times* (Dordrecht, 2000)

J. Ausubel, 'Annex 2: Historical Note,' US National Research Council, *Changing Climate* (Washington, 1977), 488-491.

M. D. Handel and J. S. Risbey, 'An Annotated Bibliography on Greenhouse Effect Change,' *Climatic Change* 21 (1992), 91-256; M.D.H. Jones, and A. Henderson-Sellers ('History of the Greenhouse Effect.' *Progress in Physical Geography* 14(1990) 1-18.

#### IMPORTANT PRIMARY SOURCES

J. Tyndall, 'On Radiation through the Earth's Atmosphere,' *Philosophical Magazine* 4 (1863), 200-207

Anders Ångström, 'Apparent Solar Constant Variations and Their Relation to the Variability of Atmospheric Transmission.' *Tellus* 22:2 (1970), 205-18.

T. C. Chamberlain, 'A Group of Hypotheses bearing on Climate Change,' *Journal of Geology* 5 (1897), 653-83.



T. C. Chamberlain, 'The Influence of great Epochs of Limestone Formation upon the Constitution of Atmosphere,' *Journal of Geology* 6 (1898), 609-621.

Charles G. Abbot, and F.E. Fowle, Jr. 'Income and Outgo of Heat from the Earth, and the Dependence of Its Temperature Thereon.' *Annals of the Astrophysical Observatory (Smithsonian Institution, Washington DC* (1908) 2 159-2176.

Charles G. Abbot and F.E. Fowle, Jr. 'Volcanoes and Climate', *Smithsonian Miscellaneous Collections* 60:29((1913), 1-24; Hans Panofsky, 'Theories of Climate Change,' *Weatherwise* ,9 (1956), 183-87.

#### CLIMATE CHANGE SCIENCE SINCE THE 1950S

David Hart and David G. Victor, 'Scientific Elites and the making of US Policy for Climate Research, 1957-74,' *Social Studies of Science* 23 (1993), 643-680.

Ronald Rainger, 'Patronage and Science: Roger Revelle, the U.S. Navy, and Oceanography at the Scripps Institution.' *Earth Sciences History* 19 (2000), 58-89.

Judith and Neil Morgan, *Roger: A Biography of Roger Revelle* (San Diego, 1996)

Justin Lancaster, 'Revelle on Global Warming.' *Science* 265: 5170(1994) 302.

Helmut Landsberg, 'Man-Made Climatic Changes,' *Science* 170 (1970), 1265-74.

C. Kramer, 'Carbon Dioxide in the Atmosphere in Relation to Climate,' *Hemel und Dampkring* 48 (1950), 189-91.

#### THE SEMINAL PAPER

Roger Revelle, and Hans E. Suess, 'Carbon Dioxide Exchange between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO<sub>2</sub> During the Past Decades,' *Tellus* 9 (1957), 18-27.

#### AN OVERVIEW OF PRE-1950 PUBLICATIONS

Nina A. Stepanova, (1952). 'A Selective Annotated Bibliography of Carbon Dioxide in the Atmosphere.' *Meteorological Abstracts* 3(1952) 137-170

Roger Revelle, 'How I Became an Oceanographer and Other Sea Stories.' *Annual Review of Earth and Planetary Sciences* 15 (1987),1-23.

P. Brimblecombe, 'History of Air Pollution,' in Hanwant B. Singh (ed.), *Composition, Chemistry, and Climate of the Atmosphere* (New York: 1995),1-18.

S. Agrawala, ' Context and Early Origins of the Intergovernmental Panel on Climate Change, in: *Climatic Change* 39(1998), 605-620

S. Agrawala, 'Structural and process history of the Intergovernmental Panel on Climate Change' *Climatic Change* 39 (1998), 621-642.

#### MODELLING

Shardul Agrawala et al, 'Integrating Climate Forecasts and Societal Decisions Making: Challenges to an Emergent Boundary Organizations,' *Science, Technology and Human Values* 26 (2001): 454-477.

Clark A. Miller and Paul N. Edwards (eds.), *Changing the Atmosphere: Expert Knowledge and Environmental Governance* (Cambridge, Mass., 2001), 31-66.

Roger Pielke, *Mesoscale Modeling of the Atmosphere* (American Meteorological Society: Boston, Mass., 1994).

Roger Pielke, *Prediction: Decision-Making and the Future of Nature* (Covelo, Ca., 2000). Pielke's weblog is excellent source of current thinking about the climate, media and society.

Clair Gough and Simon Shackley, 'The Respectable Politics of Climate Change: the Epistemic Communities and NGOs,' *International Affairs* 77 (2001), 329-345

Mark Friedman, *Appropriating the weather :Vilhelm Bjerknes and the Construction of a Modern Meteorology* (Ithaca, NY: 1989)

Mark Monmonier, *Air Apparent: How Meteorologists Learned to Map, Predict and Dramatize the Weather* (Chicago1999)

James Fleming, Vladimir Jankovic and Deborah Cohen (eds), *Intimate Universality: Local and Global Themes in Weather and Climate History* (Sagamore Beach, 2006)

Vladimir Jankovic, 'Science Migrations: Mesoscale Weather Prediction from Belgrade to Washington, 1970-2000,' *Social Studies of Science* 34 (January 2004), 45.

#### THE UNCERTAINTY OF CLIMATE MODELS

Myles Allen, Sarah Raper, John Mitchell, 'Uncertainty in the IPCC's Third Assessment Report,' *Science* 293 (20 July 2001), 430-433.

#### THE SOCIAL AND PUBLIC DIMENSION OF CLIMATE SCIENCE

David Demeritt, 'The Construction of Global Warming and the Politics of Science,' *Annals of the Association of American Geographers* 91 (2001): 307-337.

Albert Abarbanel, and Thomas McCluskey, 'Is the World Getting Warmer?' *Saturday Evening Post*, 1 July, 1950, 22-23, 57-63.

Carroll L. Wilson, and William H. Matthews, eds. *Inadvertent Climate Modification. Report of Conference, Study of Man's Impact on Climate (SMIC)*, Stockholm, 1971)

#### THE ROLE OF MEDIA

Chad Carpenter, 'Businesses, Green Groups and the Media: The Role of Non-Governmental Organizations in the Climate Change Debate,' *International Affairs (Royal Institute of International Affairs 1944-)* 77 (2001), 313-328.

Simon Shackley and Clair Gough, 'The Respectable Politics of Climate Change: The Epistemic Communities and NGOs,' *International Affairs (Royal Institute of International Affairs 1944-)* 77:2 (2001): 329-345. This issue is entirely devoted to climate change policy.

Sheldon Ungar, 'Knowledge, Media and the Popular Culture: Climate Change vs the Ozone Hole,' *Public Understanding of Science* 9 (2000), 297-312.

## UNIT 2: CLIMATE CHANGE AND THE EMERGENCE OF HUMAN 'HISTORY'

### THE DEVELOPMENT OF AGRICULTURE IN THE OLD WORLD

#### INTRODUCTION AND LEARNING OUTCOMES

The ending of the last glacial period (The Pleistocene) and the onset and stabilisation of the current inter-glacial period (The Holocene) was a major factor in precipitating profound changes in humanity's subsistence practices. This climatic change fundamentally influenced the transition from hunting and gathering to domesticated cereal production and animal husbandry in the Near East, the Nile valley and Mesopotamia, from where it eventually spread across Europe and elsewhere.

The transition to agriculture in the 'Old World' in turn precipitated a series of further, far-reaching changes. The accumulation of food surpluses enabled the development of substantial settlements and land and sea-based trading of valuable goods. This eventually became the basis for an emergent economic system that in many ways was not unlike our own economies today. At the same time, taking such a long term view raises key questions. These include how far we see 'continuity' or 'difference' between the nature and extent of our exploitation of resources and those of the first farmers. It also raises issues of power. Agriculture may have brought human beings many benefits, but were domination over the natural world and social inequality also inevitable consequences of domestication? If so, how far do these developments in the distant prehistoric past have relevance for the way we extract and use resources in the light of the changes in climate that confront us now?

This unit will examine the evidence for the changing temperatures associated with the end of the last period of glaciation, and its effects on the take up of domesticated cereal production and the domestication of animals in the Levant, the Near East and the eastern Mediterranean. It will also explore interpretations of this evidence. This will include Marxist and structuralist analyses of the evidence for the onset of farming, and a focus on settlement as a way to explore the issues of domestication and domination.

The aim of the unit is to introduce students to the evidence for and interpretations of the beginnings of Old World agriculture, as a basis to explore our ancestors' responses to a changing climate and its effects on the exploitation of resources. A focus on the ways in which agriculture was both an innovative response to a changing climate *and* the basis for irrevocable changes in human exploitation strategies may provide a historical basis for and a key comparator to our responses to climate change—enabling students to frame key questions about optimal responses to the sustainability crisis that we currently face.

## LECTURE OUTLINE:

### THE CHANGING CLIMATE AND THE EMERGENCE OF AGRICULTURE IN THE NEAR EAST—EVIDENCE AND PERSPECTIVES

Throughout prehistory, the earth's temperature was subject to massive changes during the protracted glacial and inter-glacial periods that characterise the earth's climate. Our prehistoric ancestors were forced to adapt to these extreme climatic changes. To take one example: during the last glacial maximum, which occurred between 18-20,000 years ago, average temperatures in Europe fell to at least 10°C below present day levels.

The end of the last glacial period, known as The Pleistocene, started around 12,000 BC, when warmer conditions began to set in and the ice sheets began to melt. Although glacial conditions briefly returned during the Younger Dryas, temperatures rose rapidly from c9500BC during the Preboreal of the early Holocene, and despite global variations in the speed and severity of this increase, the temperature rise stabilised globally and we remain in this warmer inter-glacial period today.

The effects of a rapid and sustained rise in global temperatures were numerous. They included sea level rises of around 35 metres between c12-6000BC, the extinction or migration to more northerly latitudes of large cold-adapted game such as reindeer, wild horse, steppe bison and woolly mammoth and massive changes in flora. Our hunter-gatherer ancestors proved to be extremely adaptable to such extreme climatic events and as temperatures rose, hunting and gathering remained viable in many parts of the world. However, in the Near East, from c9500 BC rising temperatures were associated with a systematic transition to domesticated food production.

The reasons for such a transition are subject to debate. Some argue that the already existent practices of settlement and experimental agriculture became systematic when warmer weather and the increased availability of water provided optimal conditions for domesticated food production, especially of cereal. If this is the case, it suggests that the beginnings of agriculture should be seen as an adaptive and innovative response by our ancestors to a changing climate.

Certainly, the effects of this transition were rapid and substantive. Settlements became larger and populations increased. The core practices of settlement and domestication developed first across the Near and Middle East and the eastern Mediterranean c9500–7500 BC, and by the fifth millennium BC began to spread into far more peripheral areas such as northern Europe. They also formed the basis for the first cities, out of which sprang complex production, exchange and consumption networks. The emergence of city-states and the first Empires from the fourth millennium BC created the conditions for the generation of substantial wealth, and also for warfare and social inequalities such as slavery.

Such a trajectory has long been of interest to those concerned with the 'deep history' of economic and political behaviour and systems. Marx was perhaps the first to develop a systematic theory about the history of economic production in which agriculture played a key part. This theme was elaborated in the 1930s by Marxist archaeologist Vere Gordon Childe, who coined the phrase 'Neolithic revolution' to describe the transition to agriculture. More recent approaches to this evidence lay greater emphasis on the importance of social relationships as the driver for economic change and therefore stress the differences between 'ways of doing and being' in the Neolithic and those of later historical periods. However, structuralist interpretations such as those of Ian Hodder, continue to argue that

domestication triggered dynamics that can be seen as foundational to many aspects of social and economic life over millennia, including our own.

Whichever way we choose to 'read' the transition to and development of domesticated production, there is no doubt that it represented a highly resourceful response to rapidly warming conditions. Moreover, the transition to domesticated subsistence practices was likely to have been experienced 'relationally' rather than purely economically—its primary effects were to set in train a new set of relationships, in which systematic ownership of resources became possible, perhaps for the first time. As such, it represented a profound change from hunter-gatherer ways of life, and initiated assumptions about power and control over natural resources that have had very real effects on human societies and on the landscape in which we live.

One key question this evidence raises is how far attitudes towards ownership of resources are at issue in the ways we are currently responding, or failing to respond to the changes in climate we now face. A focus on the origins and development of agriculture allows us to trace the origins of such attitudes in the context of our capacity to successfully manage and adapt to significant climatic shifts. 'Controlling' the natural world is now inherent in the ways we depend upon it to survive: warm temperatures, lack of ice cover, high rainfall and a cleared landscape provide us with optimal conditions for domesticated plant and animal production. But this also has its costs. The evidence for the transition from hunting and gathering to agriculture can give us some key pointers to some of the underlying issues associated with such costs as well as benefits, and may help us to pinpoint their role in exacerbating or mitigating the climate crisis we face today.

## CASE STUDY–JERICHO AND CATAL HÖYÜK, PROTO-CITIES OF THE NEOLITHIC?

### BACKGROUND

The first settlements in the Levant and Near East date to the late stages of the last glacial period, where wild grains were consumed from at least 10,000 BC. Soon after 9500 BC, the core agricultural crops of emmer and einkorn wheat, barley, peas, lentils and chick peas began to be cultivated and the fig tree was domesticated.

From c.9500 BC, the key animals to be selected for domestic breeding were sheep, pigs, cattle and goat.

The effects of post-glacial temperature rises continued to impact the take up and spread of agriculture until at least the third millennium BC. For example, during the Holocene climatic optimum, c.6000 BC, the Sahara was much more fertile due to increased rainfall, allowing agriculture to be practiced across wider areas. From around 5500 BC, as rainfall decreased, desertification began across North Africa, leading to the eventual desiccation of the Sahara by c.2500 BC.

Levantine settlements such as Jericho were built on some of the earliest sites to record both settlement and the practice of agriculture. By 7000 BC, this 'package' had spread across Mesopotamia, Anatolia, the Nile valley and to the eastern Mediterranean. Sites such as Catal Huyk in Anatolia, dating to around 7500 BC, represent the scaling-up of population levels and settlement sizes, supported by the more intensive agricultural practices the stabilisation of Holocene temperatures facilitated.

### JERICHO



Tower of Jericho, Tell es-Sultan archaeological site, ca. 7000 BC  
© Reinhard Dietrich  
[[http://commons.wikimedia.org/wiki/File:Tower\\_of\\_Jericho.jpg](http://commons.wikimedia.org/wiki/File:Tower_of_Jericho.jpg)]

Jericho was a settlement located on Tel es-Sultan (Sultan's Hill) in the West Bank in the Palestinian Territories. Low-lying and close to a series of springs, the site was inhabited for millennia. The first levels of the site are dated to c9000 BC - although the Natufian peoples who inhabited the Levant established the first settlements in the region even earlier.

The site was excavated in the early twentieth century by German and British teams. The most substantial excavations were undertaken in the 1950s by Kathleen Kenyon of the Institute of Archaeology in London. Kenyon established that numerous levels were present at Tel es-Sultan: the oldest were dated to the Neolithic, and included the Neolithic site of Jericho, over which lay up to 23 layers of subsequent settlement.

The Jericho levels included a large residential settlement of round mud-bricks houses encircled by a 4m thick wall with a 7m high tower. It has been estimated that several thousand people lived there. The tower was dated to Pre-Pottery Neolithic A, between 7000-8000 BC and may have been used as protection against enemies. It was on this basis that Kenyon described Jericho as the earliest city.

Excavations revealed the remains of domesticated emmer wheat, barley and pulses. Flints, sickle-blades, burins, scrapers and axes were also found as were querns and hammerstones, stone spindle whorls and possible loom weights. Dishes and bowls had been carved from soft limestone and anthropomorphic figures had been made from plaster and clay. Excavations also revealed burials under settlement floors, and plastered and painted skulls with Cowrie shells for eyes.

#### CATAL HÖYÜK

Catal Höyük was a substantial Neolithic settlement in southern Anatolia, which was occupied from approximately 7500 BC to 5500 BC. It had spectacular wall paintings and mural art—perhaps the first of its kind—and is a key site for our understanding of the development of agriculture and its related culture.



Reconstruction of a Neolithic building at Catal Höyük

© Catal Höyük Excavations team

<http://www.catalhoyuk.com/mission.html>

Catal Höyük was excavated by James Mellaart between 1961 and 1965. The site was then closed and excavations began again in the mid-1990s, directed by Ian Hodder, formerly of Cambridge and now of Stanford University.

Mud-brick houses were constructed without reference to a street plan and no footpaths or streets seem to have been used between the dwellings, which were clustered together like a honey-comb. Most houses were accessed by holes in the ceiling, which were reached by ladders and stairs. These were also used to ventilate the buildings. It is likely that the average population of Catal was between 5000 - 8000 people.

Excavations have revealed the cultivation of wheat, barley and legumes, and bones from both domesticated and wild animals. Human burials have been found in pits beneath the floors, hearths and beds. As at Jericho, some skulls were plastered and painted with ochre to recreate human-like faces. Vivid murals have been found throughout the settlement, on interior and exterior walls and so have distinctive clay figurines of women, one notable example being the Seated Woman of Catal Höyük (*see below*).

#### EARLY SETTLEMENTS AND AGRICULTURE: READING THE EVIDENCE

One of the reasons Vere Gordon Childe dominated British archaeology in the 1930s and 40s was because he applied a Marxist analysis to the evidence for the beginnings of agriculture. Childe argued that domestication represented a revolution in economic and technological practices in the classic Marxist sense of one form of economic production being superseded by another. Childe's approach was typical of those who apply economically determinist Marxist models of change. For Childe, the Neolithic Revolution was progressive and developmental—driven primarily by technology and economics. The implication behind such a view is that (European) human history has taken a steady path of economic and social development.

This interpretation of Marx, and its application to the origins of agriculture (and economic change more generally), has been theoretically challenged in both archaeology and anthropology. The archaeologist Julian Thomas has recently argued that we cannot take for granted any continuity between our current forms of agriculture and landscape use and those of the Neolithic. Thomas further argued that whereas the reading of Marx employed by Childe assumed that societies are determined by economic production, Marx in fact identified an *interplay* between social relationships and subsistence practices.

Anthropologists such as Maurice Bloch and Marilyn Strathern have proposed that evidence from contemporary tribal societies suggests people frequently interpret and understand the dynamics of this interplay in the realm of social relationships rather than in any separate 'economic' sphere in which they happen to be defined. Such societies do not recognise a distinct realm called 'the economy', but mediate production and exchange through social - and often cosmological - relationships, including those based on kinship, gift giving and ritual.

Such a view is supported by structuralist interpretations of the origins and development of agriculture. Ian Hodder (current director of excavations at Catal Höyük) has explored the ways in which the transition to agriculture may have been understood in terms of relationships and has argued that these changing attitudes to natural resources, including changes in climate, were increasingly driven by relationships based on power and control.

In his book *The Domestication of Europe*, Hodder argues that since early Neolithic societies in the Near East and South East Europe were concerned with the domestication of their environment, the symbolism they employed was generated and designed to render the processes of domestication structurally meaningful and ordered.

To further explore these ideas, Hodder uses and juxtaposes three terms, each based on a common element in Indo European languages. The first is *Domus*. *Domus* refers to the home; it also refers to the practical activities associated with the house (food production, shelter, sociability) and also to secondary, symbolic associations given to these practical activities. So, in early agricultural societies, the house became a focus for symbolic elaboration and was used as a metaphor for social and economic strategies, and for relations of power. Hodder argues the *domus* came to stand for two major strategies in particular: the concept and practice of nurture and the exclusion, control and domination of the wild.

The second term Hodder uses is *Agrios*, which refers to the wild. But the wild Hodder invokes was not a truly non-cultural place, but rather a domain for practices that were symbolically opposed to those associated with the *domus*: hunting, exchange, warring and death. *Agri-culture* thus comes to stand for the power struggle between domestication and the wild and the *agrios* the real and symbolic place where the 'wild' is both respected and conquered or 'tamed'.

The boundary between these two worlds Hodder describes as the *Foris*. This term refers to the idea of a threshold, like the door of a house connecting the domestic space to the world beyond.

Hodder, along with prehistorians such as Maria Gimbutas, argues that concepts and practices that refer to changing relationships to the landscape were directly related to gender-based roles. The spatial and symbolic evidence from early Neolithic settlements strongly suggests that women were associated with



the domus and men with the agrios (although Hodder makes a distinction between what real women and men might have done at any one time in any one group and the symbolic elaboration of gender roles). In other words, gender roles were key to the ways the transition to and development of agriculture and animal husbandry was managed, and they represented the primary means through which emergent social divisions based on responses to a changing climate were conceptualised.

A focus on the evidence from Jericho and Catal Höyük—two early and prominent Neolithic sites - allows us to see the details of the relationally-centred experience of domestication in the early Neolithic. It also helps to highlight some of the conflicts that the switch to agriculture set in train. On the one hand, agriculture appears to have been rendered meaningful by stressing the power of the wild—and hence such groups ‘looked back’ to earlier hunter-gatherer survival and adaptive strategies. On the other hand, it opened up the possibility of social divisions based on the power that domesticating plants and animals (staying in one place and ‘taming’ the wild around it) could bring.

While differences in the experience of production appear to have initially focused on gender, they also formed the basis for inter-group relationships. As the core agricultural package spread, hunter-gatherers found it difficult to resist the increased social power inherent in increasing control over resources. This in turn facilitated a ‘global’ transition that eventually pulled groups into ‘centre-periphery’ relations. These were based on emergent ‘world systems’ for the production, exchange and consumption of goods, and were the hallmark of emergent social inequalities in later prehistory.

In summary, theoretical approaches such as Marxism, structuralism and post-structuralism enable us to explore both how the earliest domesticating groups may have understood the reasons for exploiting resources differently in a changing climate and the longer term trends associated with the ongoing development of agriculture. In so doing, they assist us in pinpointing some of the assumptions that lie behind the ways we are responding to comparable climatic changes.

Jared Diamond has recently argued that a failure to respond optimally—or even adequately—to evident environmental change is one hallmark of societies that collapse. The evidence from the onset of the Holocene would suggest that our prehistoric ancestors had very powerful mechanisms for successfully adapting to changing temperatures. But the long term success of this adaptation may also be one reason we find it so difficult to respond optimally to global warming today. Our assumptions about our relationships to resources—in particular our perceived rights to control and own them—deny key elements of that relationship our ancestors took seriously. Unlike the first domesticators, we do not have a highly developed relationship to the power of ‘the wild’ (or to related notions of ‘the commons’). The evidence from the early Neolithic would suggest that without such beliefs, we are in danger of ignoring the tensions between a ‘wild’ and ‘tamed’ world that our ancestors so clearly recognised and successfully worked with, and which we urgently need to recognise and work with today.

## STUDENT-CENTRED EXERCISE

### CATAL HÖYÜK–THE ICONOGRAPHY OF RITUAL CONTROL



Seated Mother Goddess flanked by two lionesses from Çatalhöyük, Museum of Anatolian Civilizations, Ankara  
© Roweromaniak  
[[http://en.wikipedia.org/wiki/File:Ankara\\_Muzeum\\_B19-36.jpg](http://en.wikipedia.org/wiki/File:Ankara_Muzeum_B19-36.jpg)]



Bull painting from Catal Hüyük in Angora Museum  
© Stipich Béla  
[[http://commons.wikimedia.org/wiki/File:Catal\\_H%C3%BCy%C3%BCK,\\_bull\\_painting.JPG](http://commons.wikimedia.org/wiki/File:Catal_H%C3%BCy%C3%BCK,_bull_painting.JPG)]

The first image is a statue of a seated woman, with her hands on the heads of two lions. The second is a large wall painting of a bull, both from Catal Höyük. In this exercise, students will explore the symbolism of this imagery in the context of what it reveals about attitudes towards domestication - in particular the role of female sexuality and reproduction and attitudes towards taming wild animals. This in turn should raise further questions about changing perceptions of control as a result of the shift to agriculture following increasing temperatures. These (or other similar) images could be used to explore the following questions:

- The statue depicts a woman with control over two wild animals. The mural depicts a large (and wild looking) domesticated bull. At Catal Höyük, small scale cultivation and animal husbandry was practiced in a landscape that was still largely uncultivated. What does the image suggest about attitudes to that landscape? What attitudes are there around respect towards and control of 'natural' resources? What attitudes to animals are being expressed? What can these images tell us about a changing landscape in the context of a post-glacial climate?

- The female figurine at Catal Höyük is very much in the style of south-eastern European Neolithic female figurines more generally, which are found in large numbers across many settlement sites. These depictions of women emphasise their fertility and raw bodily power. Is there an explicit association between female reproduction and domestication? What do such images suggest about female power in these prehistoric societies? How might women's roles have changed as temperatures increased and hunting and gathering was abandoned for farming in these areas?
- The emphasis on gender roles is also emphasised in the layout of space at Catal Höyük. The architecture, and the burials and objects it contained, appear to have been laid out according to structural and symbolic rules that were strongly influenced by gender. To supplement the evidence contained in the above images, students could research the evidence for the role of men as well as women at such sites. Does this evidence reveal any gender-based conflicts? If so, how far may have gender roles shifted as a result of the take-up of agriculture? To what degree were such roles dependent on particular climatic conditions? What further social divisions may have such differences generated?

## RESOURCES

### CLIMATE CHANGE AND ADAPTATION IN PREHISTORY

- H. Birks and B. Ammann, 'Two terrestrial records of rapid climatic change during the glacial-Holocene transition (14,000-9,000 calendar years B.P.) from Europe', *Proceedings of the National Academy of Sciences of the United States of America* 97 (2000), 1390-94.
- W. J. Burroughs, *Climate Change in Prehistory: The End of the Reign of Chaos* (Cambridge :Cambridge University Press 2005).
- C. Gamble, *Timewalkers; the Prehistory of Global Colonization* (Cambridge MA: Harvard University Press 1994).
- P. Mellars, 'Upper Palaeolithic Revolution' in B. Cunliffe, (ed.), *The Oxford Illustrated Prehistory of Europe* (Oxford: Oxford University Press, 1994), 42-3.
- S. Mithen, 'The Mesolithic Age' in B. Cunliffe, (ed.), *The Oxford Illustrated Prehistory of Europe* (Oxford: Oxford University Press, 1994), 79-135.
- S. Mithen, *After the Ice: A Global Human History 20,000-5000 BC* (Cambridge MA: Harvard University Press, 2006).
- K. Prendergast, 'Responding to climate change: lessons from our prehistoric ancestors?'; in, M. Levene et al. *History at the End of the World? History, Climate Change and the Possibility of Closure* (Penrith: Humanities-Ebooks 2010), 34-45.

### THE TRANSITION TO FARMING

- O. Bar-Yosef and A. Belfer-Cohen, 'Facing environmental crisis. Societal and cultural changes at the transition from the Younger Dryas to the Holocene in the Levant', in R.T.J. Cappers, and S. Bottema, (eds.), *The Dawn of Farming in the Near East. Studies in Early Near Eastern Production, Subsistence and Environment* 6 (Berlin: ex oriente, 2000), 55-66.
- O. Bar-Yosef, 'The Natufian culture in the Levant, threshold to the origins of agriculture', *Evolutionary Anthropology* 6:5, (1998), 159–177.
- N. Munro, 'Small game, the younger dryas, and the transition to agriculture in the southern Levant', *Mitteilungen der Gesellschaft für Urgeschichte* 12 (2003), 47-71.
- P. J. Richerson, R. Boyd and R. L. Bettinger, 'Was Agriculture Impossible during the Pleistocene but Mandatory during the Holocene? A Climate Change Hypothesis' *American Antiquity* 66:3 (2001), 387-411.

### MARXIST AND POST-STRUCTURALIST INTERPRETATIONS OF THE DEVELOPMENT OF AGRICULTURE

- M. Bloch, *Marxism and Anthropology: The History of a Relationship* (London: Routledge 2004).
- Google books: [<http://books.google.co.uk/books?id=nvOslSoX7OsC&dq>]
- V. G. Childe, *Man Makes Himself* (London: Watts, 1936).
- M. Shanks and C. Tilley, *Reconstructing Archaeology, Theory and Practice* (London: Routledge, 1987).
- J. Parry and M. Bloch, eds., *Money and the Morality of Exchange* (Cambridge: Cambridge University Press, 1989).

- M. Strathern, *The Gender of the Gift* (Berkeley: University of California Press, 1988).
- J. Thomas, *Understanding the Neolithic* (London: Routledge, 1999).
- J. Thomas, *Interpretive Archaeology: A Reader* (Leicester: Leicester University Press, 2000).
- I. Wallerstein, *World-Systems Analysis: An Introduction* (Durham: Duke University Press, 2004)

#### JERICHO AND CATAL HÖYÜK

- M. Gimbutas, *The Goddesses and Gods of Old Europe: Myths and Cult Images* (Berkeley, University of California Press, 2007). Google books: [<http://books.google.co.uk/books?id=zKFFOoPlyjIC&dq>]
- I. Hodder, *The Domestication of Europe* (Oxford: Blackwells, 1990)
- K. Kenyon, Early Jericho, *Antiquity* 26 (1952), 116-122.
- K. Kenyon, *Excavations at Jericho - Volume I Tombs Excavated in 1952-4* (London: British School of Archaeology, 1960).
- K. Kenyon, *Excavations at Jericho - Volume II Tombs Excavated in 1955-8*, (London: British School of Archaeology, 1965).
- J. Mellaart, *Catal Hüyük. A Neolithic Town in Anatolia* (London: Thames and Hudson, 1967).
- Çatalhöyük Excavations site: [<http://www.catalhoyuk.com/>]  
Archive reports: [[http://www.catalhoyuk.com/archive\\_reports/](http://www.catalhoyuk.com/archive_reports/)]  
Extensive bibliography: [<http://www.catalhoyuk.com/bibliography.html>]  
Catal Höyük photos: [<http://www.flickr.com/photos/catalhoyuk/>]

#### THE PSYCHOLOGY OF RESPONSES TO CLIMATIC AND ENVIRONMENTAL CHANGES

- J. Diamond, *Collapse: How societies choose to fail or succeed* (London, Penguin, 2006).
- G. Monbiot, 'The Process is Dead', *The Guardian* (21 September 2010).  
[<http://www.monbiot.com/archives/2010/09/20/the-process-is-dead/>]
- S. Mithen, *The Prehistory of the Mind* (London, Thames & Hudson. 1996).

## UNIT 3: CLIMATE CHANGE AS HARBINGER OF DISASTER: POPULATION, FAMINE AND DISEASE IN THE 14<sup>TH</sup> CENTURY

### INTRODUCTION AND LEARNING OUTCOMES

The Black Death, a devastating outbreak of epidemic disease which swept across Europe between 1347 and 1350, was the greatest medical and human catastrophe in recorded history. One in every three people died in the first of what were to be repeated outbreaks of plague. Some historians have interpreted this disaster as essentially a 'Malthusian crisis', brought about by population growth outstripping agricultural production, leaving the people of Europe malnourished and easy prey to a disease to which they had no immunity. Others have seen the Black Death solely as an 'exogenous shock', an outside force which devastated a society and economy which still had capacity for development. Recent work, however, strongly suggests that the Black Death must be viewed in a wider context of climate change and environmental crisis, which provoked major subsistence crises in the generations before the arrival of the plague.

In this unit, students will learn the outline of climate change in the later medieval period, and how climate deterioration culminated in a Europe-wide famine in the years 1315-18. They will then learn about the circumstances of the Black Death's appearance in Europe and will be encouraged to consider the links between this event and the wider climate-influenced crisis. A suggested student exercise will encourage thought on the contemporary relevance of the medieval experience, and an optional supplementary exercise will focus on a local aspect of the late medieval crisis.

### CLIMATE AND SOCIETY IN MEDIEVAL EUROPE

In 1300 Europe's population had reached a peak, after several centuries of growth. Agriculture had spread into previously wooded areas and uplands, and Europe's farmers had been able to feed not only themselves, but also the people of the continent's many and growing towns and cities. Surpluses were produced and redistributed through a complex system of local and regional markets and fairs, in an economy that had moved a long way from subsistence. Conditions were harsh for the majority, however, and many country people eked a precarious livelihood from small holdings of land, from which they had to pay customary renders to their lord and periodic royal taxes.

In part the expansion of farming, and the great growth of population which it supported, had been helped by a benign climate in the period between the 10<sup>th</sup> and the 13<sup>th</sup> centuries. This period is known to historians as 'the medieval warm period' (MWP); summers were warm, winters were comparatively mild, and stormy weather seems to have been relatively rare. Documents and various types of scientific evidence—including analysis of tree-rings, lake sediments and ice-cores from the Arctic—all point to these central medieval centuries as having a generally favourable climate, well suited to the expansion of grain cultivation - and it was grain, above all, which fed Europe's people in town and country alike.

By the later thirteenth century there are clear signs that things were beginning to change, and that a deterioration of the climate was setting in. Average temperatures in the Northern Hemisphere seem to have been dropping from soon after 1200, and by c.1270 glaciers in northern Europe and the Alps were advancing once again. Episodes of severe storminess began to occur, especially affecting the countries bordering the North Sea. Flooding of reclaimed land occurred, harbours and vessels were damaged and in extreme cases whole districts and towns were lost to the sea. These types of event were becoming more and more common as the fourteenth century dawned.

Meanwhile, as temperatures dropped and winters became more severe, farming communities in the more upland and northerly parts of Europe began to experience more regular harvest failures and hunger. In parts of Scandinavia, especially Norway, some settlements began to be abandoned after 1300 in response to the harsher conditions for agriculture, which would soon to be joined by other associated threats. Glaciers began to spread in Iceland, and a long-term process of settlement retreat began there.

On the far edge of the medieval European cultural world, the Viking settlement on Greenland was shrinking towards extinction. First discovered by the Vikings before 1000AD, Greenland's climate was sufficiently mild in the early centuries of the settlement for a type of European farming to be imported in coastal regions, with cattle-rearing and even some cereal cultivation. However, the colony was precarious because of its distance from Europe and its scanty resources. The downturn in the climate had extremely serious implications for a society which proved unable to adapt, or to learn from the Inuit people who were moving into Greenland at this time. The Vikings tried to stick to their European farming and lifestyle, and the colony steadily shrank in what must have been very desperate circumstances. Cereal growing became impossible, pasture for livestock shrank as the permafrost encroached and contact with Scandinavia became increasingly sporadic as sea-ice increased. Fourteenth century visitors to western Greenland found abandoned settlements, with cattle wandering around but no people to be found. The last report from the colony reached Norway in 1410, and spoke of the burning of a sorcerer—this may suggest that the last remnants of the Viking colony had turned on each other in their desperation.

Climate deterioration did not have such dramatic consequences everywhere of course, but even in the rich lowlands of western and central Europe the shortening of the growing season and the increasing harshness of winters had a negative impact. Cooler and wetter conditions persisted for the remainder of the middle ages, with a possible temporary amelioration around 1500. Less favourably located settlements shrank or were abandoned, or were deliberately depopulated by landlords seeking greater profit from sheep grazing than could now be obtained from arable farming.

On top of the long-term consequences of a cooling climate, there came severe short and medium-term disruptions to weather patterns which made themselves felt across much of the continent. In 1258 a massive volcanic eruption—the precise location of which remains elusive, but whose 'signature' is visible in both the arctic and Antarctic ice—ushered in two years of dismal weather, crop failures and famine. Then in the second decade of the fourteenth century came the 'Great European Famine' of 1315-18, three successive years of disastrously wet summers, failed harvests and widespread starvation across Europe, resulting in perhaps 7 million deaths in excess of normal mortality. Following immediately upon the famine came a devastating livestock epidemic, which killed huge numbers of cattle, damaging the agricultural system further and hitting the supply of meat and dairy produce for human consumption. This livestock mortality—although triggered by the spread of a disease (probably rinderpest)—was underpinned by the bad weather of 1315-18; the rains devastated grazing land as well as crops, and resulted in malnutrition among animals as well as people. It must have seemed that things could not get worse, but a generation later Europe was to be visited by perhaps the greatest human catastrophe in its history—the Black Death.

## CASE STUDY—THE COMING OF THE BLACK DEATH

No event in European or world history brought such widespread terror, misery and death as the plague which erupted in Europe in the late 1340s. The absolute numbers of deaths which occurred can only be compared with the World Wars of the 20<sup>th</sup> Century, and the *relative* impact—in terms of the proportion of the population that died—was far worse. The first visitation of the Black Death is thought to have killed one in every three people in Europe; and subsequent returns of the disease reduced the population yet further, so that in the 15<sup>th</sup> century it stood at no more than one-half, and perhaps only one-third of the level it had reached at its peak around 1300.

The mid-fourteenth century outbreak of plague undoubtedly reached Europe from central Asia. Bubonic plague (still the most likely, although not universally accepted agent of the Black Death) had been endemic in China, and a new and more virulent strain appears to have spread from there into central Asia in the late 1330s. Nomadic peoples and traders carried the disease westwards to the area of the Crimea by the 1340s. In 1347 Genoese traders unwittingly became infected with the disease at the port of Caffa on the Black Sea (today Feodosiya in Ukraine), and carried it back to Italy on board their galley loaded with spices. Other traders were probably responsible for the simultaneous appearance in 1347 of plague at Constantinople, and at Alexandria in north Africa. From these ports and regions of entry, the disease spread rapidly across Western Europe during the course of 1348, leaving death and disaster in its wake. During 1349 and 1350 the plague extended into the far west and north of the continent.

News spread ahead of the disease itself, so kingdoms and cities knew in advance of the awful blow which was about to fall upon them. Attempts were made to prepare for or avoid the ordeal, but little effective could be done as the nature of the plague, and the means by which it was spread, were not understood. The suffering and fear experienced by people are unimaginable, and the consequences for European society, culture and the economy were profound and long-lasting. The Black Death contributed to a power shift in European society, and, in western Europe at least, hastened the end of traditional forms of lordship and serfdom. Rising real wages gave working people new and unprecedented bargaining power, undermined seigniorial incomes and transformed the economy of town and country alike. Rising expectations among peasants and town-dwellers, blocked by lordly intransigence and recurrent warfare, contributed to some of the great popular upheavals of the later middle ages, including the Jacquerie in France (1358) and the Peasants' Revolt in England (1381). At the same time, declining population added to the pressures on the economy and on the existing settlement system, encouraging the disproportionate abandonment or shrinkage of villages in upland or other climatically and economically marginal locations.

Historians have long debated the precise causes and broader context within which the Black Death struck Europe in the mid-fourteenth century. For some, it counts as the prime example of an 'exogenous shock' to the socio-economic system—something striking from outside, unprecedented and unconnected to what had gone before—while others see it as crucially mediated by internal or 'endogenous' factors, hitting a society and economy already weakened by overpopulation, resource over-exploitation and subsistence crises. Recent reinterpretations are placing climate at the centre of the debate, as an overarching influence upon the course of change, as a short-term trigger, and as a specific influence upon the generation which endured the first onslaught of the Black Death.

The years 1314-17 and 1347-51, spanning both the beginning and climax of the Great Famine, and the arrival in Europe and subsequent spread of the Black Death, both emerge as periods of remarkable ecological dislocation, as indicated by divergent the patterns of tree-growth in the northern and southern hemispheres. The torrential rains of the famine years are reflected in a surge in the growth of



oaks in the British Isles—but weather which suited trees was disastrous for grain. Analysis of the deuterium content of Greenland ice-cores indicates that the rains were a product of abnormally warm Atlantic surface waters, which provided moisture and energy both for unusually intense and prolonged summer precipitation and for winter storms. Then, across the temperate world, trees register a prolonged growth trough between 1343 and 1355, while western Greenland temperatures - again reconstructed from deuterium content—register a sharp down-turn, culminating in levels in 1352-3 lower than any subsequent period, including the culminating decades of the Little Ice Age in the late 17<sup>th</sup> century.

The causes of these apparently global climatic and ecological convulsions are not yet understood—there appear to be no identifiable volcanic eruptions at the time of either the Famine or the Black Death—but their reality is becoming ever more apparent. It is clear that the harvest failures and epidemic diseases of the fourteenth century can no longer be viewed in isolation from this broader environmental context. Links *between* the 1315-18 famine and the Black Death are also receiving renewed attention, and are pointing towards a further, delayed impact of climate change upon the spread of the latter. Archaeological evidence from known Black Death cemeteries in London and elsewhere—set up hurriedly to contain the mass burials of the plague years—indicates that the part of the population most severely affected by the epidemic were young adults in the 26-35 years age group. This group would include those born during the Great Famine, and those whose formative years included those desperate times. Malnutrition in early life is known to predispose survivors to fall prey to epidemic disease.

Moreover, this was not a passing episode of reduced calorific intake. Studies of the livestock epidemics which followed the famine suggest a longer-term diminution of cattle stocks and of the supply of dairy produce which provided vital protein within the diet of the medieval poor. Long-term shortages of protein during childhood and adolescence would also have increased the vulnerability of adults in their twenties or thirties when the Black Death struck. The climate crisis of 1315-18 thus impacted on society at an even more profound level than might at first appear, and takes its place as a key element in the processes of change in later medieval Europe, closely linked to the subsequent plague. Climate did not 'cause' or 'determine' the course of change in the later middle ages, but was closely involved in both the long-term processes of economic change and settlement contraction and in the short-term subsistence and epidemiological crises which rocked the societies of the fourteenth century.

## STUDENT-CENTERED EXERCISES

### 1) MEDIEVAL WARM PERIOD

The 'Medieval Warm Period' and the associated Norse settlement of Greenland have become contentious 'political' issues, in the context of contemporary climate change. 'Sceptics' have seized on these themes as indicating that climate goes through natural cycles of change, and that contemporary warming is therefore not unprecedented and probably not primarily due to anthropogenic causes. They also accuse climate scientists of trying to minimise the importance of the MWP, in order to preserve the 'hockey-stick' graph of rapid recent temperature change. Thus, Christopher Booker's *The Real Global Warming Disaster* contains no fewer than 16 index references to the MWP!

***From a climate change 'sceptic' website:***

*For the past decade or more, climate-change alarmists have tried to deny the existence of the Medieval Warm Period (which used to be known as the Medieval Optimal before it became politically incorrect to think of a warm climate as desirable). Grapes grew in southern England. Norse settlers established farms in Greenland. And the plagues and territorial wars driven by scarcity that marked the Late Middle Ages were centuries in the future – centuries notable for their coldness during the Little Ice Age (1300 to 1850).*

*This drive to erase the MWP from climate history is what led to the infamous "hockey stick" graph that is so central to the UN's claims that our current warm period is to be feared. Scientists such as Mr. Jones [Prof. Phil Jones of UEA] know that if they can establish that there was no other warm era in the past 1,000 years — if global temperatures were mild and stable for the first 900 years and only shot up in the past 100 years as human production of carbon dioxide has increased — then industrialization can be blamed for threatening a climate apocalypse and the UN (and smart, activist scientists such as those at the CRU and IPCC) will have to be called in to help Al Gore save the planet by directing us all how to live.*

<http://www.climatechange-fraud.com/enviro-extremists/6540-the-only-thing-heating-up-is-the-debate>

Students should be encouraged to read some of the suggested resources on medieval Greenland and medieval climate change (below), to see how the historical data is cited and (mis)represented in the blogosphere and sceptic books and websites, and to form their own critical conclusions on the use and abuse of history in current debates on climate change.

How does historical evidence for the MWP and subsequent climatic deterioration contribute to current debates? How should historians react to the use and misuse of their findings in the political arena? How does one marry personal concern and advocacy of action to tackle climate change in the present with the supposed critical detachment of the historian?

## 2) BLACK DEATH AND CLIMATE CHANGE - LOCAL AREA STUDY

An alternative exercise, for those with some experience of or interest in local/ landscape history

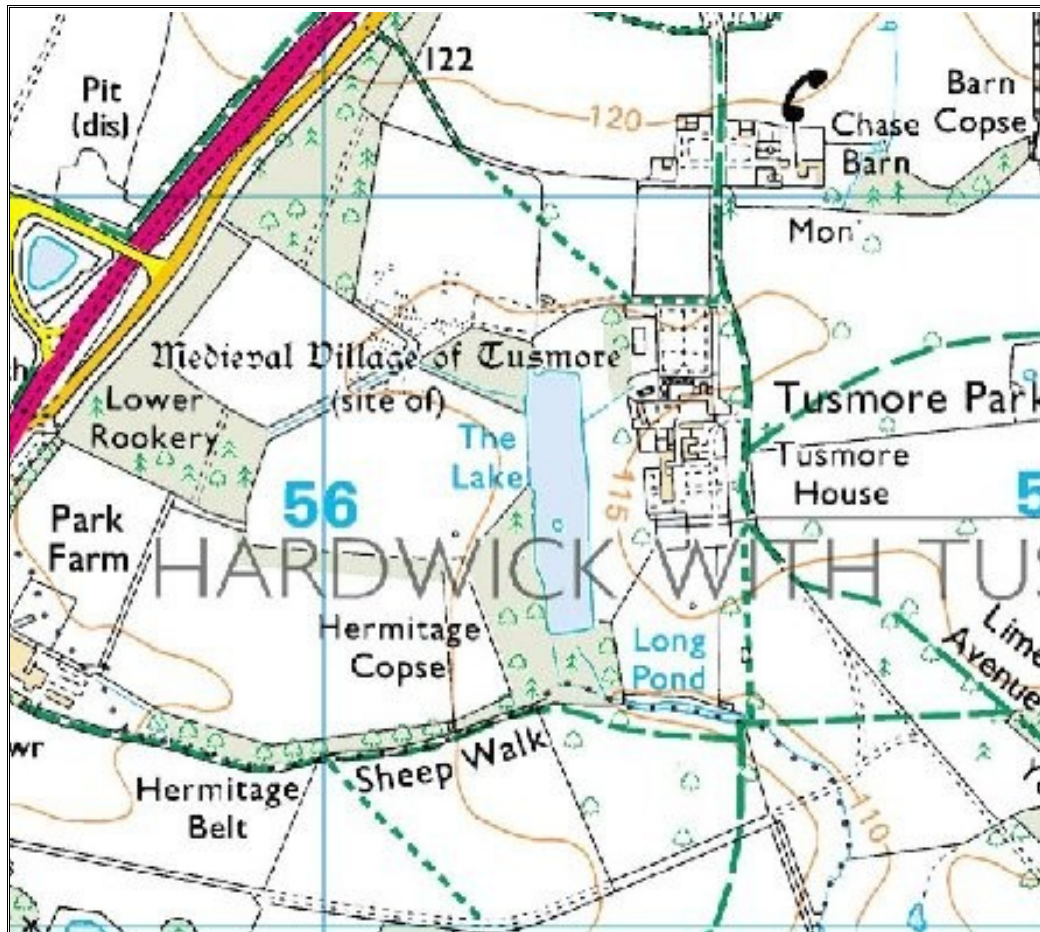
England is dotted with the sites of deserted or radically shrunk settlements of medieval date, and examples have also been identified in parts of Scotland and Wales. Large numbers of similar deserted settlements are also known from continental Europe. In Ireland the contraction of the Anglo-Norman colony there was associated with a decline in grain growing and the abandonment of settlements.

Settlement desertion took place for a variety of reasons, social and economic as well as climatic. However, changing environmental parameters provide an overarching context for the shifts in land-use and population distribution in the later middle ages which underlay the abandonment or shrinkage of settlement. Cooler conditions no longer favoured arable farming and nucleated settlement in many upland areas, while increasing wetness made some valley-floor locations inhospitable and some areas of reclaimed marshland experienced long-term flooding by the sea or fresh-water.

Students should attempt to locate examples of shrunken or deserted settlements from their local area, using Ordnance Survey maps, internet resources, local histories or (where they exist) volumes of the *Victoria County Histories* (see example). What can be discovered about the chronology of the settlement's desertion/shrinkage? Was the settlement abandoned soon after the Black Death, or much later? What can be said about land-use in the area? Are there factors in the settlement's location (altitude, remoteness, drainage) which might have predisposed it to being abandoned during a period of climatic deterioration and population decline?

For larger towns/cities, what was the effect of the Black Death upon population and prosperity? How did trade and economy change after 1350?

*Example: Tusmore, Oxfordshire*



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Tusmore lies on the Great Oolite, which is covered by fine flint gravel along the Hardwick boundary. The soil is mostly stonebrash. Most of the parish lies just below the 400-foot contour line, but it rises to 412 feet in the north... Fourteenth-century tax lists confirm the... picture of a small community: in 1327 only seven persons contributed to the tax. The village's normal tax after 1334 was 21s. 6d., but in 1354 it received an abatement of the whole sum. The Black Death struck the village with particular severity. A writ of 1358 refers to the death from the pestilence of the bondmen on Roger de Cotesford's fee and implies that the whole village had become deserted. He was licensed to enclose it. It never seems to have been resettled: it paid no tax in 1428 since there were fewer than ten householders, and it does not appear on the 16th-century subsidy rolls or in the return for the Compton census of 1676. Division of the parish into enclosures may have soon followed the depopulation and imparking of the 14th century.

From: 'Parishes: Tusmore', A History of the County of Oxford: Vol 6 (1959).  
URL: <http://www.british-history.ac.uk/report.aspx?compid=63753&>; Date accessed: 03 June 2010.

## RESOURCES

### MEDIEVAL CLIMATE

Wolfgang Behringer, *A Cultural History of Climate* (Cambridge, Polity, 2010), chapters 2 & 3.

R. Brazdil et al., 'Historical climatology in Europe: the state of the art', *Climatic Change* 70 (2005), available online (SpringerLink) at: <http://www.springerlink.com/content/n045572u43265th2/>

Bruce M. S. Campbell, 'Nature as Historical Protagonist', The Tawney Memorial Lecture 2008, podcast at: <http://www.yada-yada.co.uk/podcasts/Blackwell/video/Tawney2008/index.html>

Text of the above in *Economic History Review* (2010), online at: <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1468-0289.2009.00492.x>

Medieval environmental history timeline, at: [http://www.eh-resources.org/timeline/timeline\\_me.html](http://www.eh-resources.org/timeline/timeline_me.html)

Chronology of late Holocene climate change by J.S. Aber, Emporia State University, Kansas: <http://academic.emporia.edu/aberjame/ice/lec19/holocene.htm>

### LATE MEDIEVAL STORMINESS AND FLOODING

J.A.Galloway, 'Storm flooding, coastal defence and land use around the Thames estuary and tidal river c.1250–1450', *Journal of Medieval History* 35 (2009), online (Science Direct) at: <http://dx.doi.org/10.1016/j.jmedhist.2008.12.001>

The reclamation and flooding of Romney and Walland marshes are summarised at: <http://www.liv.ac.uk/geography/RomneyMarsh/RM%20Hum%20and%20Nat/EarlyMedieval.htm>

Christian Pfister, 'Historical climatology and the cultural memory of extreme weather events', podcast at: <http://www.eh-resources.org/podcast/podcast2009.html>

### THE NORSE IN GREENLAND

L.K. Barlow et al., 'Interdisciplinary investigations of the end of the Norse Western Settlement in Greenland', *The Holocene* 7 (1997), online at: <http://hol.sagepub.com/cgi/content/abstract/7/4/489>

D.M.Brown, 'The fate of Greenland's Vikings', online at: <http://www.archaeology.org/online/features/greenland/index.html>

### SCEPTICS AND COUNTER-SCEPTICS

C. Booker, *The Real Global Warming Disaster* (Continuum, 2009)

<http://www.climatechange-fraud.com/enviro-extremists/6540-the-only-thing-heating-up-is-the-debate>

<http://www.monbiot.com/archives/category/climate-change/>

<http://www.skepticalscience.com/argument.php>

#### THE GREAT EUROPEAN FAMINE

The standard work is W.C. Jordan, *The Great Famine: Northern Europe in the early Fourteenth Century* (Princeton UP, 1996).

Philip Slavin, 'The Fifth Rider of the Apocalypse: the great cattle plague in England and Wales and its economic consequences, 1319-50' available through Google Books, at:

[http://books.google.ie/books?id=zeyGOrJ7jjIC&pg=PA165&dq=philip+slavin&hl=en&ei=lzHhS6TuEofP-QaUp4n2Dg&sa=X&oi=book\\_result&ct=result&resnum=1&ved=0CDMQ6AEwAA#v=onepage&q=philip%20slavin&f=false](http://books.google.ie/books?id=zeyGOrJ7jjIC&pg=PA165&dq=philip+slavin&hl=en&ei=lzHhS6TuEofP-QaUp4n2Dg&sa=X&oi=book_result&ct=result&resnum=1&ved=0CDMQ6AEwAA#v=onepage&q=philip%20slavin&f=false)

Johannes de Trokelowe, a contemporary's account of the outbreak of famine in England in 1315:

<http://www.fordham.edu/halsall/source/famin1315a.html>

#### THE BLACK DEATH

Daniel Antoine, 'The Archaeology of Plague', online at:

<http://ukpmc.ac.uk/picrender.cgi?artid=1715615&blobtype=pdf>

Black Death cemetery in London:

<http://www.museumoflondon.org.uk/English/Collections/OnlineResources/CHB/Database/Medieval+cemeteries/ESmithfieldBlackDeath.htm>

R. Horrox, *The Black Death* (Manchester Medieval Sources), (Manchester UP, 1994).

#### SETTLEMENT DESERTION

A very brief introduction to 'lost villages' from Channel 4's Time Team:

[http://www.channel4.com/history/microsites/T/timeteam/snapshot\\_villages.html](http://www.channel4.com/history/microsites/T/timeteam/snapshot_villages.html)

See also 'Lost Villages' in

[http://books.google.ie/books?id=INmdwCSkvlG&pg=PA6&dq=lost+villages&hl=en&ei=msfqS6PTG-CpsQbdks2EDw&sa=X&oi=book\\_result&ct=result&resnum=7&ved=0CEoQ6AEwBjhG#v=onepage&q=lost%20villages&f=false](http://books.google.ie/books?id=INmdwCSkvlG&pg=PA6&dq=lost+villages&hl=en&ei=msfqS6PTG-CpsQbdks2EDw&sa=X&oi=book_result&ct=result&resnum=7&ved=0CEoQ6AEwBjhG#v=onepage&q=lost%20villages&f=false)

Ian D. Whyte and Angus J. L. Winchester eds., *Society, Landscape and Environment in Upland Britain*, Society for Landscape Studies, supplementary series 2, 2004

*Victoria History of the Counties of England*. The definitive local histories of English counties, with many references to deserted and shrunken medieval settlements. Not all counties are covered, and many remain in progress (after 100 years!). The Institute of Historical Research's *British History Online* provides free online access to 159 volumes: <http://www.british-history.ac.uk/catalogue.aspx?type=1&gid=153>

## UNIT 4: THE COMING OF THE ANTHROPOCENE

### INTRODUCTION AND LEARNING OUTCOMES

This module looks at a specific aspect of the emergence of the Anthropocene—one which has had profound implications for the future of the planet—the rise of fossil fuels as the main source of heating and industrial energy used by human beings. Students will be introduced to the outlines of the pre-fossil fuel economy, which rested upon the exploitation of biomass fuels augmented by wind, water and muscle power. They will then learn how coal came to displace wood and other biomass fuels as the principal fuel of Britain and Ireland during the Early Modern period, and how this process was largely completed *before* the Industrial Revolution. The case-study of London, the first world-city to undergo the transition from wood to coal, is used to focus upon the key factors involved in the process. The repercussions of this radical change upon society, environment and the climate system are brought out, and the implications for contemporary energy issues considered.

### THE ANTHROPOCENE

The concept of the ‘Anthropocene’ as a new era of earth history, following on from the post-glacial Holocene period which began c. 12000 years ago, is one to which this course returns at various points. The term was coined by Paul Crutzen in 2000, and is generally taken to relate to the period since the Industrial Revolution of the later eighteenth century, when new technologies began to transform humanity’s impact upon the world’s landscapes and ecosystems. There is no universally agreed definition, however; some writers have argued that profound human impacts upon the planet, and upon the composition of its atmosphere, can be traced far back into prehistory, while others see the range and intensities of impacts attaining a fundamentally new and unstoppable character in the second half of the twentieth century. There is a strong case to be made for the Early Modern period—generally taken to cover the periods 1500-1750 or -1800—as crucial in the emergence of the Anthropocene. During these centuries, European expansion brought previously isolated societies into contact and set in chain radical and often damaging changes in natural ecosystems. The power of the state was augmented, including its capacity to marshal natural resources and foster trade in primary products and manufactures. Schemes of drainage, reclamation or ‘improvement’ brought some previously wild or economically peripheral areas into full participation in the commercial economy, marginalising traditional cultures and natural ecosystems. Beginning in Britain, a fundamental change in the energy basis of society took place during these centuries, as fossil fuels moved from the margins to centre stage.

### ENERGY AND SOCIETY IN LATE MEDIEVAL BRITAIN AND IRELAND

In the decades around 1300 population stood at a historically high level. It is likely that more people lived in Britain and Ireland then than at any previous period, and more than were to live there again until c.1600 or later. Although most lived in the countryside, urbanisation had made significant progress and cities and towns such as London, Dublin, York and Berwick were involved in extensive networks of domestic and international trade, which channelled foodstuffs and other bulky produce from country to town as well as handling high valued, luxury goods and manufactures for elite consumption. This populous and increasingly complex society rested upon an essentially organic energy base. Land transport and ploughing were undertaken by animal power. Milling and other forms of food processing harnessed the power of wind and water, supplemented by human and animal power through hand and horse-mills. Domestic heating and industrial energy were supplied substantially—but not exclusively—by wood. The exception was the niche consumption, from at least the twelfth century, of small quantities

of coal in certain industries, notably metal-working, as a substitute for charcoal. Nevertheless, domestic fireplaces, bakers' ovens, potters' kilns, brewers' vats and a host of other industrial processes were almost exclusively fuelled by wood and other biofuels in 1300.



Coppice Woodland, Hertfordshire

(Photo: © Copyright Richard Mills and licensed for reuse under this Creative Commons Licence)

The wood fuel consumed by urban and rural households, crafts and industries was of a wide variety of types. Different users demanded a range of specialised fuels, to which producers and middlemen responded accordingly. Thus, for example, log-wood was the normal fuel in domestic fireplaces and for heating vats of ale or dye-stuffs (such as madder and woad used for colouring cloth), but kilns and ovens operated most effectively when fired by bundles of small sticks (called faggots), which created a rapid and intense blaze. Blacksmiths, by contrast, required charcoal, wood transformed through a lengthy process into a purer relatively smokeless fuel capable of generating sustained heat. Much of this varied fuel was the produce of carefully managed woods, especially in more densely populated lowland districts. The system known as coppicing, whereby deciduous trees are cropped on a regular cycle and allowed to re-grow, provided a continuous, sustainable supply of wood for fuel, as well as for fencing, tool-manufacture and a host of other uses. In more remote and upland areas, wood might be cropped in a less systematic way, with clear-felling of some areas, but almost everywhere by 1300 woodland was viewed as a valued resource, rather than as unproductive waste. Supplementing wood, in areas less well-endowed, were other biofuels, including straw from the arable fields, furze or gorse from rough hill-sides, and the 'semi-fossil' peat or turf, extracted in large quantities in parts of the British Isles, including East Anglia, where medieval peat digging led to the creation of the Norfolk Broads.





Woodcutters, early fourteenth century

(Reproduction in J.J. Jusserand, *English Wayfaring Life in the Middle Ages*, London, 1889, based on British Library Ms 10 E. IV)

Efficient and diverse as medieval woodland management was, there are signs that by c.1300 the wood-fuel system was coming under significant pressure as a result of population growth and urbanisation. Overall, the British Isles were not well wooded compared to most parts of continental Europe. England in the late 11<sup>th</sup> century had around 15% of its area under wood, but by 1300 this had fallen to no more than 10%. This significant reduction was not due to woods being 'used up' for fuel and building materials, but rather to their being progressively nibbled away at by the demands of a growing population for more farmland—'assarting' by peasants and clear-felling by lords led to the progressive conversion of woodland into arable and pasture over the course of the twelfth and thirteenth centuries. Firewood prices were rising more rapidly than those of other commodities in southern England, indicating a growing scarcity. In Surrey prices rose by over 50% between the 1280s and the 1330s. Royal concern is indicated by attempts in 1290 to halt the large-scale export of 'timber, brushwood and charcoal' from Kent and Sussex to northern France and the Low Countries. Perhaps most significantly of all there are signs that coal was beginning to expand its role beyond the specialised industrial niches it had already occupied. Large quantities of coal were burnt in lime-making during the Welsh castle-building campaign of 1290s, and, as will be seen in the case-study below, growing complaints of air-pollution in London point to increasing use of the fossil fuel there before 1350.

This growing use of coal was decisively halted in the mid-fourteenth century by the arrival of plague and the collapse of population levels. The population of England, which may have stood at 5 millions in 1300, fell to less than half of that level during the course of the later fourteenth and fifteenth centuries, and similar declines affected Scotland, Ireland and Wales. Fewer people meant a reduced demand for fuel, and at the same time an increase in its supply. Less land was needed for growing grain, and while much of the surplus was given over to sheep-farming there is evidence for an increase in the wood-cover in some regions. As a result, the incipient fuel crisis of the Middle Ages was averted, wood prices fell and remained low, and the expansion of the use of coal was halted for nearly two centuries.

#### THE TRANSITION FROM WOOD TO COAL

Population growth may have resumed on a small scale in the late fifteenth century, but its effects only become noticeable in the second quarter of the sixteenth century. During the following hundred years the number of people in Britain and Ireland approximately doubled, bringing population levels back to what they had been at their medieval peak. This was more than a repetition of the same cycle of demographic growth, price rises and growing scarcity however. New factors in the sixteenth century placed even greater demands upon the organic economy and its wood-fuel resources. Increasing standards of domestic comfort necessitated more timber for furniture as well as for structural work, increasing use of chimneys and fireplaces meant that the houses of townsmen and wealthier country people burnt more fuel than previously, while the growth of naval power in England and to a lesser extent in Scotland placed a rising burden upon the woods to provide the raw materials for ship-building. Urbanisation, in particular the rapid and unprecedented growth of London, placed strain on both supply and distribution systems, while rural ironworks consumed vast quantities of wood. Climatic deterioration, as Europe moved towards the culmination of the Little Ice Age, increased the overall demand for fuel, both for heating and for other vital purposes such as drying corn in wet harvest seasons.

Signs of strain upon the wood-fuel system were already evident before 1550. As early as 1503-4 the Scottish Parliament claimed that the woods there were 'utterly destroyed', while an Act of the English Parliament passed in the 1543 spoke of a 'great decay of Tymber and Woodes' which threatened scarcity of both building timber and wood-fuel. A fine of 40s per acre was to be levied on those who converted coppice-wood into pasture or tillage. The ineffectiveness of such measures is shown by the astonishing inflation in firewood prices, which rose far faster than those for foodstuffs, quadrupling between the 1540s and the 1580s, and reaching ten times their 1540 level by the 1620s. The developing fuel crisis, like all subsistence crises, hit the poor first and hardest. Soaring prices encouraged landless labourers and cotters to take fuel where they could find it, in other mens' woods, or in hedges and fences, creating a new offence of 'hedge-tearing' punishable by the stocks at Coventry and expulsion from the town at Leicester. At High Wycombe in 1563 anyone found bringing pilfered firewood to the town faced the stocks. By the end of the century these problems had become endemic, even in well-wooded parts of the country, and both local by-laws and national legislation attempted to curb them. The perception that these offences were prompted by a real shortage of affordable firewood however, led to a gradual change in emphasis, and towns and parishes increasingly introduced measures to control prices and to supply the 'deserving poor' with fuel. Worcester Corporation undertook to provide the poor with firewood in 1565 and in 1570s took measures aimed at controlling fuel prices, while the mayor of St Albans purchased a small area of woodland in which the town's poor could forage for fuel. Contemporaries had little doubt that they were living through a period of crisis, and that its cause was a growing shortage of woodland. Were they correct? It is probable that England and Wales retained 8-9% woodland cover by c.1600, whereas in lowland Scotland the figure may have been c.4%. Ireland remained relatively well-wooded with perhaps 12.5% of the land area under trees, although the depredations of iron-works, the timber export trade and clearance of woods for political and military reasons would soon reduce that figure markedly. These figures, although low by comparison with well-wooded European countries such as France, do not in themselves suggest an absolute scarcity of biomass fuels, as well-managed woods could produce a substantial and sustained output of fuel. Rather the problem was one of the relative locations of woods and consumers. All fuels are bulky and expensive to transport, and sources of local supply are essential to keep prices down. The fact that much wood might remain in parts of the Scottish Highlands was therefore not of great help to

consumers in Edinburgh or Dundee, just as the existence of extensive woodlands in the land-locked central Weald of Kent and Sussex did not keep fuel prices down in London. Proximity to concentrations of population, or access to cheap water transport, were essential to draw woods into the commercial supply system.

The mismatch between accessible wood supply and demand was most noticeable in the towns of eastern England, and it was consequently here that coal made its major breakthrough during the course of the sixteenth century. The coal-fields of north-eastern England had long supplied local consumers with domestic fuel as well as sending small quantities further afield, especially for blacksmithing. As wood-fuel and other biomass prices soared after 1500, it became increasingly competitive to ship coal to urban markets all down the east coast and at inland locations accessible by the Thames and the river systems feeding into the Wash. Coal shipments from Northumberland and Durham grew from around 45,000 tons annually around 1510 to over 220,000 tons per year by 1600, and some half a million tons per year by the middle of the seventeenth century. Towns such as Cambridge had by the close of the sixteenth century come to be fuelled predominantly by coal shipped from the north-east. Other coal fields located close to the sea or navigable waterways showed similar if less spectacular growth. In Scotland exposed coal seams lay to the north and south of the Firth of Forth and beside the Ayrshire coast. This accessibility, allied to a notable paucity of woodland, led to early development of mining, and many Scottish burghs came to depend upon the fuel before the mid-sixteenth century. Edinburgh's nick-name 'Auld Reekie' derives from its early adoption of coal and the characteristic smoke of coal-fires. Similarly, the Welsh coal-fields display some early development, based upon the satisfying of local demand and a coastal export trade. The towns of eastern Ireland imported Welsh coal, but more especially coal from the Whitehaven collieries in north-west England. Inland coalfields, such as those of Yorkshire and the West Midlands, were largely restricted by the expense of transport to supplying local markets in the Early Modern period, their full potential only realisable later during the canal and railway ages.

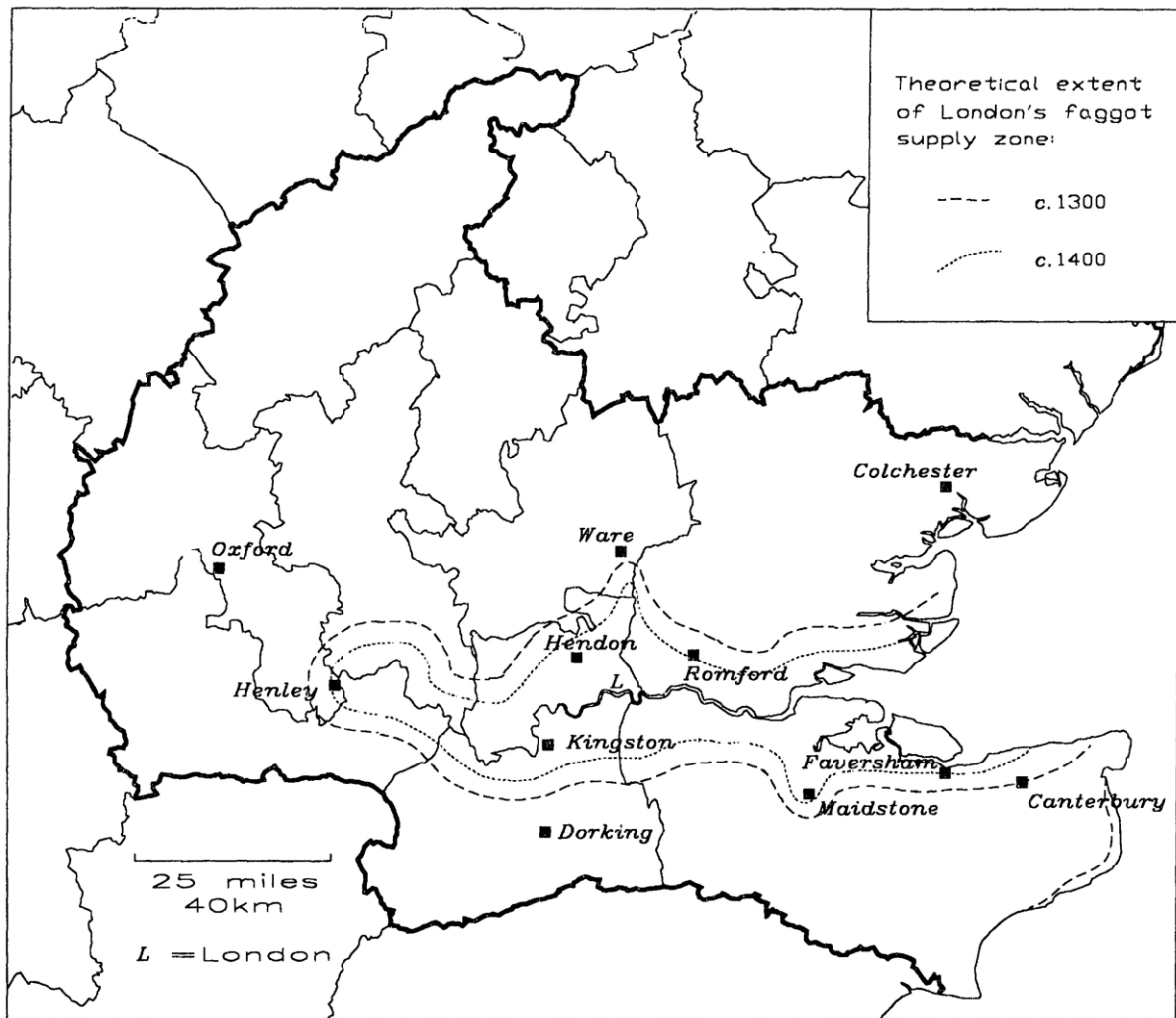
By 1700 Britain's coal-fields were producing some 3 million tons of coal per year, more than ten times the output in 1550, and substantially more than the whole of the rest of the world. The foundations had been laid for fuelling the industrial revolution and the mass urbanisation of the later eighteenth and nineteenth centuries. Comparing the estimated output of the collieries with the estimated fuel contribution of woodlands proves beyond doubt that coal was by 1700 supplying the majority of Britain's energy needs. Taking England alone, for which the most robust estimates are available, the less than 3 million acres of woodland then existing, if managed highly efficiently and solely for fuel production, could not have matched the calorific output obtained from the 2-2.2 million tons of coal which English mines were yielding each year. When we consider that some woodland was not managed to maximum efficiency, and that woods had in reality to provide structural timber for houses and ship-building, rods and poles for fencing and tool-manufacture and a host of other purposes *in addition* to providing firewood and other wood fuels, it is clear that coal in 1700 supplied the great bulk of energy consumed, perhaps more than three-quarters. On this basis coal must have become the principal fuel of England, and of Scotland, Wales and coastal Ireland, significantly earlier, perhaps no later than 1600. Sustainable wood-fuel systems can be essentially carbon-neutral, growing trees sequestering carbon released by the burning of dead wood. Burning coal, however, releases carbon sequestered by plants millions of years ago, with no compensating take-up of CO<sub>2</sub> from the atmosphere. It is clear, therefore, that Britain's contribution to the build-up of atmospheric CO<sub>2</sub> became significant as long as four centuries ago.

## CASE STUDY—LONDON’S TRANSITION FROM BIOFUEL TO FOSSIL FUEL CITY

Of all the supplies required by a major preindustrial city, fuel was the one in which constraints of cost and distances were most critical. London, which with some 80,000 people in 1300 dwarfed all other urban centres in the British Isles, generated a significant aggregate demand for fuel. Making bread and ale required considerable quantities of fuel to fire ovens and heat brewing vats, while other forms of cooking, and the many industrial processes carried out in the city and suburbs, all added to the total, as did domestic heating which increased in importance in the later middle ages as standards of comfort increased. In total, London may have required some 140,000 tons of fuel wood annually c.1300 and perhaps 90,000 tons a century later. Much of the requirement naturally fell upon the immediate hinterland, where the accessible woods of Middlesex and Surrey were highly valued and intensively managed. This part of England contained an above average proportion of woodland—around 20% of the land area c.1350 compared to a national average of 10% - partly due to environmental factors, but partly, it seems clear, because the woods were being preserved and managed in a sustainable manner to provide a self-renewing source of fuel and timber for London and other southern markets.

The accessible woods of south-eastern England—in Middlesex, Surrey, parts of the southern Chiltern Hills, coastal Kent and Essex—were managed on variable coppicing cycles to produce the large quantities of faggots and bavins (bundles of rods or sticks tied by one or more band) and the larger dimension billets and talwood (small logs) required in London for baking, brewing and heating. The predominance in these woods of short cropping cycles - usually no more than ten years, but sometimes as short as four or five years - indicates the bias of demand towards firewood production. Manors at such places as Hampstead, Hendon, Edgware and Acton in Middlesex generated sizeable income each year from the sale of faggots, while charcoal, used in a variety of industrial processes and for heating, was brought overland by packhorse from locations up to c.40km from London. As a processed fuel, it was more valuable relative to its bulk than was wood, and could hence economically be carried further. Specialised London woodmongers were active within the Thames valley, and made much use of river transport, bringing supplies from western Surrey and the southern Chiltern Hills via river ports such as Henley, Marlow and Kingston.

Much of the extensive woodlands of the Kentish and Sussex Weald, by contrast, were inaccessible to London, given the high cost of transporting bulky wood overland, and the relative expense of the sea journey from the south coast around the north foreland of Kent. Some supplies from this region reached the capital via Maidstone and the river Medway, and the Wealden woods were also home to an iron industry which supplied London's metal trades. However, perhaps more important as a commercial outlet for the Wealden woods were the fuel-hungry towns of the Low Countries, to which they regularly sent large quantities of billets and other types of firewood via the river Rother and the port of Winchelsea.



Model of the zone supplying London with firewood in 1300 and 1400

Source: J.A. Galloway, D. Keene and M. Murphy, 'Fuelling the city: production and distribution of firewood and fuel in London's region 1290-1400', *Economic History Review* xlix (1996), 447-72.

Whereas there is little to suggest that London's grain supply system had been under particular strain at the period of the city's maximum medieval population c.1300, the same does not seem to be true of fuel. Prices of faggots and other types of firewood increased much more rapidly than those of grain, with a doubling taking place in the sale prices obtained by the manor of Hampstead, 8km from London, in the late 1280s and early 1290s. Similar if less dramatic increases are evident in other parts of the city's immediate hinterland in the late thirteenth and early fourteenth centuries. By contrast the price of coal rose much less rapidly, which encouraged an increase in its consumption. Coal was brought to London by sea from north-eastern England (hence its common name of 'sea-coal') and from the twelfth century it occupied a niche in the London fuel market for blacksmiths and other industrial consumers. London also acted as a centre for re-export. While firewood was plentiful, widespread use of coal within London was resisted, as its smoke was considered noxious. An ordinance passed before 1299 banned night-working by the smiths on account of the unhealthiness of sea-coal (*propter putridinem carbonis marine*).

Rising firewood prices stimulated increased coal consumption, but the population collapse of the mid-fourteenth century averted a wholesale switch of fuels for over two centuries. By the mid-sixteenth century, however, London had regained its medieval peak population level, and soon proceeded to greatly exceed it, growing to some 200,000 by 1600 and exceeding half a million people by 1700. It is highly unlikely that growth of this magnitude and rapidity could have been sustained by an exclusively or largely biofuel system. It did not have to, as within a couple of generations the 'general fuel' of London switched from wood to coal. A short-term fuel crisis is recorded in the years 1542-3 when one London chronicle notes 'a great dearth for wood and coals', which seems to have directly stimulated both the Parliamentary Act of 1543 and actions by the government of London. In 1554 the city's Common Council initiated a local tax to provide a supply of sea-coal, to be made available to the poor in times of hardship. Institutions such as Westminster College, which had formerly burnt only wood, began to consume coal in the 1580s, and by the early seventeenth century were purchasing large quantities each year. This reflects the rather late switch made by wealthier individuals and institutions, who could afford to continue burning wood for much of the sixteenth century despite its growing expense. Their preference was based upon objection to the acrid smoke generated by burning coal. The poor had no such luxury of choice, and switched en masse to coal-burning soon after 1550. Even the rich were obliged to change their habits by the early seventeenth century however, as obtaining heat from wood or charcoal was by then 50-100% more expensive than obtaining the same heat energy by burning coal. 'Sea coal and pit coal is become the general fuel of this Britain Island, used in the houses of the nobility, clergy and gentry, in London and in all other cities and shires of this kingdom, as well for dressing of meat, washing, brewing, dyeing as otherwise' wrote the continuator of John Stow's *Annales* in 1612. While undoubtedly framed by a metropolitan perspective, this observation is just one of many which identifies a radical change in the energy basis of society, one which had essentially occurred within the span of a single human lifetime. In London, the process was largely complete by 1612, and was diffusing outwards both as a facet of culture and more importantly as an economic imperative. London's growth at this period was far faster than that of rival cities, such as Paris, which had less easy access to coal. As a result, Paris had to devote much larger areas of its hinterland to the production of wood fuel, with serious implications for food supply. By contrast, in the hinterland of London, woods which had sustained the city for centuries were, in the sixteenth century, being cut down and converted into pasture, arable and horticultural land; as a resource they had become devalued by the switch to a cheaper and (apparently) infinitely-expandable fuel supply.

This transition marks a milestone in the emergence of the Anthropocene. For the first time in world history a major city had largely freed itself from the constraints of the organic economy, and unleashed the potential of fossil fuels. From our 21<sup>st</sup>-century point of view, this marks a more dubious turning point, a movement away from essentially carbon-neutral technologies to carbon-intensive, atmosphere-changing ones. Contemporaries did not understand the long-term implications, of course, but suffered and protested against the immediate problem of smoke pollution and bad air quality. John Evelyn's *Fumifugium or the Inconvenience of the Aer and Smoake of London Dissipated* published in 1661 was only the latest in a long line of complaints and diatribes against the 'fuliginous and filthy vapour' which comprised London air, and which brought with it many health problems for the city's inhabitants. Evelyn recommended a reversion to wood-burning, and the establishment of new woodlands to supply London, but in this he was at least a century too late. The coal-based economy was spreading to encompass the whole of the British Isles, and would soon take a further quantum leap forward with the emergence of industrialisation and mass urbanisation.

## STUDENT-CENTERED EXERCISE

Students should read a selection of the literature on the fuel history of Britain, and then look at these suggested readings on wood-fuel use in contemporary Africa:

BBC article on fuel use and environmental degradation in Tanzania:

[http://www.bbc.co.uk/focusonafricamagazine/news/story/2009/09/090925\\_tanz\\_charcoal.shtml](http://www.bbc.co.uk/focusonafricamagazine/news/story/2009/09/090925_tanz_charcoal.shtml)

Project on sustainable wood fuel use in Senegal:

<http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/0,,contentMDK:21290074~menuPK:64282137~pagePK:41367~piPK:279616~theSitePK:40941,00.html>



They should also be encouraged to use the internet to locate more material on contemporary wood-fuel consumption and issues of sustainability.

The following points and questions could then be used as the basis for group discussion:

- Britain ceased to get most of its energy from wood and other organic sources soon after 1600. How realistic is it to expect developing countries to achieve sustainable development on the basis of biofuels?
- If coal had not been readily available in Early Modern Britain, how do you think the course of the country's development would have differed?
- Can wood fuels support urban lifestyles?
- What contribution can wood make to energy use in contemporary Britain?

## RESOURCES

### WOODLAND AND FUEL HISTORY

A.D. Dyer, 'Wood and Coal: a change of fuel', *History Today* 26 (1976), 598-607, online at:  
<http://web.ebscohost.com.eproxy.ucd.ie/ehost/pdfviewer/pdfviewer?vid=5&hid=109&sid=431c556c-12fd-48d1-8071-c4cc545e20be%40sessionmgr112>

J.F Richards, *The Unending Frontier: An Environmental History of the Early Modern World* (University of California Press, 2003, 2005), Chapter 6 'Landscape change and energy transformation in the British Isles'. Available on Google Books at:  
[http://books.google.ie/books?id=i85noYD9C0EC&printsec=frontcover&dq=j+f+Richards+unending&hl=en&ei=n5uQTMiqBZHNswas7u20AQ&sa=X&oi=book\\_result&ct=result&resnum=1&ved=0CC0Q6AEwAA#v=onepage&q&f=false](http://books.google.ie/books?id=i85noYD9C0EC&printsec=frontcover&dq=j+f+Richards+unending&hl=en&ei=n5uQTMiqBZHNswas7u20AQ&sa=X&oi=book_result&ct=result&resnum=1&ved=0CC0Q6AEwAA#v=onepage&q&f=false)

J. U. Nef, 'An early energy crisis and its consequences', (*Scientific American*, 1977), available online at:  
<http://newsgroups.derkeiler.com/Archive/Soc/soc.history.medieval/2008-07/msg00083.html>

K.J.W. Oosethoek, 'The role of wood in world history', online at: <http://www.eh-resources.org/wood.html>

The definitive study of the coal industry before the Industrial Revolution is J. Hatcher, *The History of the British Coal Industry vol. 1: Before 1700* (Oxford University Press, 1993). Partial view at:  
[http://books.google.ie/books?id=3savIV4\\_smEC&printsec=frontcover&dq=hatcher+coal&hl=en&ei=TZ2QTJfcHsflswbfq9m1AQ&sa=X&oi=book\\_result&ct=result&resnum=1&ved=0CCwQ6AEwAA#v=onepage&q&f=false](http://books.google.ie/books?id=3savIV4_smEC&printsec=frontcover&dq=hatcher+coal&hl=en&ei=TZ2QTJfcHsflswbfq9m1AQ&sa=X&oi=book_result&ct=result&resnum=1&ved=0CCwQ6AEwAA#v=onepage&q&f=false)

For a short introduction to the north-east England coal trade see:  
[http://www.englishspastforeveryone.org.uk/resources/assets/E/Early\\_coal\\_trade\\_1178.pdf](http://www.englishspastforeveryone.org.uk/resources/assets/E/Early_coal_trade_1178.pdf)

The best treatment of traditional woodland management and history is O. Rackham, *Ancient woodland* (1980, New Edition, Castlepoint Press, 2003)

For a basic introduction to traditional and modern management of coppice woodland, see:  
<http://www.coppice.co.uk/>

### LONDON—FROM WOOD TO COAL

*For the medieval period see:*

J.A. Galloway, D. Keene and M. Murphy, 'Fuelling the city: production and distribution of firewood and fuel in London's region 1290-1400', *Economic History Review* xlix (1996), 447-72, available online via JSTOR at: <http://www.jstor.org/stable/2597759>

R.C. Hoffman, 'Footprint metaphor and metabolic realities: environmental impacts of medieval European cities', in P. Squatriti ed. *Nature's Past: The Environment and Human History* (University of Michigan Press, 2007), 288-325



*For the post-medieval transition to coal, see Dyer, Hatcher and Richards cited above.*

*Issues of pollution:*

William H. Te Brake, 'Air Pollution and Fuel Crises in Preindustrial London, 1250-1650', *Technology and Culture* 16 :3 (Jul., 1975), 337-359 and online via JSTOR at: <http://www.jstor.org/stable/3103030>

P. Brimblecombe, *The Big Smoke: a history of air pollution in London since medieval times* (Methuen, 1987), partial view online at:  
[http://books.google.ie/books?id=rB4OAAAAQAAJ&printsec=frontcover&dq=the+big+smoke&hl=en&ei=-s-QTImWKdCVswahn\\_C1AQ&sa=X&oi=book\\_result&ct=result&resnum=1&ved=0CCYQ6AEwAA#v=onepage&q&f=false](http://books.google.ie/books?id=rB4OAAAAQAAJ&printsec=frontcover&dq=the+big+smoke&hl=en&ei=-s-QTImWKdCVswahn_C1AQ&sa=X&oi=book_result&ct=result&resnum=1&ved=0CCYQ6AEwAA#v=onepage&q&f=false)

## UNIT 5: CAPITALISM AND THE ORGANIZATION OF NATURE

### INTRODUCTION AND LEARNING OUTCOMES

This unit investigates the relationship between the history of capitalism and climate change. It is widely recognized that industrialization has played a key role in anthropogenic climate change. For some environmental historians, such as Clive Ponting, industrialization and technological change appear to be a sufficient explanation of the roots of our current predicament. This unit, however, encourages students to question the representation of industrialism as a cause of anthropogenic climate change. It aims to provide students with an insight into historical interpretations that challenge the association of industrialism with environmental degradation, and instead focus on the particular form of industrial *organization* presented by capitalist social relations. It is built around a literature that discusses two key theoretical approaches: the concept of the 'Metabolic Rift'; and the relationship between gender, capitalism and ecological change.

Students should:

- Attain a basic understanding of what the concept of the 'metabolic rift' is and how it has been applied.
- Develop an awareness of the importance of social change in remaking the human relationship to nature.
- Be able to articulate the challenge to 'technological determinism' as an explanation of climate change.
- Demonstrate an understanding of the historically constituted character of environmental transformations

### GENERAL THEMES

#### *Capitalism and Climate*

A good point of entry into this literature, especially, if the focus is climate change, is Brett Clark and Richard York's 2005 article 'Carbon metabolism: Global capitalism, climate change, and the biospheric rift'. Brett and York identify two major areas of environmental change that have critically influenced the anthropogenic contribution to climate change: the first is increasing greenhouse gas emissions through changing energy production patterns; the second is the destruction of carbon sinks, especially deforestation. The authors argue that capitalism's unique dependence upon continuous economic growth is the fundamental cause of the present climate crisis. Previous modes of production, they argue, lived within the solar income restraint but capitalist growth (rather than industrial change) both required, and was able to transcend that restraint through the use of fossil fuels.

How does this process work? And what distinguishes an interpretation based on capitalism rather than industrialism as the root problem. Driven by the 'law of value', in which money rather than utility is the arbiter of rationality, Clark and York argue that under capitalism there is an inherent contradiction between the accumulation of exchange values in the money form and the objective interests of labour and nature, which are 'mystified' by the money relation. Under capitalism, objective interests based upon utility count for nothing if they get in the way of capital accumulation. If accumulation requires cheap energy sources, cost-free sinks for carbon pollution, and extensive transformation of land and

raw-materials, then this is what will happen regardless of the consequences for environment or climate. Given that capitalism *is* the continuous accumulation and extension of value, Clark and York argue that it cannot but both pollute the atmosphere and degrade carbon sinks. In the absence of political controls, which neo-liberal policies have attenuated since the 1970s, capitalism works to create a potentially catastrophic rift between human natural needs and nature itself:

*Capital is the systematic force organizing social production and driving industrialism to intensify the exploitation of nature. Given the logic of capital and its basic operations, the rift in the carbon cycle and global climate change are intrinsically tied to capitalism.* Clark and York, 'Carbon Metabolism' (2005), 4008

Hence, the inherent dynamics of capitalism, rather than industrialization, are the root cause of anthropogenic climate change.

### *Metabolic Rifts*

Clark and York are working with 'Rift Theory', which has its roots in classical sociology, specifically Marxist theory, rather than green theory such as 'deep ecology' of which it is generally quite critical. The theory's basis in Marxism means it deploys a number of key categories which are necessary for the student to grasp. Two of these stand out as requiring explanation.

The first of these is the category of the *mode of production*, and the capitalist mode of production in particular. J.W. Moore has given an excellent account of the relations between modes of production, environmental change and Rift Theory. Throughout his work, Marx posited that world history could be partly understood as a series of transitions between different modes of production. Different modes of production are characterized by different social relations, which form the basis for the productive activities taking place within human societies. Through most of history these relations have been exploitative in some way, with a labouring class producing a surplus that is expropriated by elite classes.

Under capitalism social relations are mediated by *money*, which hides and mystifies this process of exploitation. Money makes possible (and, due to the 'iron law of competition', necessary) the limitless accumulation of value. Indeed, capitalism is characterized by the dynamism of the process of accumulation, in contrast to other systems of exploitation such as feudalism that, while not static, do not share this capacity for extreme dynamism and creativity. Capitalist dynamism is however predicated on the necessity of continuous re-investment and growth as determined by capitalist competition. No capitalist can simply consume their capital without investing in new technologies or products or their competitors will eventually out-compete them. The result is that capitalism is hyper-productive of a social surplus, expressed in the form of money (this surplus is never fairly distributed under capitalism, but does provide the potential basis of another form of production and distribution—communism). Under a capitalist mode of production, then, 'Accumulation for accumulation's sake, production for production's sake' is what matters as Marx noted in *Capital*. The necessity of growth not rationality therefore determines the characteristics of capitalism's interaction with nature.

The second key concept used by rift theorists is that of the social metabolism, which Marx invokes in the first volume of *Capital* in order to express the flow of nature's material products within the productive relations of human society. It is worth noting that Marxist theory is extremely suspicious of the notion

of a society-nature dualism, which underpins much classical sociology, the roots of Marx's own thought were strongly historical and relativist, and opposed to any attempt to naturalize human social relations, through, for instance, Malthusian theory. The whole concept of a nature separated from the social is problematic for Marxism as Neil Smith demonstrates in his volume *Uneven Development: Nature Capital and the Production of Space*. For Marx it made no sense to pretend the social and natural were unconnected. This is one reason why some argue that he has little to say about 'nature', or that he has a 'promethean' attitude towards industrialization. However, Marx's position should not be taken as suggesting that human society has no relation to the biological or organic world. Indeed, quite the opposite is the case. For Marx, and Marxist theorists like Neil Smith society and nature are deeply intertwined in a social system of production and reproduction.

Every society possesses a system of production that has a basis in the relation to nature. Production regulates the ways in which nature is put to human use. The idea of the metabolic rift describes the transformations occurring when social relations and the productive relationship to nature are changing *simultaneously*. Any change in productive social relations must simultaneously require transformations of social relations to the natural world. Nature is therefore itself subject to a continuous process of reproduction through social relations. In other words, 'nature', as we experience it is not a given, but a product of *human interactions*. Under capitalism, rift theorists argue, the relation to nature is subject to constant revolution. As Moore presents it, capitalism produces crises in the social metabolism that are only overcome through the continuous spatial and ecological transformations of nature. Hence capitalism is responsible for the constant production of a *series* of metabolic rifts as it seeks to reconcile the imperatives of accumulation with existing ecological relations.

The idea of the metabolic rift has been the subject of debate among rift theorists. The most notable issue that had arisen is the point from which capitalist rifts can be traced historically. Moore and Foster offer different historical perspectives here. For Moore the metabolic rift is first identifiable in the emergence of ecological imperialism during the sixteenth century and the transformation of South American ecologies to service the needs of silver production for Europe. Foster, by contrast, presents the metabolic rift as a nineteenth-century phenomenon that accompanied the agricultural revolution and the subsequent degradation of the European (particularly British) soil. A more all-encompassing approach might be to see the 'rift' not as a single historical event but as a continuous tendency of capitalist society to create a crisis in its relationship to nature, which in turn has to be transcended regardless of the social or ecological consequences.

## CASE STUDY

Two key examples have been deployed as examples of the metabolic rift concept: the South American Silver Rush of the sixteenth century, and the Guano Rush of the nineteenth.

### SOUTH AMERICAN SILVER

Moore refers to the example of the Potosi silver mines, in what is now Peru, which fell into the hands of Spanish colonists in the sixteenth century. The Spanish need for silver was such that the easily accessible silver was quickly exhausted and the Spanish began to introduce more intensive methods of exploitation. One of these was the use of a forced labour system, in which indigenous labourers were effectively enslaved to work the mines, many thousands dying in the process. In order to house and feed these indigenous workers the entire agro-ecological system around Potosi was transformed. The city itself became one of the largest in the world at the time, and peasant agriculture was replaced by more intensive exploitation with the consequence of serious denudation of local forest and land. For Moore, Potosi is indicative of the way in which metabolic rifts don't just solve the short-term needs of capital accumulation but are also often associated with violence and unequal ecological exchange. While the Spanish colonizers unequivocally benefited from Potosi the indigenous people of the region were utterly diminished and degraded by the transformation of their local environment.

### THE GUANO RUSH

Foster and Clark's case study of the Guano Rush of the nineteenth century is a classic illustration of the impact of the metabolic rift on both people and nature. Their example focuses on the mid-nineteenth century 'Rush' on the Guano islands, in particular the Chincha Islands off Peru.

The early nineteenth century was a period of concern about declining agricultural fertility in the core states of Europe. Many commentators believed that modern 'high agriculture' in Europe was depleting the fertility of the soil. The early nineteenth century was a period of innovation in agricultural chemistry, with important insights into the role of nutrients in plant growth. The most influential text, Baron von Liebig's *Organic Chemistry in its Application to Agriculture and Physiology*, was published in 1840. Liebig pointed to the loss of soil nutrients due to urbanization and their transfer from town to country, a system he likened to robbery of the soil. Liebig's work on soil chemistry helped to spark a commercial interest in guano as a source of replacement phosphate and nitrogen. Peru had the largest high quality deposits of guano, as well as naturally occurring supplies of nitrate. From the 1840s with the experimental demonstration of the effects of guano on plant growth a great trade emerged, dominated by British commercial interests, and centered on the Chincha islands.

The emergence of the guano trade is indicative of a metabolic rift in so far as it was a solution to an environmental contradiction which capitalist agriculture had created. However, in its specific effects it is possible to trace how a rift in ecological relations in one place can be spatially moved by the flow of capital with important effects for the ecology and human social life of the areas affected. It also illustrates an unequal ecological exchange, which is often the consequence of efforts to sustain capitalism's relation to nature.

We might think of the main consequences as follows:

1. Degradation and denudation of the Chincha Islands themselves. Overexploitation of the guano eventually leading by the 1860s to its substitution through nitrate exploitation and later by artificial fertilizer production.
2. The 'Resource curse' that afflicted Peru as a consequence. The prominence of Peruvian guano as the highest quality fertilizer led to increased Peruvian dependence on British trade and finance, and eventually to the Chincha Islands War of 1864-66 with Spain. This intensified reliance on Britain for loans, arms and political support.
3. Extreme exploitation of labour. Chinese indentured labour was employed to exploit the guano in terrifying conditions akin to slavery. Many labourers died from malnutrition, abuse and terrible working conditions.

Overall, Peruvian guano brought big profits for foreign investors, both who invested in guano and those who supported the Peruvian government through loans. It had few benefits, however, for either the Peruvian people or those who worked to exploit the resource. Foster and Clark call this effect of the metabolic rift Ecological Imperialism.

In summary the key question here is that if anthropogenic climate change is a consequence of capitalist relations of production, then it must also be seen the context of capitalism's own historical tendency to exceed its relationship to nature and to generate crises that negatively affect both nature and human society. This has important implications for thinking about climate politics (See unit 12).

## STUDENT-CENTERED EXERCISE (VIDEO)

Carolyn Merchant speaking on the issue of 'Partnership with Nature'  
<http://www.uctv.tv/search-details.aspx?showID=19243>

Documentary account of the Chipko movement (1983)  
[http://www.youtube.com/watch?v=TYuCkn\\_Pw3E](http://www.youtube.com/watch?v=TYuCkn_Pw3E)

To take these issues further, I would recommend that student seminars focus on Merchant's highly accessible book *The Death of Nature* and the relationship between changing gender relations and capitalist transformations of nature. Indeed, there are some good online sources that can form the basis of seminar discussion, not least a University of California lecture in which Merchant summarizes much of her career's work in very accessible form. One possible exercise could be to ask students to critique 'rift theory' from the point of view of 'eco-feminism' and Merchant's focus on the history of ideas.

There are some similarities between the idea of the metabolic rift and the concept of 'ecological revolutions'. The latter, however, reflects a greater concern with the cultural causes of capitalist modernity's ecological destructiveness. For instance, the eco-feminist, Carolyn Merchant, in her book, *The Death of Nature*, argued that the exploitative ethic of an emerging capitalism was established in the sixteenth and seventeenth centuries with the assault by an emerging mechanistic science upon a medieval system of knowledge based on an organic view of nature. Merchant associates this shift in particular with Francis Bacon's utopian *New Atlantis* (1624) and the vision he outlined of a male-dominated science founded on hierarchy and the exploitation of a lifeless mechanical nature. Bacon's work, Merchant claims, was part of a turn away from a cosmology that had seen the earth as a living supernatural and feminine entity. The eventual success of Western science in representing nature as inanimate material, ordered by mechanistic laws that could be discovered, manipulated, and hence turned into processed, manufactured end-products was, in her view, intimately linked to an assault upon and degradation of the position of women in society.

Merchant's analysis is to be distinguished from rift theory, thus, by its emphasis upon the role of culture and gender in the production of an exploitative capitalism. This is not to suggest that Merchant believes that capitalism's effects upon the environment can be mitigated by cultural change alone, as capitalism relies upon an unequal gender order to reproduce itself. It does suggest, however, that environmental movements need to take account of the interconnection, and mutually reinforcing character of the exploitation of women and nature. A lesson that might be said to have been at the heart of movements such as the Chipko in India, an environmental movement of indigenous women who have struggled for the preservation of forests and the rights of indigenous peoples within them. The *YouTube* video providing a documentary account of this movement is excellent, and would provide an excellent point for discussion of the politics of gender and the experience of ecological imperialism.

Points for consideration in class:

1. What do students understand by the concept of the metabolic rift? More exactly, what do they understand by the term 'capitalism'? Is it uniquely destructive of the environment/climate?
2. If they had to choose between Moore and Foster over the dating of the metabolic rift, whose argument would they support?

3. Does the concept of the metabolic rift suggest the possibility of a 'green' industrial society?
4. Can an environmental politics successfully tackle climate change while failing to recognize the consequences of the capitalist form of development?
5. Does Merchant's work on gender offer a different/contradictory insight into capitalism's relationship to nature? Is social and political equality for women a necessary precondition of tackling environmental issues such as climate change?
6. In what ways is the history of climate change also likely to be a history of capitalism?



## RESOURCES

### GENERAL

C. Ponting, *A New Green History of the World: The Environment and the Collapse of Great Civilizations* (Vintage Originals, 2007).

N. Smith, *Uneven Development: Nature Capital and the Production of Space* (University of Georgia Press, 2008 edn.).

### METABOLIC RIFT

B. Clark & R. York, 'Carbon metabolism: Global capitalism, climate change, and the biospheric rift', *Theory and Society*, 34 (2005), 391-428. An earlier version of this paper is available online at *Allacademic*:  
[http://www.allacademic.com/meta/p\\_mla\\_apa\\_research\\_citation/1/0/9/9/8/p109983\\_index.html](http://www.allacademic.com/meta/p_mla_apa_research_citation/1/0/9/9/8/p109983_index.html)

J.B. Clark, 'Ecological Imperialism and the Global Metabolic Rift: Unequal Exchange and the Guano Nitrates Trade', *International Journal of Comparative Sociology*, 50 (2009), 311-334.

J.B. Foster, *Marx's Ecology: Materialism and Nature* (Monthly Review Press, 2000).

J.B. Foster, *Ecology against Capitalism* (Monthly Review Press, 2002).

J.B. Forster, 'Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology', *American Journal of Sociology*, 105 (1999), 366-405.

A. Hornborg et al, *Rethinking Environmental History: World System Theory and Global Environmental Change* (Plymouth, Altamira Press, 2007).

K. Marx, *Capital; A Critique of Political Economy* (Penguin, 1990 edn.).

J.W. Moore, 'Environmental crises and the Metabolic Rift in World-Historical Perspective', *Organisation and Environment*, 13 (2000), 123-57.

A. Rudy, 'Marx's Ecology and Rift Analysis', *Capitalism Nature Socialism*, 12 (2001) 56-63.

Free open access *Monthly Review* essays on *Marxist Theory* and ecology:  
<https://www.monthlyreview.org/mrmarxistecology.php>

Foster and Clark on Ecological Imperialism:  
[http://www.nodo50.org/cubasigloXXI/taller/foster\\_clark\\_301104.pdf](http://www.nodo50.org/cubasigloXXI/taller/foster_clark_301104.pdf)

Contemporary Maps of the Chincha Islands:

<http://www.davidrumsey.com/luna/servlet/detail/RUMSEY~8~1~20625~580029:Plano-de-las-Islas-de-Chincha--Vist>

GENDER AND ECOLOGICAL REVOLUTIONS

C. Merchant, *Ecological Revolutions: Nature Gender and Science in New England* (University of North Carolina Press, 1989).

C. Merchant, *The Death of Nature: Women, Ecology and the Scientific Revolution* (San Francisco, Harper, 1993 edn.).

Francis Bacon's *New Atlantis* (1627): <http://www.gutenberg.org/dirs/2/4/3/2434/2434-h/2434-h.htm>

Carolyn Merchant speaking on the 'Partnership with Nature': <http://www.uctv.tv/search-details.aspx?showID=19243>

Documentary account of the Chipko movement (1983):  
[http://www.youtube.com/watch?v=TYuCkn\\_Pw3E](http://www.youtube.com/watch?v=TYuCkn_Pw3E)

## UNIT 6: THE ACCELERATION OF THE 'ANTHROPOCENE': 'OIL'

### INTRODUCTION

As students have seen in previous modules, humanity has now entered what Paul Crutzen has labelled the anthropocene, i.e. a new geological era shaped not by natural variation in climate or big geological events, but rather by human activity. Crutzen has suggested that this new geological era has started with the industrial revolution, c. 1800. This phenomenon of global change, which has accelerated in the twentieth century, represents truly *Something New under the Sun*, to paraphrase the title of John McNeill's book about the environmental history of the world in the twentieth century which makes the same observation. 'This is the first time in human history that we have altered ecosystems with such intensity, on such scale and with such speed', he writes. 'During the Twentieth century, humankind has begun to play dice with the planet, without knowing all the rules of the game. The human race, without intending anything of the sort, has undertaken a gigantic uncontrolled experiment on the earth. In time, I think, this will appear as the most important aspect of twentieth century history, more so than World War II, the communist enterprise, the rise of mass literacy, the spread of democracy, or the growing emancipation of women.

Yet, as McNeill demonstrates—an opinion he recently said has further been reinforced by global developments in the last ten years—the main driver of ecological change was, and still is, fossil-fuels, especially oil. Fossil fuels have made all the other changes possible: the growth of human population and urbanisation, economic growth, vast ecological changes, and—looming large on the horizon: Climate Change. This unit will focus on the numerous transformations brought about by fossil fuels in human societies. We will be looking at questions such as: when and why did people start to use oil? How has our use of oil impacted upon our lives since the 1860s, socially, politically, economically and in the realm of ideas and even sexuality? We will also be looking at the impact of oil on warfare and strategic considerations, for example how the war in the Pacific started in 1941 because of the American oil blockade of Japan, and Hitler's armies' constant search for oil, up to the present 'No Blood for Oil' campaign in response to the Iraq war. A final part of the unit will study the impacts of our increased use of energy in the past two hundred years, and the role it played, in particular, in the abolition of slavery.

### LEARNING OUTCOMES

- Acquire some general knowledge and a broad chronology of the development of the use of oil in the world
- Understand the historical importance of oil and fossil fuels for our societies, and the changes they have brought about, socially, politically, economically and ecologically in the past.
- Understand the unintended consequences of this reliance on fossil fuels, from concerns linked to 'Peak Oil' and Climate Change to 'blood for oil' politics.

## A BRIEF HISTORY OF OIL AND ENERGY

Petroleum, more often known as oil, has been used by humans since antiquity, and probably even before, for a variety of purposes. However, it is only recently that it has taken such an important place in our societies, as both a source of energy, especially for Internal Combustion Engines (ICE) and as one of the most—if not the most—important raw material on the planet (from plastic to synthetic fibres through to fertilizers). For most of their history, humans have only relied on their own muscles (or that of slaves) and that of domesticated animals to live, to grow food, build shelters, or travel. They have also relied on biomass (mostly wood and straw) to warm themselves and cook food. (Cooking food has one main purpose: to make food more easily digestible for people. This has enabled our species to have bigger brains and smaller guts). Humans also started early on to harness the power of the wind for transport: sails on boats started to appear well before the time of the Roman Empire. Mankind also started to use water mills in Mesopotamia, for various purposes as well. However, windmills and watermills only started to be used on a large scale in Europe in the Middle-Ages.

From around 1500 onwards, Europeans started to use fossil fuels, initially almost exclusively as a source of heat (peat in Holland around the beginning of the 16<sup>th</sup> century; coal in England as seen in module 4). With the invention of the stationary steam engine, first developed by Thomas Newcomen around 1710 and greatly improved by James Watt at the end of the 18<sup>th</sup> century, Britons increasingly used fossil fuels as a source of motion (thereby transforming chemical energy into mechanical energy). This was a real breakthrough as for the first time in their history humans could harness stored solar energy (coal and oil are made up of residues of plants and living things that have decayed) to trigger motion. Initially this 'artificial' motion was mostly used to pump water out of collieries, but soon this new force was used for an endless variety of other purposes, from trains to steam boats and textiles factories. This "industrial revolution"—the term has been contested but can be retained as it was perceived as a revolution by contemporaries - had important social and psychological consequences (see student led exercise 2). It is also interesting to note that the 'golden age' of many nations coincided closely with the harnessing of new energy sources (e.g. Holland became a world power when it started to use peat as a source of heat to replace its depleted forests, Britain the first nation to harness coal for motion, Germany when it too started to use its vast coal reserves to industrialise, and later the United States as it became the leading producer—and consumer—of oil).

As humans discovered new applications for the steam engine, more and more energy became used (and coal also became increasingly to be burned as a source of heat as forest became gradually depleted, especially near cities). However, coal had several disadvantages: it was dirty, bulky and required a lot of manpower to be shifted around. There was also during the 19<sup>th</sup> century a growing demand for lighting (for houses or factories) which coal could not easily satisfy (it was possible to convert coal into a gas that could then be burned to produce light, but this gas was very dangerous to use). Before the invention of the electric light bulb, people had to rely on lamp burning oil. The main source of this oil came from the fat of whales. Hunting whales was thus a lucrative business (see Herman Melville, *Moby Dick*, 1851), and whales were hunted all over the world. However, their numbers diminished rapidly because of over whaling the consequence of which was that whale oil became prohibitively expensive. Someone, around the middle of the 19<sup>th</sup> century, found a way to refine a substance that was surfacing from the underground in a number of places, and to use it as a substitute for whale oil. At about the same time new techniques were discovered which made possible the drilling of hard rock. In 1859 (almost exactly 150 years ago), a man called Drake managed to find oil very close to the surface in Pennsylvania using this new technique. It was to become the first modern oil well, and the beginning of a new industry.



Figure 1: Pennsylvania oil field, around 1862

This photo was published by the Pennsylvania Historical & Museum Commission. Source: Wikipedia (<http://commons.wikimedia.org/wiki/File:Earlyoilfield.jpg>): 'This image depicts early oil field exploitation in Pennsylvania, around 1862. The two wells shown are the Phillips well and the Woodford well, both among the most productive of the time. Note the small distance between them. At the foreground appear wooden barrels in which the crude was stored, explaining why oil is still measured in "barrels". Note the barrel size was not standardized yet: various size of barrels can be noticed'.

Petroleum soon became an extremely important commodity, as more and more new applications for oil were discovered (initially, only that part of the oil for lighting was used. The residue - gasoline - for a long time being considered useless, and often poured into rivers at night as a way of getting rid of it, is now what we put into our car tanks). The first modern, multinational corporation in the world, Standard Oil, was formed at the end of the 19<sup>th</sup> century, under the leadership of John D. Rockefeller, the first American billionaire. But, it was the development of motors with an Internal Combustion Engine towards the end of the 19<sup>th</sup> century which really brought petroleum to the forefront of human affairs. From then on, petroleum has had an ever increasing impact on our lives and on the planet. Here are a handful of the most important:

1) Population and urbanisation: the advent of the coal and petroleum age has made possible a huge increase in human population, from about 1.6 billion in 1900 to 6 billion in 2000 (about 6.9 billion today). This increase in world population would almost certainly have been impossible without the invention of modern fertilisers and pesticides from fossil fuels, which have enabled vast increases in agricultural yields. About half the food production in the world depends on artificial fertilizers (see Smil, *Energy in World History*, 1995). The post- World War II research that led to the 'Green Revolution' (which Wikipedia defines as the 'development of high-yielding varieties of cereal, the expansion of irrigation infrastructure, and distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers') was also financed in large part by the Rockefeller and the Ford foundations - whose wealth obviously was drawn, directly and indirectly, from the exploitation of petroleum. More generally, the fossil fuel economy has created a 'virtuous circle' (for some people in some countries, not for everyone) which has enabled a high number of other improvements and the breaking free of constraints. Improvement of hygiene and sanitation were often directly linked to fossil fuels: the construction of the London sewage system, for example, required huge pumps driven by steam engines (see the BBC documentary: 'The Sewer King', referenced below). The wealth and freeing of hands enabled by the use of fossil fuels have also made possible medical research which has brought down dramatically the number of people dying from a large number of diseases (one hundred years ago, one could still die very quickly from bacterial infections contracted in very trivial ways. The son of US President Calvin Coolidge died of such an infection in 1924. He had developed a blister on one foot after playing tennis. A few days later, he was dead and medicine—before the invention of antibiotics - could not do anything to save him).

Equally, if wood alone had had to be used as fuel to provide heat and fuel for cooking, and as raw material for ships, furniture and other items, it would cover a huge stretch of the globe, taking away lands used today for farming, and thus severely limiting human population growth. By using fossil fuels, Britain, as a forerunner for these worldwide developments, was able to break free from constraints on population imposed by the 'organic economy', i.e. an economy that relied on energy from the sun alone, rather than tapping into energy that had taken eons of time to form (see Introduction). It was this breaking free from the 'organic economy' which Kenneth Pomeranz, has described as 'the Great Divergence' in the economies of Britain and China in the 19th century. Yet, not only has the advent of a worldwide fossil fuel economy made possible an equivalent expansion of population it has also made possible megapolis-style urbanisation in many cities, now containing more than 20 million inhabitants (Tokyo, Canton, Seoul, Mexico City or Delhi all have 25 millions inhabitants). At the time of the organic economy, such mega-cities would have been unthinkable as they would have been impossible to supply. Many people have concerns about the sustainability of these mega-cities. Several scholars have long claimed the dependency on fossil fuels means that our very survival is at stake: 'proper alternative sources of energy that can substitute for fossil fuels must be found to prevent mankind from reverting to an agricultural level of activity which would mean a dramatic and painful reduction of both mankind's size and its level of living' (Cipolla *Economic History of World Population*, 1978: 63; many comparable claims are made in the literature on 'peak oil').

2) Social effects: the larger social effects from the fossil fuel age have also been huge. Two centuries ago, the vast majority of people were farmers or working in industries linked to farming and the production of food. But because fossil fuel powered machines have greatly reduced the need for workers on farms, and even (at a later stage) in industry, a seemingly ever increasing proportion of human work in the service sector, producing not goods but services. The so called 'middle-classes' have grown massively, following too from the rise in education (the organic economy could not afford to

leave young men and women to study until they were in their mid-20s before becoming active). Paradoxically, this has led to a greater awareness amongst some in the population of the richest countries, of the dangers of materialism. Many middle-class families, for instance, have come to adopt what some social scientists call 'post-materialist values', such as concerns about the environment. The standard ownership of cars amongst most sections of Western societies by the mid- to-late 20<sup>th</sup> century also has had numerous social effects. While railways began the movement, cars accelerated the trend towards suburban life, enabling people to commute to work while living in a sort of semi-countryside. Again, ironically, cars enabled people to reconnect with nature in some way, providing a means for city folk to visit the countryside much more often. This also ironically contributed to raising awareness about the need to preserve beautiful landscapes and began to feed into opposition to road building programmes. Yet car culture also meant widespread changes in more basic social, even sexual behaviour. As Daniel Yergin puts it: 'the automobile was also absolutely central to dating, going steady, the acquisition of carnal knowledge, and the ritual of courtship. One survey in the late 1960s found that almost 40 per cent of all marriages in America were proposed in a car'.

It is also important to be reminded that most consumer goods today are either sub-products of the refinery of oil, made of some of the constitutive elements of oil, or produced using processes that require a lot of energy input, or both. This is why our so-called 'consumer societies' in the Western World could not exist without fossil fuels and petroleum (see student centred exercise, below). More generally, because fossil-fuel powered machines have now largely replaced the work which used to be done in centuries past by servants or slaves, we, in rich societies, almost all live in a material luxury comparable with that of Kings and Queens from not so long ago (see case study, below).

3) Economics: GDP (Gross Domestic Product) per capita increased four times between 1900 and 1992 and the overall world GDP was increased by a factor of 15 (an order and a half of magnitude) between 1900 and 1992. This is again directly linked to the use of fossil fuels, even when the share of fossil fuels in the economy might appear to be relatively modest. 'Oil extraction and refining accounts for a relatively small share—perhaps five per cent—of the [US] gross domestic product'. Yet, 'the availability of vast quantities of relatively inexpensive petroleum is indispensable to a whole host of other industries, including automobile manufacture, road and highway construction, airlines, petrochemicals, agriculture, tourism, and suburban commerce. Taken together, these sectors make up the heart of the American economy, and without cheap oil they—and the way of life they make possible—could hardly survive' (Klare, *Blood and Oil*, 2005). This painful fact was made even more tangible during events such as the power-cut of 13 August 2003 which left sixty million people in New York, Detroit, Toronto and dozens of other cities without electricity for several hours or when Arab states organized an oil embargo against the United States in 1973. The US secretary of state, Henry Kissinger, who knew little about America's dependency on oil before the Yom Kippur War, later declared: 'Energy is at the core of our industrial system. Our security, our economy, our place in the world are at stake' (quoted in Debeir, *et al.*, *In the Servitude of Power*, 1991, 165). Unfortunately, lessons were quickly forgotten, and oil dependency increased after President Carter's administration: urban planning, for example, implicitly assumed that cheap energy would continue more or less forever. Today, it is practically impossible to live in Los Angeles without a car - 97 per cent of America's transport system relies on oil. Yet, because of a lack of foresight, transport has also become essential to the distribution of all goods, including food, and other services, not to say agriculture itself. In 2008, amongst the ten largest companies in the world, six were oil companies and two car manufacturers, another sign of our dependence on fossil fuels. This dependence cannot be accounted only as a matter of quantitative economic analysis: to do this would

be a little bit like trying to assess the importance of water for people by measuring the income of water companies. To contest the importance of fossil fuels in our lives would also be not dissimilar to smokers claiming that they are not addicted to tobacco, but who actually never prove their point by stopping to smoke. The point is clearly illustrated using an historical example. Some economic analyses have attributed a minor role to coal in France in 1914—only 2.7 per cent of the economic activity was directly generated by it. But this would be to ignore the gamut of its social implications:

In the case of rail transport, the use of the steam engine and coal brought considerable changes that cannot be accounted for in monetary terms alone. For instance, in 1850, a train of fourteen trucks pulled by a 100 hp locomotive could carry about 90 tons of merchandise, that is, replace 18 stagecoaches, as many coach drivers and 144 horses. From Paris to Lille [a city about 300 kilometers from Paris], the stagecoach took two and a half days, a train, four hours and 50 minutes, consuming a little under one ton of coal, that is, the daily output of two miners (Debeir, *et al.*, *In the Servitude of Power*, 1991, 124).

The dependence of nation-states on fossil fuels for asserting their power is also significant: it has been suggested by several scholars that the formidable power of the USA in the twentieth century owes a great deal to its ability to extract large amounts of petroleum from its own underground, in a similar way as the British, and later German, great powers in the nineteenth century relied on their easy access to abundant reserves of coal. The importance of oil is also emphasized by the fact that since the Second World War recessions in the Western World very often followed oil price increase (and the current recession is not an exception). (See figure 1, below).

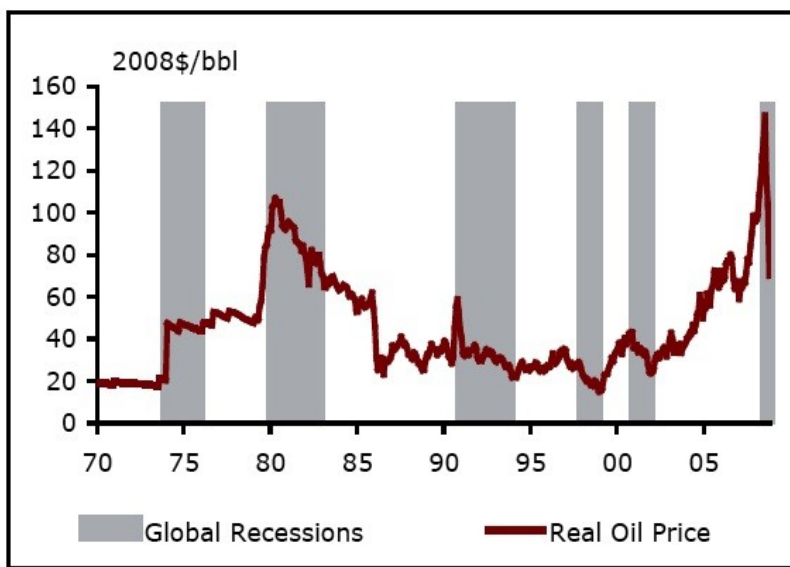


Figure 2: Oil Price and Global Recessions: 'Four of the last five global recessions were preceded by [an oil shock]. Yet the recent spike in oil prices doesn't seem to get any credit for what's happening to the world economy now. That's odd because it should'.

Source: Jeff Rubin and Peter Buchanan, 'What's the Real Cause of the Global Recession?', *StrategEcon* - 31 October, 2008, available at [http://www.manicore.com/fichiers/Rubin\\_Buchanan\\_CIBC.pdf](http://www.manicore.com/fichiers/Rubin_Buchanan_CIBC.pdf)



4) Military and political impacts: Petroleum has also played an important role in several wars in the last and present centuries, and many experts foresee that it will continue to play an ever increasing role in future conflicts. Petroleum did not play a very big part during the First World War, even though the requisition of taxis in Paris in 1914 (*Les Taxis de la Marne*) enabled the French military to quickly move troops where they were needed at a crucial time. This permitted a victory of the French in a battle that, had it been lost, would probably have ended the war in 1914. By contrast, Germany ought to have collapsed without the fossil-fuels needed for the wartime production of fertilisers and ammunition denied to it by naval blockade imposed by the Allies. In normal times guano (from Peru) for its agriculture or ammonium for its gun powder would have been necessary. Instead, the high-energy synthesis of ammonium by the chemist Fritz Haber in 1909 made the German war effort just about sustainable for four years. Compare this with the centrality of petroleum as one of the key causes for the advent of war in the Pacific in 1941. Before Pearl Harbor, the USA and other Western nations had imposed strict restrictions on the delivery of oil to Japan, following Japan's aggression against China, and her wider territorial ambitions. It was in part in response to what it perceived as a threat to its oil supply that Japan attacked the USA. Japan, a country devoid of oil, finished the war with almost no oil left at all (the strategy of the *Kamikaze* was partly a result of this severe deprivation of oil, as planes often had just enough oil to reach their target, but not to return). In Europe, it has been argued that one of the reasons for the invasion of Russia by Hitler was his aim to seize the vast reserves of oil in the USSR, thereby ensuring his ability to continue the struggle against the Western Allies. In fact, the Nazis were defeated in part because the German military, towards the end of the war, had virtually no oil left to run its tanks and planes, in this instance, despite the major German effort to convert coal—which Germany has in abundance—into synthetic petroleum.

Since 1945, oil has played a powerful role on the international stage. The OPEC Petroleum embargo was used as a weapon to put pressure on the USA and a number of Western nations during the Yom Kippur War of 1973 between Israel and a coalition of Arab states led by Egypt and Syria. This raised the prices of oil to an unprecedented level and led to the first post-war global recession. Some scholars also claim that the progressive weakening and subsequent collapse of the USSR in the late 1980s was directly linked to the oil price collapse which happened after 1986, as it represented a serious loss in revenue for this oil-producing country. Oil also played an important role in the Iranian Revolution of 1979, in the Iran-Iraq war of 1980-1988, in the Gulf War of 1990/91 and the Iraq War which began in 2003. It is also in the background of the Israeli/Palestinian conflict.

It is thus pertinent to ask whether we are not putting our societies at risk by relying so heavily on fossil fuels. In the same way as slave owners constantly worried about slaves escaping or revolting, we also worry about our suppliers of oil or gas stopping to deliver the precious liquid. This scenario has happened more than once in recent times, as in the case recently when Russia cut off natural gas shipments to Ukraine. As a result, industrial countries have also become involved in an increasingly violent politics of oil from Iraq, to the Sudan, to Nigeria and elsewhere, leading to the well-known 2003 slogan, 'no blood for oil'.

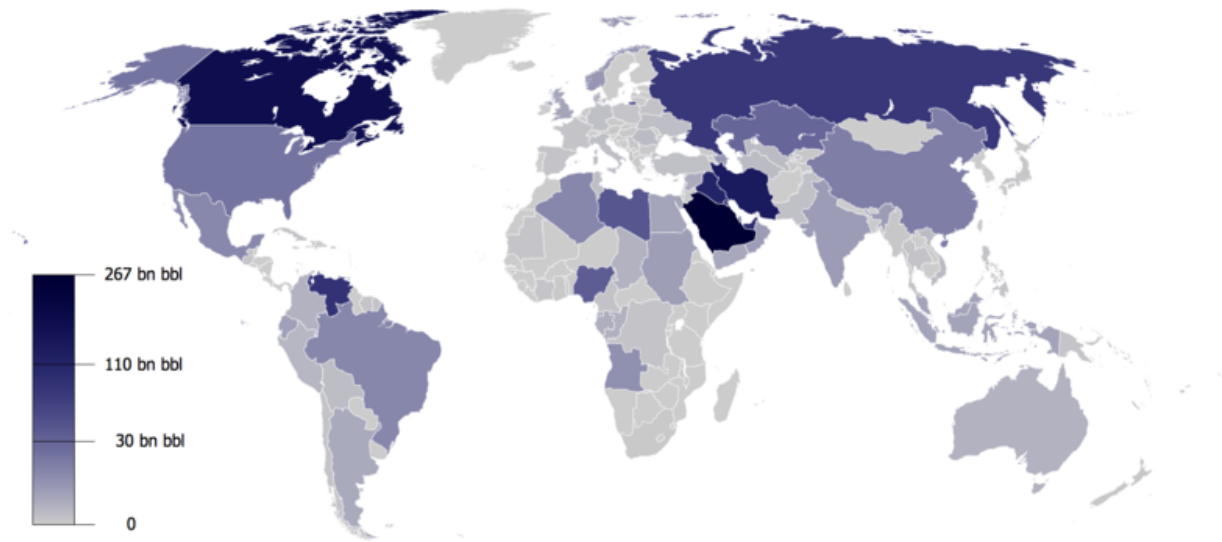


Figure 3: Proven oil reserves (world)<sup>1</sup> Source: Wikipedia, from CIA Factbook: <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2178rank.html>

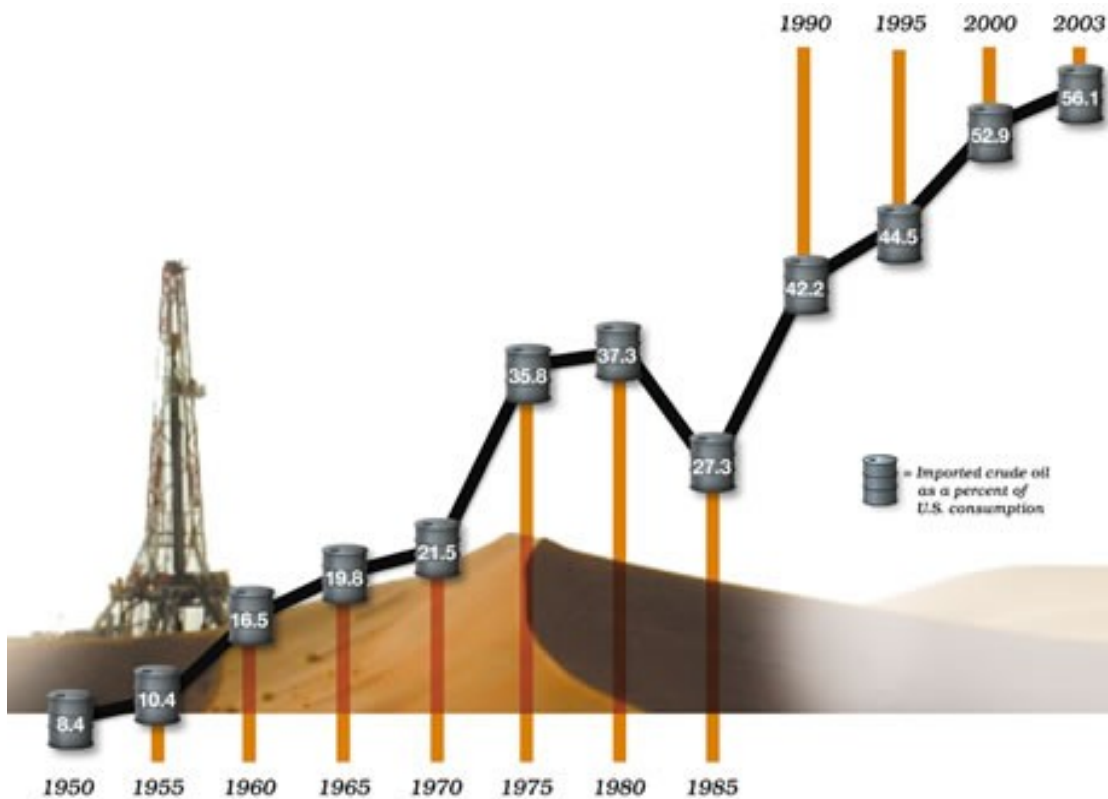


Figure 4: Imported crude oil as a per cent of U.S. consumption. Source: [http://www.ornl.gov/info/ornlreview/v38\\_1\\_05/article04.shtml](http://www.ornl.gov/info/ornlreview/v38_1_05/article04.shtml)

<sup>1</sup> Source: Wikipedia. [http://en.wikipedia.org/wiki/File:Oil\\_Reserves.png](http://en.wikipedia.org/wiki/File:Oil_Reserves.png)

5) Ecological impacts: Ecologically, oil has had an important impact on the environment, at four different stages of its exploitation.

- a) *Extraction*: oil extraction has always been a messy affair, since the time of Drake, when the soil at the place of extraction was covered by mud, and made up of a mixture of oil and earth, to the 2010 *Deepwater Horizon* oil spill in the Gulf of Mexico (see for example Myrna Santiago *The Ecology of Oil*, 2006 for more on the ecology of oil extraction).
- b) *Transport*: the transport of oil can be damaging in several ways, for example when an accident occurs which results in a black tide, such as in the sinking of the *Torrey Canyon* off the coast of France and the UK in 1967, or the *Exxon Valdez* oil spill in 1989. But it can also be ecologically damaging when the transport of oil requires the construction of pipelines in ecologically sensitive areas, such as Alaska.
- c) *Combustion*: petroleum and fossil fuels, when burnt—e.g. in power plants or in cars—are also harmful to the environment in several ways: they create air pollution, directly or indirectly causing a range of respiratory and other illnesses. In further units we consider the impact of the 4,000–12,000 who died because of the London 'smog' of 1952. A plausible estimate for the total number of deaths caused by air pollution in the 20th century is 40–50 million, comparable to the global death total from World War II. And of course, we are now well aware of the potentially much more threatening consequences of the burning of fossil fuels in the form of increased CO<sub>2</sub> concentration in the atmosphere, leading to Climate Change.
- d) *Indirect effects*: oil has also a powerful impact indirectly in what it gives us the power to do and undo. To give just a few trivial examples, much of the deforestation which took place in the twentieth century would arguably have been much slower if men had not been able to use chain saws. Similarly, several species of whales would not have come so close to the brink of extinction so quickly if bigger coal or oil-driven boats, had not taken to the seas. For instance, some whalers from the USSR were as big as aircraft carriers, enabling them to not simply to hunt whales but process them as floating factories.

## CASE STUDY

### THE ADVENT OF FOSSIL FUELS AND THE ABOLITION OF SLAVERY

What the harnessing of fossil fuels achieved in the sphere of work itself - a historic liberation from muscular toil - abolition [of slavery] achieved in the social sphere. They were connected events and roughly simultaneous. The use of inanimate energy gradually made labor less scarce, and forced labor less appealing. It made communication of antislavery ideas easier. It made the imposition of European anti-slavery morality upon Asia and Africa easier. In some settings, the abolition of forced labor made the use of machinery and inanimate energy more economic. Worldwide currents of demographic growth, industrialisation and energy use, and egalitarian morality all flowed together to refashion the human condition.<sup>2</sup>

*The following is adapted from Jean-Francois Mouhot, 'Free the Planet' History Today, August 2008, 42-44*

We often approach slavery with the underlying assumption that our western civilization is now morally much superior to those barbaric slave owners' societies. But are we really so different? Are we really morally superior? If we look at our current attitude to fossil fuels and climate change, on the one hand, and the behaviour of slave owners, on the other, there are more similarities than one might immediately perceive.

Historians have long argued that there are numerous links between the commerce of slaves and the Industrial Revolution. Slavery encouraged early industrial production in a circular way, by channelling demand for goods and providing capital for investments. The slave trade stimulated production: slaves were exchanged against goods produced by manufactures in Europe, such as textile or firearms, and the demand for padlocks and fetters to chain slaves represented a significant market for burgeoning industrial cities like Birmingham. Goods exported by planters helped create the first mass consumer markets in the world and made Europe dependent on imported commodities. Plantation agriculture also resembled 'factories in the field' which prefigured the manufactures of the future. Finally—even though the importance of this phenomenon is still debated—some of the capital accumulated by slave traders and planters fuelled investments back into new machineries, which helped the Industrial Revolution to kick off. Slave traders therefore played a significant—if perhaps indirect—role in the establishment of the industrialist system at the core of our contemporary societies. It is another 'inconvenient truth' that the very same people whom we consider today as incomprehensible barbarians, played such a significant role in establishing the basis on which our contemporary civilisation rests.

Ironically, there are also connections between the industrial revolution and the demise of slavery. A striking correlation in time exists between the rise of anti-slavery movements and the appearance of steam machines. Was there a more than coincidental correlation between the two phenomena? A few industrialists at the time perceived that steam power might ultimately reduce the need for slaves. For example, Birmingham manufacturers Boulton and Watt, who opposed slavery on moral grounds,

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<sup>2</sup> J. R. McNeill, and W. H. McNeill. *The Human Web: a Bird's-eye View of World History* 2003, 258

supplied steam engines to the sugar plantations in the West Indies. By doing so they hoped to reduce the need for slave labour.

The idea that steam power could and was replacing the work of a large number of people can be traced back to an intuition of Aristotle: 'we can imagine a situation in which each instrument could do its own work ... A shuttle would then weave of itself.... In this situation... masters would not need slaves'. It is difficult to estimate to what extent these ideas were widespread at the time of abolition, but they were certainly not secret. Many Luddites held similar views: they believed that labour-saving technologies triggered unemployment by reducing demand for labour. In 1832 John Quincy Adams (a former United States president and a prominent Abolitionist) reported to the Congress that 'the mechanical inventions in Great Britain were estimated [in 1815] as equivalent to the manual labor of two hundred millions of people'.

Robert Dale Owen (the son of British socialist Robert Owen), who supposedly had some influence with Lincoln prior to the Emancipation Proclamation, clearly equated steam-powered machines to slaves, and their owners as masters, in a lecture given in 1848: 'Great Britain may be said to have imported, from the vast regions of invention, two hundred millions of powerful and passive slaves; slaves that consume neither food nor clothing; slaves that sleep not, weary not, sicken not; ... slaves patient, submissive, obedient, from whom no rebellion need be feared, who cannot suffer cruelty nor experience pain. ... That aid ... sent down from Heaven ... to assist man in his severest toils, must have rendered him a master instead of a slave, a being with leisure for enjoyment and improvement, a freeman delivered from the original curse which declared that in the sweat of his brow should man eat bread all the days of his life '.

The connection between steam powered engines and the demise of slavery is however not a straightforward one. Machines were not yet advanced enough in the eighteenth or nineteenth century to effectively replace the work done by slaves (this took place gradually during the late nineteenth and twentieth centuries, when tractors, washing machines and other devices started to replace human work). Most slaves in the USA worked in cotton fields where machinery started to appear on a large scale only much later. If there had been an easy substitute for the work of slaves, America would perhaps not have had a civil war. The intuitions of people like Owen remained mostly irrelevant to the wider public at the time. During heated debates on slavery, abolitionists do not seem to have used this argument. However, it is not necessary for something to be voiced or a connection to be made at a particular moment in history for that connection to have happened. Historian William McNeill has noted how 'processes of which contemporaries were often quite unaware mattered more than [conscious] purposes' of the sort that conveniently leave written records for historians to decipher. Hindsight often provides the opportunity to see things that were not perceived by contemporaries. It may be that one enabling or facilitating condition for the abolition of slavery was that there was a growing feeling that slaves could eventually be replaced by steam powered machines. The industrial and technological advance created a diffuse feeling of human progress.

Few people, therefore, thought that steam powered engines could replace slaves in the nineteenth century. However, this makes no difference to the fact that there are actually nowadays a growing number of people who convincingly argue that modern technology has replaced slaves. Is it far fetched, then, to go one step further and draw a comparison between our attitude and actions towards oil, gas and coal and the attitude of slave owners? I will argue that it is not, for a number of reasons.

To start with, as an author recently put it, 'today the United States is as dependent on fossil fuels for its patterns of consumption and production as its South was on slavery in the mid-nineteenth century'. Another study published in 2006 has shown that 'through its use of energy, each European has at its disposal about a hundred slaves called plant machines, trains and cars, ships and planes, tractors, central heating, white goods, lawnmower and ski tow'. That is, if we wanted to do without any petroleum, coal, natural gas or electricity, we would need to employ about a hundred persons working full time for us. The authors of the study ask: 'who had the possibility, only a century ago, to afford the equivalent of several tens of servants to get fed, washed, transported, diverted, and so on, with the sole product of one's work? 'It is no wonder that people in the nineteenth and twentieth century quickly adopted new energies and machines, or that the majority of us want to continue to enjoy the undeniable and numerous positive aspects of fossil-fuel powered machines.

Secondly, slavery caused harm to human beings, as does our current large scale burning of fossil fuels. Some might argue that it is not possible to compare pain triggered by the use of slaves and pain caused by the use of oil, gas or coal, as in the latter case we are dealing with unanimated objects that cannot suffer. However, when we burn oil or gas above what the eco-system can absorb, we are causing pain and suffering to other human beings. The conclusions of the Intergovernmental Panel on Climate Change (IPCC) make it clear that the release of carbon dioxide is already causing harm and suffering and is forecasted to produce much more in the future, by increasing droughts and flooding, threatening crop yields and displacing large numbers of people. Also, what should we do of the moral problem that in a world where world grain stocks are at a 30-year low and where poor people struggle to find enough food to feed their families, we are increasingly burning food to run our cars or heat our homes? Filling up a 4x4's fuel tank with ethanol uses enough maize to feed a person for a year. Put starkly, we, the rich, are buying up food to run our cars at the expense of the world's poor.

It is possible to interpose that when we hurt someone without realising it, we cannot be blamed as severely as if it was intentional. But this argument only stands as long as we are ignorant of the fact that the way we live is having damaging consequences for others. It is not the case any more. Another objection is that burning fossil fuels has also positive effects. The hospitals, schools, roads built today thanks to the use of petrol will be endowed to future generations. A lot of people also think that a rise in temperature by a few degrees in Britain will improve their lives. However, these arguments are erroneous as the predicted overall damages, according to the IPCC, far outweigh the positive impacts Climate Change may have. The same kinds of arguments were in fact used by slave owners to justify having slaves. They said that the work of slaves would benefit future generations too and that slaves were actually better off being slaves in America rather than working in slave-like conditions in nineteenth century England's factories. Freed slaves were also supposedly unable to feed themselves or be responsible for their own fate.

It is also true that it is almost impossible in our contemporary world, even for the most virtuous of us, to live without relying on some sort of energy of the fossil-fuel variety. If we cannot do otherwise, we should not be blamed, for we cannot prevent ourselves from indirectly hurting other people. As individuals, we are subjected to constant incitement (from governments, corporations and others) to consume ever more goods or foreign holidays. We are perhaps as much victims as culprit of this consumer society. However, our moral duty, once we become aware of the evil of the system, is to resist it. We know that some emissions are not causing any harm because they are absorbed by the eco-

system. To be free from hurting other people, we must get a fair share of carbon dioxide allowances per person, and we should keep the overall international emissions under the threshold of what worldwide carbon sinks can safely absorb each year.

A last objection to my comparison is that definitions of slavery all emphasise the idea of complete ownership and control by a master over a person who is legally owned by someone else and has to work for them. Now, surely, we do not own any other human beings and if we can afford to live even more comfortably than slave owners in Antebellum America, we do not compel anybody to work for us for free. Slavery denies people autonomy (expressed as self-ownership, or liberty, or making decisions about one's own life). Our causing the harm of climate change does not directly do this. However, this objection can in turn be challenged on two grounds. Firstly, the availability of comparatively cheap energy enables transport of foreign goods on a massive scale and over large distances. As it is inexpensive to transport those goods from the Far East to Europe or America, it is possible to import products made in often slave-like conditions for a fraction of what it would cost to produce them in our own countries. We have delocalised slavery far from view, but it still exists and we benefit from it. Secondly, the harm of climate change often amounts to violence or force against a large number of people. Climate change, like slavery, is already (and will increasingly) make people's lives hard, or miserable, and limit the possibilities they have for living a good life. Floods, droughts and sea level rise will force millions of people to become refugees; their land will be taken away from them and they might have to work in slave like conditions instead of growing their own crops. If the most pessimistic predictions of the IPCC materialise, it is even possible to argue that the consequences of Climate Change will be far worse and long lasting, and affecting a much larger number of people, than slavery ever did.

Comparing the attitude of slave owners and our own attitude to petroleum is therefore both adequate and useful. It is useful because so many people nowadays agree that owning slaves is wrong. If we accept the analogy, it follows that we are enabled to see the evil of continuing to live as we currently do. We all want to identify with abolitionists, but at the same time we know that the slave owner in each of us will want to resist change. Our abundant energy gives us an extraordinary power (it is ironic that the same word in English is used both for 'power' and 'electricity') but we should never forget that power corrupts. If we do not change, we and our children will pay heavily for the consequences of our reckless activity. Moreover, future generations will look back at us in a few years time and wonder how our early twenty first century civilization could have been so backward and live in such appalling moral conditions. Will they see that western societies had some mitigating circumstances? That until relatively recently, we did not know the devastating consequences of our actions? That the vast majority genuinely thought fossil fuels were improving the lives of all people on the planet? That we were also suffering ourselves from the fossil fuel bonanza, through obesity, pollution or loneliness and had become surreptitiously addicted to the substance? Probably not. They are more likely to curse us for the damage we will have done to the planet. Surely, they will say, these were barbarian people.

## STUDENT-CENTERED EXERCISES

1) DISCUSS THE CASE-STUDY ABOVE, ABOUT THE ADVENT OF FOSSIL FUELS AND THE ABOLITION OF SLAVERY. DO YOU AGREE OR DISAGREE ABOUT THE COMPARISON BETWEEN THE USE OF SLAVES AND THE USE OF FOSSIL FUELS. ARE THE TWO PROBLEMS COMPARABLE? WHAT ARE THE DIFFERENCES?

One way of considering our dependency on 'virtual' slaves is to try and see how many people we would need to replace work done by our machines. At the end of the nineteenth century human labour still made up about 95 per cent of all industrial work in the US. Today, it constitutes only 8 per cent. At the turn of the twentieth century, for authors such as Joseph Hart, or Oscar Wilde, the steam engine was the functional equivalent of servants or slaves. However, the term 'energy slave' (and subsequent efforts to quantify how many 'energy slaves' people were using on average in the world), seems to have first been coined by American energy philosopher, Richard Buckminster Fuller, in the early 1950s. Fuller estimated the average amount of mechanical work a healthy human could do in a year. This concept has since been used very widely. Different methods of calculations have provided different figures for the number of 'virtual slaves' working for us. These estimates vary, depending on whether one considers a global average or estimates by country. Taking a global picture, Fuller estimated in 1950 that each individual on earth had then at his disposal about 38 'energy slaves'. Ivan Illich then propagated the term but without trying to quantify exactly how many slaves were used. McNeill has given a recent estimate of twenty energy slaves 'working 24 hours a day, 365 days a year' for each global citizens (McNeill, *Something New*, 2000, 15). The contrast between the West and the rest of the world is striking: 'the supplementary energy used per person is equivalent to 15 energy slaves in India, 30 in South America, 75 in Japan, 120 in Russia, 150 in Europe, and 300 in the United States and Canada' (Craig *et al. Resources of the Earth* 1996, 103).

If we wanted to have the same lifestyle without any petroleum, coal, natural gas or electricity, we would need to employ several dozen persons, or more, working full time for us. This astoundingly high figure comes from the fact that a single litre of petrol contains the equivalent of about 9 kWh of energy, while the output of an average human being is about 3 kWh in the course of a 40-hour working week. Compared to the amount of labour offered by fossil fuels, we pay little for our oil. It is no wonder that people in the nineteenth and twentieth century enthusiastically adopted new energies and machines, or that the majority of us want to continue to enjoy the numerous positive aspects of fuel-powered machines.



## 2) IMAGINE WHAT LIFE WOULD BE LIKE WITHOUT FOSSIL FUELS. HOW WOULD YOU CLOTH YOURSELF?

Think of all the steps required to produce a piece of clothing (see the short film 'The Story of stuff' in resources). Now, can you think of any piece of clothing you are wearing today that would not have needed some input from fossil fuels, especially oil? Most of the things we wear contain some synthetic fibres (from Nylon to Gore-Tex). Even natural fibres (cotton and linen, for example), require heavy inputs from artificial fertilisers and pesticide (both of which are derived from oil or natural gas). Even when these plants are grown organically—i.e. without artificial fertilisers and pesticides—farmers almost always use tractors and other machineries that rely on fossil fuels. Cotton also requires irrigation, and the water is often spread on fields using pumps running on fossil fuels (even if they are electric, the electricity is almost always generated from fossil fuels). Even if one can imagine a situation in some countries, where wages are low and oil is comparatively more expensive, where cotton or linen can be grown with virtually no fossil fuels, the raw cotton needs to be transported from the place of production to the place where it will be transformed into clothes. It then needs to be sent to the place where it will be sold to the consumer. This will almost inevitably involve the use of fossil fuels at some stage along the way. The same is true of wool and leather. Even if you imagine animals grown on organic farms that are not fed by plants that have required large inputs of nitrogen fertilisers (made from natural gas), you still need to process the raw cotton and leather in factories that will use large amounts of fossil fuel-based energy. Thus, practically all our clothes today are produced on the basis of heavy fossil fuel inputs. This is the reason why before the industrial revolution most ordinary people would only have a very limited number of clothes, which they would constantly repair and mend until they were finally worn out. As David Nye noted in his book *Consuming Power*, in 18<sup>th</sup> century North America shoes were still a luxury that not everybody could afford, even in winter.

Similarly, how would we grow food without fossil fuels? Who would grow the food? Where would it be done? What would things be like without freight lorries to bring food to you? In what ways would life potentially be better or worse? Repeat the exercise with any item of food that you have eaten today or objects you can see in the room where you are now. Between now and [next week], observe carefully what you eat and the objects you use, and come with a list of items that have not used, at any time during their production and until they reach you, any fossil fuel inputs.

[Note: for group leaders: there are very few such items I could personally think of: vegetables or fruits grown in one's garden/allotment qualify as products grown entirely free of fossil fuel inputs only if they have been grown strictly organically, if they have not been watered by the main water supply (heavily reliant on fossil fuel to pump the water to maintain pressure in the tap); if the person who grew the vegetables never used any electrical<sup>3</sup> or petrol driven device to plough the allotment/garden or cut the weeds, etc.. As far as objects of ordinary consumption are concerned, they virtually all have required some fossil fuel input at one stage or another.

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<sup>3</sup> It would be fine to use an electric tool if it is powered by renewable energy (wind, solar, or hydro-electric).

## RESOURCES

### THE HISTORY OF OIL AND ENERGY

Alfred W. Crosby, *Children of the sun: a history of humanity's unappeasable appetite for energy*. (1st ed: W.W. Norton, 2006).

Carlo M. Cipolla, *The Economic History of World Population* 7th edition (Penguin, 1978).

Jean-Claude Debeir, Jean-Paul Deleage, and Daniel Hemery. *In the Servitude of Power: Energy and Civilisation through the Ages*(Zed Books, 1991).

Thomas. Hager, *The Alchemy of Air: A Jewish Genius, a Doomed Tycoon, and the Discovery that Fed the World but Fueled the Rise of Hitler*(Harmony Books, 2008).

J.R.McNeill, and W. H. McNeill. *The Human Web: a Bird's-eye View of World History* (W.W. Norton and Company, 2003).

J.R.. McNeill, *Something new under the sun: an environmental history of the twentieth-century*. (W.W. Norton/Penguin, 2000).

David E. Nye, *Consuming power: a social history of American energies*. (MIT Press 1999).

Kenneth. Pomeranz, *The great divergence: Europe, China, and the making of the modern world economy*( Princeton University Press, 2000).

Joachim Radkau, 'Energy: Genie or Genius?' *History Today* 46 (1996),14.

Myrna L Santiago, *The ecology of oil: environment, labor, and the Mexican Revolution, 1900-1938, Studies in environment and history*. (Cambridge University Press, 2006).

Vaclav Smil, *Energy in world history, Essays on world history series*. (Westview, 1995).

Will Steffen, Paul J. Crutzen, and John R. McNeill. 'The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?' *AMBIO: A Journal of the Human Environment* 36: 8 (2007), 614-621.

Daniel Yergin, *The prize: the epic quest for oil, money and power* (London: Pocket Books, 1991).

### DOCUMENTS

Daniel Horowitz, *Jimmy Carter and the energy crisis of the 1970s : the "crisis of confidence" speech of July 15, 1979 : a brief history with documents* (St. Martin's, 2005).

Karen R Merrill, *The oil crisis of 1973-1974: a brief history with documents, The Bedford series in history and culture* (St. Martin's, 2007).

## PEAK OIL / RESOURCES DEPLETIONS AND THE LINKS WITH CLIMATE CHANGE

J. R. Craig, D. J. Vaughan, B. J. Skinner, and J. A. Fillipone, *Resources of the Earth: Origin, Use, and Environmental Impact* (Prentice Hall, 1996).

Kenneth S Deffeyes, *Beyond oil: the view from Hubbert's Peak*. Updated with a new preface (Hill and Wang, 2006).

D. L. Goodstein, *Out of gas: The end of the age of oil* (WW Norton, 2004).

Richard. Heinberg, *The party's over: oil, war and the fate of industrial societies* (New Society Publishers, 2003).

Michael T Klare, *Blood and oil: the dangers and consequences of America's growing petroleum dependency*. (Penguin, 2005).

James Howard Kunstler, *The long emergency: surviving the converging catastrophes of the twenty-first century*. 1st ed. (Atlantic, 2006).

Jeremy K Leggett, *Half gone: oil, gas, hot air and the global energy crisis*. (Portobello, 2005) [also published as: *The empty tank: oil, gas, hot air, and the coming global financial catastrophe*].

W. F. Ruddiman, *Plows, plagues, and petroleum: how humans took control of climate*. (Princeton University Press, 2005).

## VIDEO / ONLINE RESOURCES

"The Story of Stuff" (<http://www.storyofstuff.com/>)(20 minutes video).

*The Sewer King*, from the series *Seven Wonders of the Industrial World* (BBC documentary, 2003, 60 minutes)

*From Whales to Wind: A History of Energy*: Radio podcast: Historian David Nye discusses the origins of our gluttony for energy, and historian Anne Norton Greene explains why the 'Age of Steam' was also the Age of Horses. <http://backstoryradio.org/2008/12/from-whales-to-wind-a-history-of-energy/>

*Crude Britannia: The Story of North Sea Oil*, BBC 4 Documentary (3 x 60') (Series combining archive footage and eye-witness accounts to tell the story of North Sea oil and gas from the 1960s to the present, offering a fresh perspective on British politics and society): <http://www.bbc.co.uk/programmes/b00lbnyn>

*Blood and Oil* (60' documentary based on the book by Michael Klare) <http://www.bloodandoilmovie.com>

*A Crude Awakening*, 90' movie on Peak Oil: <http://www.oilcrashmovie.com>. The movie can be downloaded in iTunes). The video can also be watched on Google Video: <http://video.google.com/videoplay?docid=-665674869982904386#>

*The Power of Community: How Cuba survived Peak Oil* (52' video on how Cuba survived after oil shipping from the USSR stopped in the early 1990s, looking in particular at the growth of organic agriculture). Available to watch on [http://current.com/news/89990938\\_the-power-of-community-how-cuba-survived-peak-oil.htm](http://current.com/news/89990938_the-power-of-community-how-cuba-survived-peak-oil.htm)

CASE STUDY

"How much of a slave master am I? (Website of author Jean-Marc Jancovici)

[http://www.manicore.com/anglais/documentation\\_a/slaves.html](http://www.manicore.com/anglais/documentation_a/slaves.html)

Marc D. Davidson, 'Parallels in reactionary argumentation in the US congressional debates on the abolition of slavery and the Kyoto Protocol', *Climatic Change* 86 (2008), 67-82.

Jean-François Mouhot, 'We are All Slave Owners now': Fossil Fuels, Energy Consumption and the Legacy of Slave Abolition.' In Levene *et al*, eds., *History at the End of the World?* 132-47.

idem., 'Free the Planet,' *History Today* (August 2008), 42-44.

idem., 'Past connections and present similarities in slave ownership and fossil fuel usage' *Climatic Change* (forthcoming).

## UNIT 7: DEALING WITH CLIMATE CHANGE: THE ECONOMIC DIMENSION

### INTRODUCTION AND LEARNING OUTCOMES

The pervasive acknowledgment of anthropogenic climate change as reality is commonly attributed to the triumph of science. From the Earth Summit to the IPCC's Fourth Assessment Report, the facts of have been pushed outwards from the labs and monitoring stations onto TV screens, newspaper pages and the desks of top executives and policy makers. Now, so the narrative goes, even corporate business elites have become enlightened enough to want to act. Business is convinced about the reality of climate change because scientists have convinced them. And in turn, scientists have convinced them, because they themselves, within the scientific community, are consensually convinced by a correct understanding of nature. Put bluntly, business is said to be acting on climate change, because it is real.

However, climatological knowledge of itself is not sufficient to explain the emergence of a purported 'green economy'. As recent events suggest, the formulation of climatological knowledge is as much within the world of science as it is in the world of politics. Climate science, as with so many other truth-claims through the history of science, has become politically relevant to the extent that it can do something else—in this case, provide substantial political and economic opportunities and improve material life-conditions around the globe. In many ways, climate change has become certainty through economic analyses and investment strategies. This is why the language used to describe its effects is so anthropomorphic: climate change is something that impacts on the 'economy;' 'affects' countries; 'harms' national security; 'hurts' the world's poor, and potentially 'leads' to global conflict. The UNDP Human Development report calls for a '*fight against climate change,*' while BBC and the Met Office say that '*tackling climate change will be one of the most important things this generation does.*'

In this unit we explore the ways in which the world science and political leaders have come to see climate change as an *economic* agency. We will see that the social and economic dimension of climate (and climatology) was not unknown or unimportant to past generations. In fact, climatology was rarely seen as the average weather or the trends in atmospheric variations. It was more often regarded as a tool of social and economic planning. 'There is nothing more jejune and uninteresting,' argued William Hennen early in the nineteenth century, 'than a protracted enumeration of the daily variations of [atmospheric parameters] if the person who describes such occurrences does not deduce from them some practical information.'

In the modern period, since c. 1700, climate and weather became particularly prominent in discourses dealing with epidemics, law, transport, the military, agriculture, New World settlement and town planning. Adam Smith compared climate with taxes in terms of the scarcity they might lead to. With the rising concerns over industrial pollution, fluctuations of trade, insurance costs, energy physics and ice age theories, climatology became pertinent to both popular welfare and economic growth. In 1880, an American lawyer considered it a form of 'ventilation and hygiene,' and predicted that governments become obliged to protect the meteorological rights of their subjects, using state institutions to procure 'to every citizen the needful amount of pure air.' In Manchester, at the same time, the chemist, Robert Angus Smith, unwittingly worked on one such project when he used 'chemical climatology' to collaborate with manufacturers in reducing emissions in a way that would raise both the productivity and profits of the emitters—a model with a continuing appeal for corporations and governments to this day.

Economists took up the issue as well. William Stanley Jevons, at Owens College, wrote in 1866 on the seasonal impact of outdoor and leisure markets on the autumnal trends in the Bank of England's financial decisions to raise interest rates. In the twentieth century, Sir Napier Shaw and H. Stanley Jevons worked on seasons and crops; William Beveridge on the correlation between export index variations and the changes in barometric pressure while Henry Clayton established the correlation coefficient between commercial panics and rainfall deficit in the Ohio Valley. Implicit in such studies was that economics and meteorology *shared* interests, and that a research on climate patterns would hedge off future trade risks. Jevons' wrote: 'Knowledge of the weather cycles and their correlation with crop cycles in different countries would also be of great value to economists, as the foundation of an intensive statistical investigation of industrial fluctuations. Governments and universities should devote meteorology and economic statistics funds for research on the same scale as those devoted to astronomy, geology, physics and chemistry.'

This came true with Helmut Landsberg of the US Weather Bureau's Section of Industrial Climatology, who in 1946 wrote that American climates should be seen as a 'friendly element' to be tapped for national benefits, constituting 'a very important natural resource.' He wished that the wartime uses of climatology could translate into uses addressing expenditures in housing, heating, airports, all-weather highways, dam construction, flood control, and wind power. This vision was shared among contemporaries who worried that climate and weather, as basic natural resources, are not sufficiently turned to good advantage. The head of the National Weather Bureau argued that 'permanent changes in climate could bring ruin to our entire business structure' [in which] 2 million people every morning used the weather report, and more than a million listened to the weather forecast. This was in 1946!

The principle that 'permanent changes in climate could bring ruin to our entire business structure' is thus, fundamental to all political discussions about climate change, past and present. It continues to inform the economic perception of climate and the scheduling of future climate change effects. For example, during the 1970s, there was an increased interest to identify adverse climate as a major player in the economy, especially agriculture. Hubert Lamb's book *Climate, History and the Modern World* (1982) summarized this in a discussion of what he termed the 'Experience of 1972' the year in which not only extraordinary heat and drought in Russia, China, India and Australia caused significant grain shortages but also caused c. 100-200 thousand people to die from drought in the Sahel -also causing mass migration southwards. Coffee harvest declined in Ethiopia, Kenya and Ivory Coast and the impact of El Nino ruined anchovy fisheries in Peru and Ecuador. The net effect was a first drop in the world's total food production since 1945. There was some debate as to which aspects of 1972 were short-lived and which were the signals of longer term trends. Yet arguably this simply added to what, with hindsight, may have been the first global concern about the climatological future. The concern was perfectly summed up by Lord Zuckerman—both Prime Minister Heath and then, Wilson's chief Scientific Adviser—in his statement that '[m]an's present political problems are miniscule in relation to what could result from major changes in climate.'

At the same time, the economist William D. Nordhaus's paper entitled 'Economic Growth and Climate' (1977) outlined options for emission control and asked: 'How costly are the projected changes in (or the uncertainties about) the climate likely to be, and therefore to what level of control should we aspire?' Other studies followed Nordhaus' lead. Among the first European assessments of climate change impacts were the studies undertaken by the Environmental Committee of the Organisation of Economic Cooperation and Development (OECD), while in the US a major report, written by J. B. Smith and D.

Thirpak was commissioned by the Environmental Protection Agency (EPA). During the 1990s, researchers worked out economic models some of which predicted that, for example, doubling greenhouse gases would cause long-run damages in the US equal to about 1-2 % of Gross Domestic Product, even if a small amount of warming would produce marginal net-benefits in US agriculture and forestry. Overall, the scheduling of damages caused by 'business as usual' showed a steady shift toward long term effects, making climate change a public 'bad' and an example of the so-called global stock externality. In 2006, the British government-sponsored Stern Review was forthright in proposing that dealing with such an externality required immediate action.

## CASE STUDY—CLIMATE AS ECONOMIC AGENCY

Classical readings of climate assume that the material prosperity of a nation or region depend, in part, on the constraints imposed on development by the physical circumstances and/or forces beyond human control. To hedge off a crisis, societies have developed mechanisms of coping, some of which have involved predictive skills based on environmental regularities. However, virtually every past society has had a repository of rules to alert and prepare for a contingency. Weather sayings, health manuals, farmer's almanacs and astro-meteorological ephemera, for instance, have been used as social insurance tools whose validity relied on perceived correlations between what was observed and what was impending: 'Red sky at night, Shepherd's delight; red sky in morning, shepherd's warning'. Other tools included the information about a region's modes of subsistence for finding out which crops were affected by seasonal extremes, or human error. In many instances, such knowledge crystallized into a norm. The fact that corn rather than vine, *had been* grown in a certain area meant that corn, rather than vine, *could be* grown in that area. This 'stability principle' was the standard against which 'climate change' was perceived as a threat.

As variations in climate distinguished regions from one another by what they could produce, local methods of extraction and export of commodities defined different economic cultures. For example, during the colonial era, a policy directed toward extracting tobacco, sugar, tea, and spices was dependent on the trader's ability to locate the sites of their growth. Rising profits were a matter of identifying optimal sites of exploitation and routes of transport. In these matters climatology served an important role. It justified the choice of a colony and the value of native goods. Colonial promoters used climate as a theoretical warrant of the commodity's market value because it determined the potential of staple products based on the ease of access and cultivation. This particular role of climatology can be found in numerous eighteenth century documents, from legal tracts and contracts to trade pamphlets and daily news, to climatological treatises and travel journals. Many of their writers understood climate as an *agency* productive of value and considered it as an *active force* in shaping the world's economy.

It was common to speak of climate as a tool in the material production of goods: the 'British Climate *produces* a more robust and hardy people than hot countries generally do;' every 'Climate *produces* Horses which are most suitable for that climate in which they are bred'. Ireland possessed 'abundance of good corn of fruits such as these northern climates *produce*;' in Lapland, 'the diversity of the Soil and Climate *produces* different kinds of plants and fruits [...] and diverse Sorts of Minerals, Plants and Living Creatures, that are not to be met with in the Southern Parts'. By contrast, 'hot climates *produce* a quantity of delicate fruits,' which give local inhabitants a leisure than could be enjoyed by the northern nations to whom 'climate *denies*' production of wine but whom it 'richly *supplies*' with corn. Such and similar formulations juxtaposed climate with production, supply, and yield. The meaning of such terms in large measure derived from a discourse that put labour and climate in a compensatory relationship: where climate failed, labour compensated; where labour failed, climate compensated. That industry compensated the failings of climate put climate and labour on a par and made climatology an instrument of valuation and economic modeling: 'a very indifferent climate, by skill and industry, may be made to furnish out not only the mere conveniences but even the elegancies of life.' In such statements, air meshed with commerce, climates with cash,



latitudes with labour. 'Air is ever best where most Money is stirring, for poverty and want will render people unhealthy in all climates.' So, what was the Earth's best air?

## STUDENT-CENTRED EXERCISE

### CLIMATE (CHANGE) AS AN ECONOMIC ISSUE

In this exercise, students will come to grips with the economic readings with climate through a comparative exercise. We will first follow Jean Pierre Purry's pursuit to discover the best climate on Earth. We will first look at an excerpt from Purry's *Memorial on the Country of Kaffraria* (1718) to discover what the author means by the 'best climate' and familiarize ourselves with the geographical framing of climatology. Students will then be asked to read closely and discover whether Purry's argument makes sense, and if so, how. How does his thinking compare with how we speak about the climate today? Does it make sense to judge the quality of any particular climate? Purry writes:

*As for me, My Lord, I feet that in order to find the best countries on the earth, one must look for them in the centrer of the fifth climate at the 33 degrees of latitude. For although it is certain that it is uniquely the sun which gives life to wines, nevertheless, neither the hottest nor the coldest countries are appropriate not only for vineyards, but for all sorts of good crops and it is only temperate regions which can be appropriate for them. The thirty three latitude line is where the degree of fertility and of temperature of the air exists that we are seeking. Experience justifies the truth of what I have just established. For I feel sure that if one is in the least acquainted with the world, one will deduct without hesitation that the regions of the Barbary Coast, Syria, Chaldea, Persia, Mongolia, China [...] confined in the fifth climate between 30 and 33 degree latitude are the best countries of our ancient continent. And that the countries of all these regions which are closest to the thirty third degree greatly surpass the fertility of others. (Purry, 1718).*

Purry is arguing in a way similar to Landsberg's analysis of American climates as natural resources (see above). In the economic context, then, climate can be seen as a material precondition of prosperity. But climate can undergird prosperity only if it stable; otherwise, planning cannot be reliable as alterations in economic activities would entail great costs. In other words, preventing climate change—or painlessly adapting to it—are the economic imperatives which, as the Stern Report showed in 2006, must be addressed before the costs of inaction become punishing. Stern wrote:

*Using the results from formal economic models, the Review estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of action—reducing greenhouse gas emissions to avoid the worst impacts of climate change—can be limited to around 1% of global GDP each year.*

*The investment that takes place in the next 10-20 years will have a profound effect on the climate in the second half of this century and in the next. Our actions now and over the coming decades could create risks of major disruption to economic and social activity, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century. And it will be difficult or impossible to reverse these changes.*

*So prompt and strong action is clearly warranted. Because climate change is a global problem, the response to it must be international. It must be based on a shared vision of long-term goals and agreement on frameworks that will accelerate action over the next decade, and it must build on mutually reinforcing approaches at national, regional and international level. (Stern, 2006), for full access go to <http://bit.ly/d8V27P>.*

What do these texts tell us about climate as an economic category? Is the concern over climate change essentially a concern of the consequences of economic maladaptation? Is Purry's quest for best climate a quest for a 'fixed' and predictable climate which would guarantee an economic prosperity? Is Stern's case enough of a stimulus for the general population to act? Finally, can a major shift in economic practice save the planet from climatic disaster?

## RESOURCES

### READINGS

J-P. Purry, *Memorial on the Country of Kaffraria* (Amsterdam: Pierre Humbert, 1718).

Nicholas Stern, *The Economics of Climate Change* (Cambridge: Cambridge University Press, 2007).  
Complete document at <http://bit.ly/bSs0R2>

### BIBLIOGRAPHY

P.H. Bailey, 'Toward a Unified Concept of the Temperate climate.' *Geographical Review*, 54 (1964): 515-545.

J.H. Bruce, H. Lee, and E. Haites (Eds.) , *The Social and Economic Dimensions of Climate Change* (Intergovernmental Panel for Climate Change, Cambridge University Press, 1995).

P.W. Buck, *The Politics of Mercantilism*. (New York: Octagon Books, 1964).

E.H. Bunbury, E. H. *A History of Ancient Geography*. (New York: Harcourt, 1959).

A.S. Cook, 'Establishing the Sea Routes to India and China: Stages in the Development of Hydrographical Knowledge,' in H.V. Bowen, M. Lincoln and N. Rigby (eds.), *The Worlds of the East India Company*. (Leicester: The Boydell Press, 2002), 119-136.

S.M. Edelson, *Plantation Enterprise in Colonial South Carolina* (Cambridge, Mass.: Harvard University Press, 2006).

J. Egan, *Authorizing Experience*. (Princeton N.J.: Princeton University Press, 1999).

G. Endfield, *Climate and Society in Colonial Mexico: A Study in Vulnerability*. (London: Wiley-Blackwell, 2008).

F. Hall, *The Importance of the British Plantations in America to this Kingdom*. (London: J. Peele, 1731).

J.R, Fleming, and V. Jankovic, 'Revisiting *Klima*,' *Osiris* 26. (Chicago: Chicago University Press, 2011).

G.E. Fussell, *The Classical Tradition in West European Farming*. (Rutherford: Fairleigh Dickinson University Press, 1947).

J. Gjerde, *From Peasants to Farmers*. (New York: Cambridge, 1985).

V. Jankovic, *Reading the Skies: A Cultural History of English Weather, 250-1820* (Manchester: Manchester University Press, 2000).

- V Jankovic, 'Arcadian Instincts: A Geography of Truth in Georgian England,' in Miles Ogborn and Charles Withers (eds.), *Georgian Geographies: Space, Place and Landscape in the Eighteenth Century*. (University of Manchester Press, 2003).
- V. Jankovic, 'Change in the Weather,' *Bookforum*, (Feb. 2006), 39-41.
- V. Jankovic, 'Climates as Commodities: Jean Pierre Purry and the Modelling of the Best Climate on Earth,' *Studies in the History and Philosophy of Modern Physics*. 41:33(2010), 201-207..
- E.L. Jones, *Seasons and Prices: the Role of the Weather in English Agricultural History*. (London: Allen and Unwin, 1964).
- L.J. Jordanova, 'Earth Science and Environmental Medicine: the Synthesis of the Late Enlightenment,' in L. J. Jordanova and Roy S. Porter (eds.), *Images of the Earth: Essay in the History of the Environmental Sciences* (BHS: London, 1978), 119-146.
- K.O. Kupperman, 'The Puzzle of the American Climate in the Early Colonial Period'. *American Historical Review* 87 (1982), 1262-1289.
- H. Lamb, *Weather Climate and Human Affairs* (London: Routledge, 1988).
- D Livingstone, 'The Moral Discourse of Climate: Historical Considerations on Race, Place and Virtue,' *Journal of Historical Geography* 17 (1991), 413-434.
- D. Livingstone, 'Race, Space and Moral Climatology,' *Journal of Historical Geography* 28 (2002), 159-180.
- J. Lorimer, *Settlement Patterns in Early Modern Colonization, 16th-18th Centuries*. (Aldershot: Variorum, 1998).
- S.F. Markham, *The Climate and Energy of Nations*. (London: Oxford University Press, 1944).
- M. Martin, 'Experience of the New World and Aristotelian Revisions of the Earth's Climates during the Renaissance. *History of Meteorology* 3 (2006), 1-15.
- R Mendelsohn, *Global Warming and the American Economy: A Regional Assessment of Climate Change Impacts* (Cheltenham: Edward Elgar, 2001).
- A.C. Migliazzo (ed.), *Lands of True and Certain Bounty: The Geographical Theories and Colonization Strategies of Jean Pierre Purry*. (Selinsgrove: Susquehanna University Press, 2002).
- W.D. Nordhaus, 'Economic Growth and Climate: The Carbon Dioxide Problem,' *American Economic Review* 67 (1977), 341-346.
- D. Pearce, A. Markandya, and E. Barbier, *Blueprint for a green economy* (Earthscan, London, 1988)/

- C. Pfister, 'Climate and Economy in Eighteenth Century,' *Journal of Interdisciplinary History*, 9 (1978), 223- 243.
- S. Randalls,. 'Optimal Climate Change: Economics and Climate Science-Policy. *Osiris* 26. (Chicago: Chicago University Press, 2011), forthcoming.
- A. Ross, 'Is Global Culture Warming Up?' *Social Text* 28 (1991): 3-30.
- S. Socolow, *The Atlantic Staple Trade. Volume 1: Commerce and Politics* (Aldershot: Variorum, 1996).
- N. Stern, *Stern Review on the Economics of Climate Change*. London: HM Treasury, 2006.  
<http://bit.ly/dvzZEG>
- J Riley, *The Eighteenth-Century Campaign to Avoid Disease*. (St. Martin Press: New York., 1987).
- H.S, Robinson, 'The Tower of the Winds and the Roman Market Place,' *American Journal of Archeology*, 47 (1943),291-305.
- J. Schumpeter, *History of Economic Analysis*. (London: Allen and Unwin, 1954).
- T. Sweet, *American Georgics: Economy and Environment in Early American Literature*. (Philadelphia: University of Pennsylvania Press, 2002).
- J.O. Thomson *History of Ancient Geography*. (London: Biblo and Tannen, 1948)
- D. W. Thompson, 'The Greek Winds,' *The Classical Review* 32 (1918): 49-56
- G. Whitney, *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate North America*. (New York: Cambridge University Press, 1994)
- T. M.L Wigley, M.J. Ingram, and G. Farmer, (eds.), *Climate and History: Studies in Past Climates and Their Impact on Man*. (Cambridge: Cambridge University Press, 1981).

## UNIT 8: DEALING WITH CLIMATE CHANGE: THE NATIONAL AND INTERNATIONAL ARENA

### INTRODUCTION AND LEARNING OUTCOMES

In recent decades, our society has been preoccupied with the possibility that humans are changing the composition of the atmosphere in ways that are harmful to life on earth. In the middle of the 20<sup>th</sup> century, clean air efforts were focussed on regional problems related to smoke pollution caused by coal burning. This was followed by concerns over the so-called "hole in the ozone layer" and climate change.

In this unit, students will explore how governments and international organisations have responded respectively to smoke pollution and the ozone problem. They will learn what caused these different episodes of pollution and how societies responded to them. The last section of the module will focus on recent international attempts to deal with global warming and asks whether we can learn anything from previous problems of air pollution which can help us tackle the present crisis. The module ends with a suggested student exercise that will encourage students to think about past and present issues related to air pollution, the successes and failures of dealing with these problems and what we can or cannot learn from them for dealing with today's greenhouse gas emissions.

### THE GREAT LONDON SMOG

As we have already seen in unit 4 the use of coal increased steadily in British cities, during the early modern period, both as a domestic fuel and as a source of energy for industrial activities. This led to an increase of smoke and soot pollution that would reach a peak in the mid-20<sup>th</sup> century.

London was infamous for its combinations of smoke and fog, combined in the word smog, and therefore earned the nickname 'the Big Smoke'. All major cities suffered from smoke pollution and Edinburgh's nickname, 'Auld Reekie' refers partly to the sanitary situation of the town as well as to smoke pollution.

The effects of this air pollution brought cities to a halt, disrupting traffic but more dangerously also causing death rates to rise. It also had a curious side effect. London became quite famous for its smogs, and many visitors came to see the capital in the fog, most notably, the artist Monet. He painted the atmospheric conditions at sunset caused by the smog many times between during his visits in the years 1899 and 1901. A recent study has shown that Monet's paintings of the House of Parliament were not created from his imagination but that these were firmly based on actual observations made during the artist's visits to London. It is perhaps the earliest visual record of the great London smogs.



'The Houses of Parliament' by Monet. The paintings of Monet form probably the best coloured record of the Victorian smog in London. *Monet.parliament.jpg*, ©Nicolas Pioch, *WebMuseum Paris*, <http://virgo.bibl.u-szeged.hu/wm/paint/auth/monet/parliament/>

In the paintings of Monet the smog appears harmless, producing vividly coloured skies but the reality could be deadly. A week of smog in 1873 killed over 700 people in London. In the decades before the disaster the earliest examples of legislation to control air pollution could not prevent smog deaths on such a scale. The first

piece of legislation was introduced by Home Secretary Lord Palmerston in the form of the Smoke Nuisance Abatement (Metropolis) Act of 1853. This Act demanded that every industrial furnace and steam boat navigating on the Thames between London Bridge and Richmond should be fitted with equipment to consume their own smoke, as far as possible, or should burn coke instead of coal. However, soon after the Act came into force it became clear that there were no arrangements to enforce the law. The problem was that the wording of the law was too vague and that many could easily prove that it was not practical to 'consume their own smoke'.

However, the real problem was not so much industrial smoke pollution. While air pollution control legislation may have reduced industrial air pollution, any reduction was more than offset by the increase in smoke created by domestic coal fires. By the turn of the 20<sup>th</sup> century it was becoming increasingly apparent that the main barrier to improved air quality was not of a technical nature but the general public's dependence on the use of open coal fires.

During the years of the First World War a parliamentary committee chaired by Lord Newton was set up to investigate possible legislative options to enforce smoke control. The so-called Newton Committee produced its report in 1920 and this formed the basis for the Public Health (Smoke Abatement) Act 1926. The Act included increased penalties for industrial polluters but did not go as far as the lobby groups had wished - with domestic smoke still exempt.

In 1929, the National Smoke Abatement Society was formed and this group introduced the idea of creating smokeless zones with homes designed for the economical use of fuel, with insulation and the use of smokeless fuel. These ideas influenced a Government Committee chaired by Sir Ernest Simon to report on domestic fuel policy. Their report, published in 1946, supported the transition to smokeless coal claiming that in terms of health, cost, efficiency and convenience these were superior to ordinary coal. The report concluded that a shift to smokeless coal would require positive action on behalf of the Government. However, there was not much public support to deal with smoke pollution because reconstruction was regarded as more important than clean air. It would take a disaster to shift public opinion and shock the politicians in Westminster into action.

In early December 1952 thick smog fell over London that lasted for five days and led to over 4,000 deaths in excess of the number of deaths in normal circumstances. The Government panicked and realized that it had to act immediately. Yet in good Westminster fashion a committee under the chairmanship of Sir Hugh Beaver was appointed in June 1953 to examine the causes and effects of air pollution and what preventive measures were practicable.

The Beaver Committee presented its report in November 1954 and there was nothing new about its recommendations which included the introduction of smokeless zones and the relocation of industries. In short, many smoke abatement lobby groups had been pressing for similar measures for almost a century. However, what was new was the suggestion to put all existing legislation into a single comprehensive Clean Air Act that covered not only industrial air pollution but also domestic smoke.

The recommendations of the Beaver Report resulted in the Clean Air Act of 1956. This Act aimed to control domestic sources of smoke pollution by introducing smokeless zones. In these areas, smokeless fuels had to be burnt by households. In addition industrial pollution of towns decreased because of the use of tall chimneys and relocation of power stations to rural areas. There is no doubt that the reduction



of domestic and industrial coal burning and the use of smokeless coals have led to a reduction in the levels of emission of sulphur dioxide, one of the main contributors to acid rain. Indeed, the emissions fell between 1970 and 1994 by 60%. However, the most important cause of the decline in urban air pollution was the introduction of new fuels and technologies. The switch from coal to oil and gas as the main fuels for heating, cooking, transport and industrial activities reduced emissions dramatically. Gas and oil produce only a fraction of soot, smoke and sulphur of coal, making the London smog a thing of the past. The question that remains is whether air quality in Britain improved because of the 1956 Clean Air Act or whether this would have happened regardless as a result of the introduction of new fuels and technologies.

#### TRANS-NATIONAL AND GLOBAL ATMOSPHERIC POLLUTION

For most of human history air pollution problems were local or regional in scale, with the exception of lead pollution. None of these instances of air pollution altered the composition of the atmosphere significantly to have any long-term consequences. That all changed during the 20<sup>th</sup> century with the emergence of two problems: the hole in the ozone layer and global warming. These two problems were the result of industrialization of the globe, which was made possible by technical developments such as the invention of the steam engine, and the internal combustion engine, and the availability of cheap energy in the form of fossil fuels.

#### A HOLE IN THE OZONE LAYER

The story of the hole in the ozone layer started in 1928. It was then that Thomas Midgley invented CFC (Chloroflourocarbon), a gas that was perfectly suited to refrigerating and for use in spray cans. Midgley is an interesting individual and historian John McNeill has remarked that Midgley 'had more impact on the atmosphere than any other single organism in earth history.' Not only did he invent CFCs but also discovered that adding lead to fuel makes engines run better. One could argue that Midgley's inventions symbolize how humankind, by developing technology, is supposedly killing itself. However this view is too simplistic since it was thought initially that CFCs were harmless. In addition, the gas is highly stable: it does not react with any other gas or substance. This remarkable chemical stability made people confident that there would be few, if any, environmental side effects. As a consequence the chemical was embraced by industry.

In 1974, Sherwood Rowland and Mario Molina discovered that CFCs are agents that can destroy stratospheric ozone under the influence of ultraviolet light. By 1977 it was almost certain that these gases, which were used on a large scale in spray cans and refrigerator systems, were damaging the ozone layer - which protects us from harmful UV-B radiation. However, governments, pressurised by the chemical industry, refused to act, since the mechanisms by which ozone was destroyed were by then not fully understood. It was argued that more data and research was needed to warrant action.

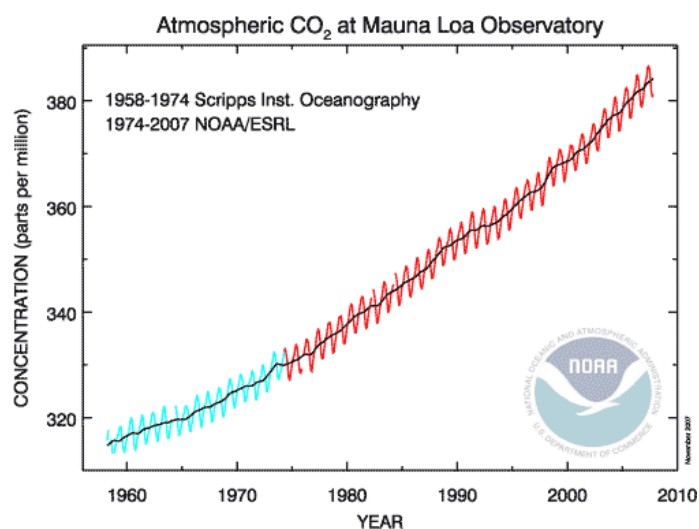
By the mid-1980s a severe seasonal thinning of ozone over the Antarctic was observed and by 1987 the world's media were reporting on a 'Hole in the Ozone Layer'. It was during that year that the Montreal Protocol established a scheme that led to a total global ban of the production of CFCs by the late 1990s. In 2003, observed levels of chlorine in the atmosphere peaked and then began to fall. However, they will remain high for decades to come and it is expected that atmospheric concentrations of ozone will not return to natural levels before the middle of the century.

Since depletion of stratospheric ozone has been the first human caused global environmental threat, it seems a good example of what can be achieved by international cooperation and determined action. However, on close inspection, it appears that if the precautionary principle had been applied at an early stage, money could have been saved and damage to the ozone layer avoided. The chemical industry reacted in the same way that the tobacco industry reacted to research that showed that smoking caused lung cancer. In both cases the industry in question bought scientific 'evidence' and launched public campaigns based on this so-called evidence to deny any harmful effects of either smoking or the use of CFCs. In addition governments were successfully lobbied to take no action on the grounds that there was not enough data to establish any harmful effects. As a result action was delayed for a decade, which resulted in the formation of the infamous ozone hole over Antarctica. When it was decided that CFCs had to be banned, alternatives that were more difficult to produce than the chemicals they replaced had to be developed at high costs and in a hurry. If it had been decided in 1977 to reduce the production of CFCs to levels that the atmosphere could cope with, and if alternatives had been developed during subsequent years, the hole over Antarctica could have been avoided altogether.

A combination of luck and foresight neutralised the threat caused by CFCs. If bromine instead of chlorine had been used on a large scale, the ozone hole would have been global by about 1970. Bromine and chlorine can be used interchangeably for many purposes but bromine is 45 times more potent than chlorine to destroy ozone. Luckily, bromine is too expensive and was for this reason not widely adapted. More by luck than wisdom the catastrophe did not develop. Next time we might not be so lucky.

#### GREENHOUSE GASES

Another major by-product of industrial activity, transport and agriculture is the increased emission of carbon dioxide (CO<sub>2</sub>) and methane, the two most important of the so called 'greenhouse gases'. These gasses in the earth's atmosphere act like a blanket that keeps heat in. Once the sun's energy heats up the earth surface, the heat is radiated back into space but the greenhouse gasses in the atmosphere traps part of this heat so the earth is much warmer than it would be if it had no atmosphere. This is essential for life and without greenhouse gases the earth would be permanently frozen. However, a rise in the concentration of the greenhouse gases caused by industrial processes has meant that more heat than usual is being trapped, leading to a potentially significant rise in the earth's average temperature.



This figure shows the history of atmospheric carbon dioxide concentrations as directly measured on top of the Mauna Loa volcano, Hawaii. This curve is known as the Keeling curve, and is an essential piece of evidence of the man-made increases in greenhouse gases that are believed to be the cause of global warming. The Mauna Loa observations are the longest record of carbon dioxide increase available and confirm that human activity is increasing the amount of this gas in the atmosphere. The annual fluctuations in the graph are caused by seasonal variations in carbon dioxide uptake by vegetation. The black line

shows the average monthly concentrations of CO<sub>2</sub>.

Source: Image courtesy of the National Oceanic and Atmospheric Administration,  
[http://www.esrl.noaa.gov/gmd/webdata/ccgg/trends/co2\\_data\\_mlo.png](http://www.esrl.noaa.gov/gmd/webdata/ccgg/trends/co2_data_mlo.png)

The increase in industrialisation has led to an annual increase of 5 billion tonnes of CO<sub>2</sub>. Methane from landfill sites and agriculture is increasing at a rate of over 1% per year. Plant life cannot absorb this rapid increase of greenhouse gases so the overall concentration of CO<sub>2</sub> is rising, and the temperature with it. The release of greenhouse gases is now recognised as a hazard for the planet. International legislation is trying to decrease the levels of pollution but the already industrialised countries, although reducing their levels of pollution, still contribute most to the problem.

#### NGOS AND CORPORATE INTERESTS

The year 1989 is often regarded as the breakthrough year of environmentalism and saw a surge of awareness concerning issues ranging from soil pollution to habitat loss and global warming. It was around this time that non-governmental organizations (NGO's) started to frame climate change as a 'green' issue. Large NGOs like the Sierra Club, Friends of the Earth and Greenpeace began to make global warming one of their top campaign priorities.

In response to the emerging climate consensus, corporate interests started to fund well-organised lobby groups to undermine any policies designed to counter climate change.

The most influential of these groups was the formidable Global Climate Coalition (GCC), a grouping of car, oil and other industrial companies. It claimed that the American economy would be damaged, and that consumers would suffer from increasing energy prices. They also believed that exempting developing countries from taking carbon reduction measures would create unfair competition. The GCC used disruptive and underhand tactics, aiming at discrediting climate change science and to sow doubt about the necessity of reducing emissions. It applied the experience of the smoking industry lobby to 'prove' that mainstream medical science was wrong with regard to the dangers of smoking.

But the GCC found it hard to maintain unity in the face of the growing evidence compiled by the IPCC. Many major corporations such as BP and Shell left the Coalition and the GCC was disbanded in early 2002.

However, with the disbanding of the GCC climate sceptics started to employ new tactics from the base of well-funded think tanks politically aligned with right wing political organizations. These tactics aimed at politicizing science itself and portraying scientific consensus as if it were a democratic process. This meant that climate sceptics demanded equal time for alternative 'theories'. If this was not happening, science could not be trusted, they argued. Since the about 2005 climate sceptic organizations have sustained a media campaign in which they have repeated this message over and over again, and not without results. Recent surveys in the United States and Britain have shown that increasing number of people have doubts about global warming. These pressures from NGOs and lobby groups as well as public opinion have had a considerable influence on the formal political negotiations.

## INTERNATIONAL POLITICS OF CLIMATE CHANGE

In 1988 the World Meteorological Organization and the United Nations formed a joint organization: the Intergovernmental Panel on Climate Change (IPCC). This new body was charged to fairly and openly assess the science and socio-economic challenges that societies are facing in the light of climate change. To date, the IPCC has published four full assessment reports in 1990, 1995, 2001 and the most recent one in 2007. The reports are a comprehensive review of the current state of scientific knowledge about global climate change, bringing together evidence of changes in the chemical composition of the atmosphere, evidence of warming of the climate system, understanding of the human contribution to the observed warming, and projections of changes to the global climate expected during the next few centuries.

The IPCC is only a scientific reporting body and has no powers to broker any internationally binding treaties to reduce the emissions of greenhouse gasses. The first attempts to come to an internationally binding agreement over reducing greenhouse emissions took place at the Earth Summit in Rio de Janeiro in July 1992. During this summit, a preliminary meeting of the so-called Conference of Parties (COP) was held. At that meeting, 154 countries signed the Framework Convention on Climate Change (FCCC), a treaty that committed signatories to voluntary cuts in greenhouse gas emissions, with the goal of bringing those emissions down to 1990 levels by the year 2000.

The Convention recognized the global climate system as a shared resource whose stability can be affected by carbon dioxide and other greenhouse gases. But since developed countries have been historically the main emitters of greenhouse gases, much of the convention was devoted to recommendations for those countries to reduce their emissions of greenhouse gasses.

The Convention entered into force on 21 March 1994, after ratification by more than 50 countries the previous December. To date, 192 countries have ratified the Convention, according to the FCCC. The first meeting of the signatories, the so-called COP1, took place in Berlin in 1995. It was not until COP3 in Kyoto in 1997, five years after the first meeting in Rio, that industrialized nations finally agreed to hard targets for cuts in carbon dioxide emissions. The Kyoto Protocol committed major greenhouse gas emitters to an average reduction of 5 per cent compared with 1990 levels between 2008 and 2012. An important detail that would have huge implications for future negotiations was that developing countries were exempt from reducing their emissions.

But the effectiveness of the Kyoto Protocol was undermined when the world's biggest greenhouse gas emitter at the time, the United States, walked away from this international framework in March 2001. Their justification for this course of action was that Kyoto would damage American economic prospects, that consumers would suffer from increasing energy prices and that large developing countries would benefit at the US's expense because they did not have to cut their emissions. These arguments were almost identical to those used by the Global Climate Coalition.

Without US participation, the American delegation was relegated to observer status, as negotiations moved forward. Notwithstanding the absence of the United States as partners in the international framework many countries moved forward and signed the treaty, including all the countries of the European Union and Russia.

During the 11th COP meeting held in Montreal in November 2005, a successor to the Kyoto Protocol, which expires in 2013, was discussed for the first time. Given the small scope of emissions cuts involved in the Kyoto Protocol, a new framework extending beyond 2013 was seen as the best way of restoring momentum to the fight against climate change.

In 2007, the international community took a decisive step in Bali, Indonesia, in their discussion for a 'post-Kyoto' treaty. Parties at the COP13 negotiations adopted the 'Bali Action Plan,' which committed them to a follow-up treaty to the Kyoto Protocol by the time of the 15th COP meeting in Copenhagen, Denmark, in December 2009. The expectation was that the meeting in Copenhagen would result in a comprehensive new treaty to limit greenhouse emissions. But things did not go according to plan. The climate meeting in Copenhagen did not end with the hoped for comprehensive treaty that would replace the Kyoto Protocol. In essence major differences in approach between key countries, and especially between the groups of large population: low wage developing countries labelled as the BASIC countries (Brazil, South Africa, China, India, and ASEAN) and the large OECD players in the form of the US and the EU resulted in a stalemate. The large developing countries like China, India, Brazil, and South Africa resented the pressure from rich western nations for parity in economic decarbonization at the very moment when their countries were enjoying rapid economic development. China, for example, is willing to cut carbon emissions but rejects legally binding targets for large developing countries. At the same time, China wants rich countries to be legally bound to a treaty to cut *their* emissions.

African developing countries want rich countries to pay poor countries for the mitigation of climate impacts. They have proposed a climate mitigation fund to reach \$100bn a year by 2020. Like China, African nations want rich countries legally bound to cut emissions to 40% below 1990 levels by 2020.

Another strong voice in Copenhagen was a group of low lying islands and coastal nations. They literally fear they will disappear into the sea if temperatures rise beyond 1.5 degrees centigrade. In order to prevent the flooding of their territories they have lobbied for a goal to cut global greenhouse emissions by a whopping 85 per cent by 2050.

And finally, it is not surprising that oil-producing countries led by Saudi Arabia have been lukewarm to climate science and a climate agreement. Together they pressed for compensation to offset any decline in oil export revenues due to any reduction in carbon dioxide emissions.

All these voices with their own agenda's made negotiations almost impossible and the outcome of the Copenhagen meeting was an unusual small document of three pages. This small document contained a non-binding accord that for the first time made 2 degrees Celsius the maximum acceptable global temperature increase an official guideline, rather than a EU aspiration. It also put in place a commitment to significant funding for developing nations to adapt to climate change, although falling short of the \$100 billion a year demanded by African nations. On the other hand, no hard emission reduction targets were set. This was left to the next meeting in Mexico in November 2010.

#### LESSONS FROM THE PAST?

Many regard the Copenhagen climate conference as a failure and much rests on future negotiations to limit the impacts of global warming. Looking at the history of pollution and environmental problems, the question arises if we can learn anything from the 1952 smog disaster and the ozone problem.

In the case of smog in Britain, the underlying causes had been known for more than a century when the Great London Smog occurred. The reasons that no serious action was taken - despite the many committees favouring it - were economic interests, the technology to mitigate air pollution was not yet sufficiently developed, and the general public was unwilling to give up their open coal fires. It took a disaster to introduce legislation to limit smoke pollution and combined with the introduction of new fuels and technologies it made the London smog a thing of the past.

The ozone problem is slightly more complex because it is a trans-national issue mixed with corporate interests. The ozone problem could occur because clever lobbying and the argument that additional scientific data was needed delayed action. The delay was quite costly but fortunately not disastrous. Global warming, on the other hand, is a much more complex problem in which all countries of the world are involved. So far, the IPCC has been entangled in the political process of the COP meetings that delays a speedy transition to lower carbon emissions. Indeed, with hindsight, the creation of the IPCC and the COP framework may appear as an excuse for delaying swift action over the past 20 years. The steps toward legally binding treaties to reduce greenhouse gas emissions have been incremental and bogged down in discussions rooted in the economic self-interest of the nations involved. What would have happened if decisive international action had been taken in 1988 leading to the reduction of greenhouse gas emissions to levels that the earth could cope with? In this scenario it would have been possible to continue to use fossil fuels, although at much lower levels, while buying humanity time to develop alternative forms of 'clean' or renewable energy.. Even then, we must keep in mind that it would have been necessary to take precautions against the warming that was already in the pipeline and could not have been avoided.

Perhaps all three cases of atmospheric pollution underscore that this is a story of delays to act which in turn are deeply consequent on issues of self-interest and political inertia.

## STUDENT-CENTRED EXERCISE

### DEBATING AIR POLLUTION AND CLIMATE CHANGE

Below are five statements referring to the history of smog, the ozone hole and climate change. Groups of students will debate these statements by either defending them or refuting. First divide the class in eight to ten groups, depending on the class size, and assign a statement to each of them. This means that one group argues 'in favour' of a statement and one 'against'. Groups may sign up on a first come, first served basis, by specifying both the debate topic and the position desired (Pro or Con).

Debate topics and position statements are outlined below. All group members are expected to participate in the research, development, and presentation of your debate position. Preparation will require substantial research using some of the suggested resources and reading and additional literature found in the library or online.

The debate will take the form of timed individual and group presentations and responses separated by timed group work periods.

*Prior to the beginning of the class period*, both teams are to position their chairs facing each other at the front of the room. Each team is to write its team name, debate position, and debate position statement on the blackboard/whiteboard behind them.

### DEBATE FORMAT

The debate is divided into three sections:

Opening Statements (5 minutes for each side)

One or two persons (preferably two) on each side should establish the key points of their side. Approach of the end of the time slot will be signalled. Five minutes will be complete cut-off.

*Five minutes will be given to both sides to consider the opening statements and plan their rebuttal responses.*

Rebuttal/ Supporting Statements (up to 10 minutes)

This is the core of the debate. Roughly equal time will be given to both sides, though the nature of debate is such that the exchange has a constant flow. Any team member may speak and wide participation from within a team based on areas of expertise is very helpful. All speakers must respect the chair's decision to stop a speaker to allow the opposing side to respond.

*Five minutes will be given to both sides to modify or reinforce their concluding statements in light of the arguments made during the debate.*

Concluding Statements (5 minutes for each side)

One or two persons (ideally two) from each side will summarise the key points and effective counter-arguments of their side. Approach of the end of the time slot will be signalled. Five minutes will be complete cut-off.

Debate 'Winners' will be selected in two ways, as follows:

*Audience Vote:* Class members in the audience will vote by secret ballot for a debate winner. At the conclusion of the debate, class members will put to the ballot if the Con or the Pro team has won. After all ballots are collected, the number of votes for each team will be announced. Whichever team has more votes will be the winner, and the team will receive 10 bonus points in addition to the 30 for basic preparation. In the event of a tie, the instructor's vote will decide the winner.

*Instructors' Vote:* The instructor will also evaluate both teams based on criteria such as presentation, quality of arguments, quality of research, collaboration within the group etc. The instructor's vote is 50% of the number of points, adding up to 100.

#### DEBATING STATEMENTS

1. The London smog disappeared in the decades after 1956 due to the implementation of the Clean Air Act.
2. The Great London Smog, the hole in the ozone layer and global warming persisted or continue to persist because, social, political and economic self-interest have sabotaged effective action.
3. The international response to the ozone hole could be a blueprint of how to tackle global warming.
4. The damage to the ozone hole could be successfully limited because there were technological solutions available. In the case of global warming we do not yet have the technology to deal successfully with this problem.
5. The developed countries are largely to blame for global warming and should reduce greenhouse gas much more drastically than developing countries.



## RESOURCES

### LONDON SMOG

Laura de Angelo, 'London smog disaster, England', *The Encyclopedia of Earth*,  
[http://www.eoearth.org/article/London\\_smog\\_disaster,\\_England](http://www.eoearth.org/article/London_smog_disaster,_England)

'Clean Air Acts', *Encyclopaedia of the Atmospheric Environment*,  
[http://www.ace.mmu.ac.uk/eae/Air\\_Quality/Older/Clean\\_Air\\_Acts.html](http://www.ace.mmu.ac.uk/eae/Air_Quality/Older/Clean_Air_Acts.html)

Video: Air Pollution in a Historical Perspective, *Environmental History Resources*, <http://www.eh-resources.org/vodcast/index.html#4>

The Great London Smog of 1952, *Met Office Education*,  
[http://www.metoffice.gov.uk/education/teens/casestudy\\_great\\_smog.html](http://www.metoffice.gov.uk/education/teens/casestudy_great_smog.html)

Peter Brimblecombe, *The Big Smoke: a history of air pollution in London since medieval times* (London: Methuen 1987).

Devra Davis, 'The Great Smog', *History Today*, 52:12 (2002), 2.

Stephen Mosley, *The chimney of the world: a history of smoke pollution in Victorian and Edwardian Manchester* (Cambridge: White Horse Press, 2001)

J.B. Sanderson, 'The National Smoke Abatement Society and the Clean Air Act (1956)', *Political Studies*, 9:3 (1961), 236.

### THE HOLE IN THE OZONE LAYER

'The History behind the Ozone Hole', *The Ozone Hole Tour*, University of Cambridge,  
<http://www.atm.ch.cam.ac.uk/tour/part1.html>

'Ozone Depletion', *NOAA Earth Systems Research Laboratory*,  
[http://www.esrl.noaa.gov/gmd/infodata/faq\\_cat-2.html](http://www.esrl.noaa.gov/gmd/infodata/faq_cat-2.html)

Richard Kahle, 'Montreal +22: Is this International Success Story a Blueprint for Climate Change Negotiations ? Earth Trends', <http://earthtrends.wri.org/updates/node/337>

'Libertarism, Climate change and the Tobacco Lobby', *Jules' Climate Blog*, <http://jules-klimaat.blogspot.com/2009/01/libertarism-climate-change-and-tobacco.html>

G. Megie, 'From stratospheric ozone to climate change: historical perspective on precaution and scientific responsibility', *Science and Engineering Ethics*, 12 (2006), 596–606.

Jan, Oosthoek, 'The IPCC and the Ozone Hole: a Warning from History', *Globalizations*, 5(2007), 63-66.  
<http://www.eh-resources.org/documents/WarningFromHistory.pdf>

T.F. Flannery, *The Weather Makers: The History and Future Impact of Climate Change* (London: Allen Lane, 2006), chapter 23.

Jonathan Shanklin, 'Reflections on the ozone hole', *Nature*, 465, (6 May 2010), 34-35.

## LESSONS FROM THE PAST?

'Climate Change', *NOAA Earth Systems Research Laboratory*,  
[http://www.esrl.noaa.gov/gmd/infodata/faq\\_cat-1.html](http://www.esrl.noaa.gov/gmd/infodata/faq_cat-1.html)

'Climate Change', *The Natural History Museum*, <http://www.nhm.ac.uk/nature-online/environmental-change/index.html>

'Climate Change Timeline', *The Met Office*,  
<http://www.metoffice.gov.uk/climatechange/guide/timeline/>

'Research Methods: Climate History', *Environmental History Resources*, <http://www.eh-resources.org/climate1.html>

Alex Evans and David Steven 'Climate Change Debate', *Global Greenhouse Warming.com*,  
<http://www.global-greenhouse-warming.com/climate-change-debate.html>

P.T. Zeleza, 'The Predictable Failure of the Copenhagen Climate Change Conference', *The Zeleza Post*,  
<http://www.zeleza.com/blogging/global-affairs/predictable-failure-copenhagen-climate-change-conference>

Kevin C. Armitage, 'State of Denial: The United States and the politics of global warming', *Globalizations*, 2 (2005), 417–27.

T. Flannery, *The Weather Makers. The History & Future Impact of Climate Change* (Melbourne: The Text Publishing Company, 2005).

J. R. Fleming, *Historical Perspectives on Climate Change* (New York: Oxford University Press, 1998).

Peter J. Jacques Riley, E. Dunlap and Mark Freeman, 'The organisation of denial: Conservative think tanks and environmental skepticism', *Environmental Politics*, 17, : 3 June 2008 , 349- 385,  
<http://www.informaworld.com/smpp/section?content=a793291693&fulltext=713240928>

## UNIT 9: DEALING WITH CLIMATE CHANGE: THE DRIVE TO TECHNOLOGICAL 'SOLUTIONS'

### INTRODUCTION AND LEARNING OUTCOMES

In this unit we will investigate the possibility that has been suggested by some, of dealing with climate change by employing one or more technology-based solutions. These suggestions involve adjustments being made to the geophysical processes that ultimately determine the temperature at the Earth's surface. We will examine the basis for these suggestions and explore past experiences of the application of technological solutions to human problems. Although it has been a common perception among many in the 'industrialised world' that science and technology can offer solutions to the problems that society or the world faces, many others have grave doubts about the uses of technology for this purpose. Evidence suggests that the use of technology in this way does not always address the central core of the problem and often causes more problems than it solves. The term 'technological fix' is often used to describe this situation. We will give a general background to the discussion on the difficulties of applying technological solutions to human problems and look at some case studies where technology has been able to offer solutions for specific problems and examples where it has failed to do so, or in so doing has presented society with other, sometimes bigger, problems. Many would argue that anthropogenic climate change has been, for the most part, a consequence of the widespread and irresponsible misuse of technology. Some might argue that the technological fixes—termed geoengineering—that are being suggested and developed in an attempt to lessen the effects of climate change, are a consequence of engineers and scientists feeling that they need to redress the image of science and technology, which has been somewhat tarnished during the climate change debate. We will outline the ideas behind these proposed technical solutions and explore the possibility of success or failure.

At completion of this module students should be able to:

- demonstrate a basic understanding and familiarity with the concept of the 'technological fix' and how it has been used successfully and unsuccessfully in the past;
- communicate and understand the problems associated with applying technological solutions to human problems;
- develop a critical analysis of the geoengineering solutions currently being proposed to alleviate the immediate problems of climate change.

### The Technological Society and the 'Technological Fix'

There can be no doubt that the development of technology has been responsible for enormous changes in some societies. The development of washing machines and vacuum cleaners has taken much of the drudgery and hard work away from caring for the home. Cars, trains and planes have enabled large numbers of people to travel faster and further than their ancestors ever did. However, the large scale development, manufacture and transport of machines such as these have been largely responsible for the climate change problems we are experiencing now. In addition, the promises made by technologists that the development and increasing use of machines would release us from work and give us more free-time for leisure and relaxation has not materialised. Instead, large numbers of workers have lost their jobs because of mechanisation and those who have kept theirs still work long hours. The introduction of machines has been seen to serve business and profits rather than the workforce and general population.

Even so, the technological developments made by a country are often seen as a way of measuring the success of its economy and of its status and influence in the world. In particular, the rapid development of superior and effective new technologies are often seen as being significant and decisive during war time (for example, the British developments of the Spitfire, radar and the code breaking technology employed at Bletchley Park). Perhaps the ultimate example of this is the development of the atomic bomb and its use on the citizens of Hiroshima and Nagasaki by the US at the end of the Second World War. At that time it seemed that the ultimate war fighting weapon had been invented and some even believed that its use was so devastating that it would make further wars unthinkable. This was not the case, however: instead the US and USSR engaged in technological arms and space races, desperately trying to demonstrate their superiority in science, technology and thereby, in war fighting capability. The Cold War that followed World War II also saw the rise of a branch of applied mathematics applied to the social sciences - Game Theory - and the mathematical modelling of human behaviour became an important influence on economic planning, politics and international relations. The mathematician John Nash (of '*A Beautiful Mind*' fame) based his models on the assumption that humans are essentially suspicious and selfish and that their behaviour is the result of strategies that they develop from these basic characteristics. These ideas became popular among some economists who based their ideas on the concept of self-interest alone. They had no place for altruism. Like-minded assumptions were used by the RAND Corporation to develop the USA's nuclear deterrence strategy. These strategies almost led the world to nuclear war instead of its avoidance.

This faith in technology, regardless of its outcomes, has been closely analysed by the French philosopher and sociologist, Jacques Ellul. He has written extensively of his concern that technology threatens human freedom and Christian faith and that humanity is in danger from a 'technological tyranny'. He also saw that people were beginning to revere technology. In *The Technological Society* (1964) he declared that the problem is not so much the society of machines as the society of 'efficient techniques' which defines the new social order—where efficiency is no longer an option but something imposed on all human society. His concern is that an over emphasis and/or reliance on technology is changing the way we view problems and their possible solution. Sometimes we may only be arriving at short term fixes to an approximation to a particularly complex problem and not tackling the heart of the real problem at all. This kind of approach is often referred to as a 'technological fix.'

In the introduction to *The Technological Fix: How People Use Technology to Create and Solve Problems* (2004), Lisa Rosner points out that the term 'technological fix' may first have been used by Alvin Weinberg in 1967. In his book *Reflections on Big Science* he posed the following question:

*In view of the simplicity of technological engineering and the complexity of social engineering, to what extent can social problems be circumvented by reducing them to technological problems? Can we identify Quick Technological Fixes for profound and almost infinitely complicated social problems, 'fixes' that are within the grasp of modern technology, and which would either eliminate the original social problem without requiring a change in the individual's social attitudes, or would so alter the problem as to make its resolution more feasible?*

Weinberg was a nuclear scientist working at a time when science, engineering and technology were seen as extremely important ways of determining progress and measuring global status. He was convinced that nuclear energy would be a great boon to society. Even though later, in his 1994 book *The First Nuclear Era: The Life and Times of a Technological Fixer*, he admitted that the costs of nuclear

energy were far more than he predicted; he remained a great champion of technology. He thought that the hydrogen bomb acted as a 'stabilizer of relations between the US and USSR' and thus, a technological fix for preventing a Third World War. By the same token, television and air conditioning would keep people reasonably comfortable and off the streets, and so fix urban unrest. Others pointed out then and since that technological fixes deal with symptoms and not the underlying cause of the problem. Such fixes also often have unforeseen and damaging side effects that are sometimes worse than the social problem they were supposed to deal with. As John Burke commented in 1969:

*Although there is no doubt that some of our problems can be solved by sophisticated engineering methods, I think it erroneous to insist that all problems are capable of a technological fix.*

Lisa Rosner suggests that by 1970 the term technological fix was mainly viewed in a negative or ironic sense—people had become disenchanted with technology's ability to solve all of humanity's problems. The testing of bigger and bigger nuclear weapons by the US and USSR and the misuse of weapons technology in Vietnam showed perhaps the worst side of the application of technology to an assumed problem.

However, it remains common for engineers and scientists, in particular, to suggest that environmental problems can be fixed by technological solutions.

## CASE STUDIES

### Silent Spring

There have been a number of occasions when some technologies have been adopted and introduced on a wide scale without proper consideration of the possible side effects. Such a case is that of the use of DDT as an insecticide to protect crops in the 1950s and 60s. In her famous book *Silent Spring* (1962) Rachel Carson clearly documented the effects of pesticides on the environment and in particular on birds. She showed how the use of DDT had been responsible for the thinning of egg shells, reproductive problems and the widespread death of birds. She accused the chemical industry of misinforming the general public about the safety of their product and public officials of accepting their disclaimers without question. The book, and the plea within it to curb the use of insecticides, caused a huge stir and public concern eventually led to a ban on the use of DDT. Carson, and the book, were heavily criticised by the chemical industry and the agriculture department. She was attacked with threats of legal action and accused of being hysterical, anti-scientific and of taking civilisation back to a time when insects and disease would inherit the earth. She was heavily criticised even recently for not taking into account the role that DDT played in curbing the spread of malaria carrying mosquitoes (even though the widespread use of DDT had actually made some mosquito populations DDT resistant).

The relevant issue here is that the chemical DDT was employed in an attempt to technologically fix a major problem - the attack on valuable and important crops by insects - but it ended up causing another unforeseen one.

Students can be asked to investigate how crops were protected when DDT was banned. Are there non-technical/chemical ways of protecting crops?

There are also some interesting parallels between this case and that of climate change. It took some time before the links between the use of DDT and environmental damage became widely accepted. They were disputed by those with a vested interest and deniers continue to argue that the case is not proven or that there are undesirable side effects to any action taken—e.g. a restriction of economic freedoms; an increase in cases of insect born disease, etc.

'The Story of Silent Spring' from the Natural Resources Defense Council gives a background to the effects the book had on the general public—see: <http://www.nrdc.org/health/pesticides/hcarson.asp>

A useful article for discussion is 'Fooling with Nature: Silent Spring Revisited,' by Dorothy McLaughlin for *Frontline*—available at <http://www.pbs.org/wgbh/pages/frontline/shows/nature/disrupt/sspring.html>

## Environmental Management and Industrial Pollution

It may also be useful to follow this up by considering a similar case as to how technology and the scientific method can be used to manage environmental problems caused by the excessive burning of fossil fuels. The Open University offer a Unit to students called 'Issues in environmental management: beyond the technical fix.' It is available on the 'OpenLearn' website which gives free access to learning materials from higher education courses and is made available within the Creative Commons framework under the CC Attribution–Non-commercial licence. An introduction to the idea of 'technical fix' and the related case studies can be found at:

<http://labspace.open.ac.uk/mod/oucontent/view.php?id=426011&section=1.1>

Sometimes major disasters have led to profound changes in the way we manage environmental issues. Some might even argue that these disasters are necessary before any change is effected. We have already seen in our previous unit the impact of the London Smogs of the 1950s (leading eventually to Acts of Parliament in favour of smoke abatement, the root cause of the problem).

In another similar case, an overseas example of technological fix can be garnered from China where rapid industrial revolution brings its own environmental health challenges. Industrial legislation and regulation are not yet well developed here and in some regions rice fields are exhibiting high levels of mercury pollution which is emanating from nearby industrial waste processes. Attempts are being made to address the problem by using rare earth minerals in the agricultural fields adjacent to industrial plants to neutralise the toxic effects of waterborne waste chemicals. A technological fix of this sort may be helpful as a short-term palliative, but is clearly not addressing the nub of the problem.

Students can look more closely at this problem of Industrial pollution in China at: <http://labspace.open.ac.uk/mod/oucontent/view.php?id=426011&section=1.3>

Students can be asked to consider why these two cases - the use of DDT as an insecticide and the attempt to deal with China's industrial pollution of its agriculture—might be described as technological-fixes.

Other, alternative and more sustainable solutions could be discussed, along with the possible reasons why technological solutions that just require tinkering with or adding extra processes to an operation often appear to be more attractive than making fundamental changes to the way that society, or traditional industrial processes, work.

What kind of systemic changes would alternative solutions require in these two cases?

What are the differences and the similarities between Chinese industrial pollution, the case of Silent Spring and that of anthropogenic climate change?

## Childhood Tooth Decay

A penultimate illustration of a technological fix is described in 'Wikipedia' at [http://en.wikipedia.org/wiki/Early\\_childhood\\_caries](http://en.wikipedia.org/wiki/Early_childhood_caries). Here the problem considered is that of childhood tooth decay. It is widely known that fluoride helps protect teeth against decay. As a consequence, those people seeking a simple technological fix to the problem of children requiring too many visits to the dentists for fillings, would advocate treating the community water supply with a low level of sodium fluoride. By contrast, those who prefer a purely attitudinal fix would mount an educational campaign to promote good nutrition and encourage parents to teach children to take better care of their teeth. An intermediate approach would be built around urging everyone to brush regularly with fluoride based toothpaste.

In this case, two groups might be considered to have polarised approaches to solving the problem. Those who have a technological fix mentality believe that technology is the key to solving most problems, conflicts, or unpleasant situations. On the other hand, there are those with a particular dislike or distrust of technology who would work to change peoples' attitudes and behaviours in their attempt to solve societal problems - even when simple and effective technological fixes are available. The Wikipedia item suggests that it is more typical for problems to be solved by intermediate approaches which employ both technological and attitudinal fixes.



## Geoengineering our Way out of Climate Crisis?

*Americans in particular have often seen technological progress as the surest basis for progress in general, and have tended to believe that technological solutions to problems are less painful than solutions that require political or social changes.*

(Rudi Volti, *Society and Technological Change*, 3rd edition, 2006. 16.)

Preventing Climate Change through multilateral negotiation has proved to be extremely difficult. Indeed, the failure to date of sovereign states to reduce their production of CO<sub>2</sub> by common agreement is a classic case of the 'Tragedy of the Commons'. Even before climate change the problem was identified by Garrett Hardin in the journal *Science* in 1968 (available at <http://www.sciencemag.org/cgi/reprint/162/3859/1243.pdf>) as occurring when a number of individuals or groups, acting independently and seeking only their own self-interest, ultimately deplete a shared resource even when they know that it is not in their or anyone's long term interest to do so. Changing embedded structures and putting in its place effective Climate Change Regulation has proved so far not simply too difficult to implement, monitor and enforce but lacking the fundamental political will to begin the very process.

These difficulties have led some to think of alternative ways of ensuring our long term survival. Adapting to climate change is risky and avoids the real problems so there are an increasing number of ideas being suggested for alleviating Climate Change through so-called Geoengineering projects which The Royal Society defines as 'the deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change'. These proposals are highlighted and discussed in Clive Hamilton's article 'The powerful coalition that wants to engineer the world's climate', posted on the Guardian Environment Network on 13 September 2010 (available at <http://www.guardian.co.uk/environment/2010/sep/13/geoengineering-coalition-world-climate>) and involve techniques that aim to reduce the temperature at the surface of the Earth either by reflecting solar radiation so that it does not reach us or alternatively, by removing CO<sub>2</sub> from the atmosphere.

Among some of the more farfetched ideas put forward are proposals for blocking or reflecting solar radiation by launching giant mirrors or billions of reflective discs into space. Another idea involves increasing the levels of sulphur dioxide in the upper atmosphere to reflect the sun's rays in the same way that volcanoes reduce global temperatures by releasing sulphates when they erupt. A further one is to coat 67,000 square miles of desert in shiny reflective plastic. See also Corporate Watch's 2008 report 'Techno-fixes: a critical guide to climate change technologies' (available from <http://www.corporatewatch.org.uk/?lid=3126>) brief critical overview of each proposed technique.

Ideas for removing CO<sub>2</sub> from the atmosphere include Ocean Fertilisation (whereby phytoplankton in the oceans which absorb CO<sub>2</sub> as part of their photosynthesis process are encouraged to grow by the introduction of tons of iron filings); filtering CO<sub>2</sub> from the air by constructing giant filters or 'wind scrubbers' that would trap passing CO<sub>2</sub> molecules; carbon capture and storage (or sequestration—whereby CO<sub>2</sub> is injected into geological formations such as depleted oil or gas reservoirs for long term storage); or even turning CO<sub>2</sub> to stone through absorption by peridotite rocks that react naturally with CO<sub>2</sub> at high rates to form solid minerals.

A range of articles have been written about these techniques ranging from the generally supportive (e.g. 'Geoengineering May Represent Earth's Best "Plan B" by Matthew Berger—see <http://ipsnews.net/news.asp?idnews=53021> or 'How Earth-Scale Engineering Can Save the Planet' *Popular Science*, June 2005—see <http://www.popsci.com/environment/article/2005-06/how-earth-scale-engineering-can-save-planet>) to the fairly non-committal: 'Can engineering the earth save it from catastrophe?' by Steve Connor, science editor of the *Independent*, September, 2008—see <http://www.independent.co.uk/news/science/can-engineering-the-earth-save-it-from-catastrophe-914549.html>) to outright oppositional '20 Reasons why geoengineering may be a bad idea', in which Alan Robock, raises a host of scientific, social and ethical issues posed by geoengineering in the May/June 2008 edition of *the Bulletin of the Atomic Scientists* - <http://climate.envsci.rutgers.edu/pdf/20Reasons.pdf>. ( See also the follow-up article involving Alan Robock and four fellow discussants: Dan Whaley, Ken Caldeira, Margaret S. Leinen and Tom Wigley; debating on how to weigh geoengineering's potential benefits against its negative consequences—at: <http://www.thebulletin.org/web-edition/roundtables/has-the-time-come-geoengineering.>)

In September 2009 the Royal Society published their findings from a major study into geoengineering the climate (see: <http://royalsociety.org/geoengineering-the-climate/>). The report recommended:

- Parties to the United Nations Framework Convention on Climate Change should make increased efforts towards mitigating and adapting to climate change and in particular to agreeing to global emissions reductions of at least 50% on 1990 levels by 2050 and more thereafter;
- Carbon Dioxide Removal (CDR) and Solar Radiation management (SRM) geoengineering methods should only be considered as part of a wider package of options for addressing climate change. CDR methods should be regarded as preferable to SRM methods.
- Relevant UK government departments, in association with the UK Research Councils, should together fund a 10 year geoengineering research programme at a level of the order of £10M per annum.
- The Royal Society, in collaboration with international science partners, should develop a code of practice for geoengineering research and provide recommendations to the international scientific community for a voluntary research governance framework.

What are your views on these recommendations?

In March 2010 the House of Commons published a report from the Parliamentary Science and Technology Committee on 'The Regulation of Geoengineering'—available at <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/221/22102.htm> among the conclusions and recommendations were:

- Through its involvement in the existing international regulatory arrangements such as the UN Framework Convention on Climate Change and when these instruments come up for revision we recommend that the Government raise geoengineering, particularly those for Carbon Dioxide Removal (CDR), and seek to develop, in conjunction with other governments, the arrangements provided by these international instruments so that they address research on, and deployment of, CDR geoengineering techniques.
- We conclude that there is a gap in the regulatory framework for geoengineering techniques, especially for SRM techniques.

- We recommend that the Government review its policy on geoengineering to give it greater priority.
- The science of geoengineering is not sufficiently advanced to make the technology predictable, but this of itself is not grounds for refusing to develop regulatory frameworks, or for banning geoengineering. There are good scientific reasons for allowing investigative research and better reasons for seeking to devise and implement some regulatory frameworks, particularly for those techniques that a single country or small group of countries could test or deploy and impact the whole climate.
- We conclude that there is a need to develop a regulatory framework for geoengineering. Two areas in particular need to be addressed: (i) the existing international regulatory regimes need to develop a focus on geoengineering and (ii) regulatory systems need to be designed and implemented for those SRM techniques that currently fall outside any international regulatory framework.

What are your views on these recommendations?

An interesting debate between Gwynne Dyer (author of *'Climate Wars: The Fight for Survival as the World Overheats'*) and Vandana Shiva (Indian environmentalist, scientist and philosopher) appeared on *Democracy Now* on 8 July 2010 and can be seen (along with a transcript) at <http://www.handsoffmotherearth.org/2010/07/vandana-shiva-debates-geoengineering-with-gwynne-dyer-on-democracy-now/>

Students might like to comment on the various attitudes and philosophies that can be seen in the overall debate on geoengineering.

## Topics for Student Discussion and Further Research

Some reasons why geoengineering may be a good idea:

- Climate Change 'Marshall Plans,' designed to curtail greenhouse gas emissions, tend to fail before they begin;
- Developing technology to affect the climate directly - a 'Climate Change Manhattan Project'— may at least give a breathing space for regulations to become effective.

Some reasons why geoengineering may be a bad idea:

- The development of geoengineering projects may lead people to believe a solution is at hand and this may encourage people to continue emitting CO<sub>2</sub> rather than attempting to cut down emissions;
- All of the geoengineering projects being considered might have unintended consequences, we don't really understand the climate well enough, so should we start doing something where the cure might be worse than the disease?

Other Geoengineering Questions

- How effective would various climate engineering proposals be at achieving their climate goals?
- What unintended outcomes might result?

- How might these unintended outcomes affect both human and natural systems?
- Should legitimate research activities continue?
- Should experimental as well as theoretical research take place?
- Who decides whether an experiment or project can go forward?
- Are people concerned about geoengineering because they fear that the research might be harmful, or because they're worried that the knowledge gained might be dangerous?
- Is it more cost-effective to continue reducing emissions and find savings in energy efficiency with the best application of technology?
- Are science and business mutually exclusive activities?

## RESOURCES

### TECHNOLOGY AND SOCIETY

J. Ellul, *The Technological Society*, (Vintage Books, 1964).

L. Rosner, (ed), *The Technological Fix: How People Use Technology to Create and Solve Problem*, (Routledge, 2004).

A. Weinberg, *Reflections on Big Science*, (MIT Press, 1969).

R. Volti, *Society and Technological Change*, (3rd edition, Worth Publishers, 2006).

### CASE STUDIES

R. Carson, *Silent Spring*, (40<sup>th</sup> Anniversary Edition, Mariner Books, 2002).

G. Hardin, 'Tragedy of the Commons' ", *Science*, 1968 - available at <http://www.sciencemag.org/cgi/reprint/162/3859/1243.pdf>

Natural Resources Defense Council, 'The Story of Silent Spring' - <http://www.nrdc.org/health/pesticides/hcarson.asp>

D. McLaughlin, 'Fooling with Nature: Silent Spring Revisited', *Frontline* – <http://www.pbs.org/wgbh/pages/frontline/shows/nature/disrupt/sspring.html>

The Open University, 'Issues in environmental management: beyond the technical fix', available on the "OpenLearn" website at -<http://labspace.open.ac.uk/mod/oucontent/view.php?id=426011&section=1.1>

### GEOENGINEERING

M. Berger, 'Geoengineering May Represent Earth's Best "Plan B"', Inter Press Service, 30 September, 2010 –available at <http://ipsnews.net/news.asp?idnews=53021>

S. Connor, 'Can engineering the earth save it from catastrophe?', *The Independent*, September, 2008– see <http://www.independent.co.uk/news/science/can-engineering-the-earth-save-it-from-catastrophe-914549.html>

Corporate Watch, 'Techno-fixes: a critical guide to climate change technologies,' 2008 - available from <http://www.corporatewatch.org.uk/?lid=3126>

Democracy Now!, 'Vandana Shiva debates Geoengineering with Gwynne Dyer', 8 July 8 2010–available at <http://www.handsoffmotherearth.org/2010/07/vandana-shiva-debates-geoengineering-with-gwynne-dyer-on-democracy-now/>

C. Hamilton 'The powerful coalition that wants to engineer the world's climate' *posted on the Guardian Environment Network*, 13 September 2010 - available at <http://www.guardian.co.uk/environment/2010/sep/13/geoengineering-coalition-world-climate>

Parliamentary Science and Technology Committee—Fifth Report, 'The Regulation of Geoengineering', *House of Commons*, 10 March, 2010—available at <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/221/22102.htm>

Popular Science, 'How Earth-Scale Engineering Can Save the Planet', *Popular Science*, June 2005—see <http://www.popsci.com/environment/article/2005-06/how-earth-scale-engineering-can-save-planet>

A. Robock, A., '20 Reasons why geoengineering may be a bad idea', *Bulletin of the Atomic Scientists*, May/June 2008 - <http://climate.envsci.rutgers.edu/pdf/20Reasons.pdf>

A. Robock, D. Whaley, K. Caldeira, M.S. Leinen and T. Wigley,. "Has the time come for geoengineering?" *Bulletin of Atomic Scientists*, August, 2008 - <http://www.thebulletin.org/web-edition/roundtables/has-the-time-come-geoengineering>

Royal Society, 'Geoengineering the Climate', the Royal Society, London, September 2009 - <http://royalsociety.org/geoengineering-the-climate/>

## UNIT 10: DISCOURSES OF DENIAL

### INTRODUCTION

For environmental issues like pollution, resource management or loss of biodiversity to be recognised by us as environmental *problems* some degree of scientific expertise, almost inevitably, is required. Activities once thought rational and benign we now *know* to generate environmental problems. Scientific knowledge shapes the way that remedial action is conceptualised and defines the *solutions* that we propose for dealing with these problems. Such knowledge therefore has epistemological *and* political significance. It tells us how the world is, but inherently raises questions about how the world ought to be. We may *know* that CO<sub>2</sub> in the atmosphere is rising due to anthropogenic activity, but we *judge* that this CO<sub>2</sub> is, what Mary Douglas would call, 'matter out of place'<sup>4</sup> and therefore constitutes pollution that it would be desirable to remedy.

Taking action to address an environmental problem involves changes to social patterns of behaviour. New distributions of welfare are generated, meaning that many groups lose their environmental privileges (e.g. to use the atmosphere as a dump for waste products) or, alternatively, benefit from new opportunities (such as the manufacture of 'green' goods). There are many reasons therefore to advocate or resist transition to more environmentally benign practices. Scientific knowledge has therefore become a site for political contestation. Ever since Rachel Carson's publication of *Silent Spring* in 1965<sup>5</sup>, claims that human activities have unintentionally given rise to environmental harm have been met with counter-arguments that the activity is either not as harmful as supposed or that proposed responses to the problem would do more damage than continuing with 'business as usual'. In the case of anthropogenic global warming this has become particularly apparent as the idea of a 'climate change sceptic' or a 'climate change denier' enters public parlance and rejection of scientific claims about environmental harm become an unavoidable element of environmental politics.

### LITERATURES OF DENIAL

Climate change scepticism / denial itself is most systematically analysed in America, where the phenomena has been most apparent. Emerging around 1988 when the IPCC was founded and the issue of anthropogenic global warming became an international policy issue; sections of American society began to publicly dispute the veracity of climate scientists' claims. Commentators have identified three key components, which characterise this project:

- A group of self professed sceptical scientists
  - Sonja. Boehmer-Christiansen, 'Global climate protection policy: the limits of scientific advice' Parts I & 2, *Global Environmental Change* 2 (1994), 140-159 and 185-200.
  - Aaron M, McCright, and Riley E Dunlap, 'Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy', *Social Problems* 50:3 (2003), 348-373.
- Business and industry groups like the Global Climate Coalition
  - Ross Gelbspan, *The Heat is On* (Reading, Massachusetts: Addison-Wesley Publishing Company Inc., 1997).

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<sup>4</sup> Mary Douglas, *Purity and Danger: Analysis of Concepts of Pollution and Taboo*, (London: Routledge, 2002)

<sup>5</sup> Rachel Carson, *Silent Spring*, (London: Penguin Modern Classics), 1962

- Simone Pulver, 'Organising business: Industry NGOs in the Climate Debates', in *The Business of Climate Change: Corporate Responses to Kyoto*, ed. Kathryn Begg, Frans van der Woerd and David Levy (Sheffield: Greenleaf Publishing, 2005), 47-60.
- Conservative think tanks
  - Aaron M McCright and Riley E. Dunlap, 'Challenging Global Warming as a Social Problem: An Analysis of the Conservative Movement's Counter-Claims', *Social Problems* 47:4 (2000), 499-522.
  - Peter J. Jaques, Riley E. Dunlap and Mark Freeman, 'The organisation of denial: Conservative think tanks and environmental scepticism', *Environmental Politics* 17:3 (2008), 349-385.

The evolution of the sceptical discourse and its effect on American policy over the course of the 1990s can be traced through the interaction of these three components and their ultimate success in resisting the – for sceptics and deniers - much hated Kyoto Protocol. Useful reading on this topic might include:

- Newsweek, 'The Truth About Denial' *Newsweek*, 13 August 2007:  
<http://www.newsweek.com/2007/08/13/the-truth-about-denial.html>
- Short summaries of American climate change policy making in the 1990s such as-
  - Armin Rosencranz, 'U.S. Climate Change Policy', in *Climate Change Policy: A Survey*, eds. Stephen H. Schneider, Armin Rosencranz and John O. Niles (Washington: Island Press, 2002) 221-234.
  - Armin Rosencranz and Russell Conklin, 'National Policy', in *Climate Change Science and Policy*, eds. Stephen H. Schneider, Armin Rosencranz, Michael D. Mastrandrea and Kristin Kuntz-Duriseti (London: Island Press, 2010) 343-356.
- Use of the global research database, Nexis, might fruitfully be made in searching the press for mentions of the 'Global Climate Coalition'. This will generate a lot of material that will illustrate the kind of message being developed in their press releases over the course of the decade.

There are various literatures, which try to characterise this kind of contestation of scientific knowledge. Some have developed the idea of 'denialism' as a way of labelling a particular type of rhetoric that can be deployed with regard to a variety of issues.

- Rick Stoff, 'Denialism' and muddying the waters.' *St. Louis Journalism Review* 37:296 (2007) 21 and 33.
- Mark Hoofnagle, 'Climate change deniers: failsafe tips on how to spot them', *Guardian*, 11 March 2009.
- Pascal Dethelm and Martin McKee, 'Denialism: what is it and how should science respond?' *European Journal of Public Health* 19 (2009) 2-4.

Others characterise climate change, and other kinds of environmental, scepticism/denialism as part of America's culture wars. Frederick Buell explores how America's conservative movement challenged the environmental and social movements of the 1970s, neutralising environmentalists demands for change. Peter Jaques and his colleagues look at the role of conservative think tanks in challenging environmentalism. Naomi Oreskes and Erik Conway make the point that campaigns in favour of the



Tobacco Industry and the 'Star Wars' defense program in the 1970s and 1980s, shared the same rhetoric, personnel and institutions as later campaigns against legislation to reduce acid rain, ozone depletion and global warming. James Hoggan and Richard Littlemore give us a PR practitioner's personal perspective on the 'Climate cover-up', while Chris Mooney argues that contemporary conservatism is in tension with science on a wide range of issues and takes his discussion beyond environmental problems by including issues like stem cell research, abortion, contraception, etc.

- Frederick Buell, *From Apocalypse to Way of Life* (London: Routledge, 2003).
- James Hoggan and Richard Littlemore, *Climate Cover-Up: The Crusade to Deny Global Warming* (Vancouver: Greystone Books, 2009).
- Peter J. Jaques, Riley E. Dunlap and Mark Freeman, 'The organisation of denial: Conservative think tanks and environmental scepticism', *Environmental Politics* 17:3 (2008) 349-385.
- Peter J Jaques, *Environmental Skepticism: Ecology, Power and Public Life* (2009).
- Chris Mooney, *The Republican War on Science* (New York: Basic Books, 2005).
- Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (London: Bloomsbury Press, 2010).<sup>6</sup>

#### LEARNING OUTCOMES

Students should:

- Be aware of the importance of scientific knowledge in shaping the way environmental problems are perceived and interpreted.
- Be familiar with the American tradition of climate change scepticism, which emerged as a response to the international policy agenda of the late 1980s/early 1990s.
- Understand the arguments for seeing environmental scepticism as an ideological position within the conservative movement of the US culture wars.

#### SEMINAR DEVELOPMENT

##### *A Comparison: Holocaust Denial*

The seminar activity compares climate change denial, which attacks the authority of natural scientific knowledge, to Holocaust denial, which attacks the authority of historical knowledge.

##### *Holocaust denial*

It is unlikely that anyone involved in the seminar would be unfamiliar, with or unconvinced by, the arguments for the existence of the Holocaust. Before and during the Second World War, the Nazi state

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<sup>6</sup> An audio recording of an excellent talk by Oreskes, summarising this book, can be found at <http://www.ecoshock.org/downloads/climate2010/Oreskes%20Naomi%20Climate%20Skeptics.mp3>

in Germany organised concentration and extermination camps for elements of society which it considered undesirable or dangerous. The term 'Holocaust' is most usually used to refer to the 5-6 million European Jews killed in these camps or elsewhere as a consequence of the Nazi 'final solution to the Jewish question'. Few people would deny that this happened. The reliability of the evidence for the existence of such camps and for the overarching logic of the 'final solution' project is overwhelming. Morally, the magnitude of the suffering entailed adds an imperative to truth, which makes us despise idle speculation or lack of rigour in analysing this topic. It is a morally significant, but also deeply political, act to deny that such suffering took place when the evidence for it is so compelling. 'Holocaust denial' is understood as a transgression of this taboo and as a morally repugnant act.

Holocaust denial may take various forms: a denial that extermination and concentration camps physically existed; or that mass killings took place in them; or that millions of people died or suffered extreme hardship as a result. Society at large dismisses these claims more or less out of hand on two bases: that the evidence is too compelling to warrant such interpretations; and that to countenance such interpretations of the evidence does a profound injustice to those that suffered in such places. The first criterion rests on our belief in the reliability of evidence and the second rests on a moral judgment.

### *Climate change denial*

Equally it is unlikely that anyone involved in this seminar will be unaware of the theory of anthropogenic climate change: that human activity is changing the global mean temperature of the earth by increasing the quantities of greenhouse gases in the atmosphere. This idea was being championed as early as the 1930s, but it took another five decades for scientists to become convinced that this was an issue for society to worry about. In the late 1980s, climate change science was settled enough for the issue to become a problem in the international public and policy domain.

In this case though, there is a divide as to whether the evidence for anthropogenic climate change is adequate. It is much more difficult for an average observer to understand what reliable evidence would look like, let alone whether we have any or not. Most of us rely on 'experts' who sound plausible and whom we feel have authority to speak on this subject. Likewise the moral judgement involved in denying anthropogenic climate change is much more confused. For those who are convinced by the theory, the suffering that will be caused by inaction is of great magnitude and therefore must be taken seriously. On the other hand, those who are not convinced by the evidence anticipate only the cost of taking action and see no benefits in addressing a problem they do not believe exists.

Some have argued that we ought to make a distinction between a denier and a climate change sceptic based on the notion that deniers are dishonest in their analysis of this issue, while sceptics are sincere. This might help to make the moral aspect of scepticism/denialism clearer. Initially, a 'climate sceptic' was a scientist who was unconvinced by the theory of anthropogenic climate change. Yet, over the years, the term has ceased to be applicable only to experts. It is now used, not only for scientists like Fred Singer, Dennis Avery, Patrick Michaels and Bjorn Lomborg, but also to describe politicians, business representatives and members of the public who believe that the science of climate change is flawed or inadequate.

For some, like David Humphreys, this is problematic because scepticism is an important part of the scientific method: we test a hypothesis by *trying* to find fault with it. It therefore makes no sense to see scepticism as *opposing* science. He defines a 'sceptic' as 'a scientist who objectively seeks the truth but who has yet to be convinced that the available scientific evidence supports a particular claim or hypothesis'.<sup>4</sup> In contrast, 'A denier will ignore or undermine scientific evidence for political ends'.<sup>5</sup>

Labelling someone a 'climate sceptic' now, can imply what is explicit in the labelling of a 'climate denier': that the primary motivation of the speaker is *solely* to undermine the case for political action against climate change and that the individual in question is indifferent to the relative merits of the scientific arguments. The difference between a sceptic and a denier then may be a moral judgment about the sincerity of the views held rather than a description of what those views are.

*Points to draw out in discussion*

In asking students to compare Holocaust denial and climate change denial, one might explicitly consider some of the underlying political and ethical problems with this undertaking. Appendix I illustrates some of the attitudes taken to this comparison and could be used to generate debate within the seminar. The key arguments against making this comparison are:

1. That it may be seen as belittling the Holocaust- This raises the question of whether different instances of suffering can be comparable. Can we, either qualitatively or quantitatively, compare the human consequences in two such different contexts?
2. That it may be seen as an attempt to suggest that those who do not accept the official line on climate change are 'as bad as' Holocaust deniers - This accusation, some suggest, is already implicit in the language. One response has been to distinguish between 'sceptics', who sincerely dissent from orthodox views, and 'deniers', who are politically motivated, but this is a hard distinction to maintain in practice. Could we comfortably apply such a distinction to Holocaust denial? How can we do justice to sincere differences of opinion, while also recognising that other people may have to suffer the consequences of inaction?

These are important points and the seminar should probably begin with an exploration of the problems with this comparison.

## STUDENT-CENTRED EXERCISE: THE ORTHODOX ESTABLISHMENT VERSUS THE DENIERS

In this exercise we look at two examples, which are intended to provide concrete opportunities for examining the views held by deniers. In both cases deniers attacked the orthodox academic position and challenged expert authority in a formal, but not academic, public setting. Within academia it is not questioned whether the Holocaust happened or whether anthropogenic climate change is occurring; research in these fields could not progress without accepting these basic theoretical frameworks. Those who have questioned the consensuses have either become marginalized within their disciplines, or have conducted their questioning from outside them. In the two cases below deniers made their arguments in formal, establishment settings and the orthodox position was, to some extent, 'on trial'. Deniers were able to publicly make the criticisms they argued had been ignored by academic elites and discovery of 'the truth' became fundamental to the consequent adjudication.

### DAVID IRVING VS. DEBORAH LIPSTADT / PENGUIN BOOKS

In 1993 Deborah Lipstadt published a book called *Denying the Holocaust* in which she made certain claims about non-academic historian David Irving. These included that he was:

- 'accused of skewing documents and misrepresenting data in order to reach historically untenable conclusions';
- that he is 'an ultra-nationalist who believes that Britain has been on a steady path of decline accelerated by its misguided decision to launch a war against Nazi Germany';
- that he "seems to conceive of himself as carrying on Hitler's legacy";
- that in 1988 he had shifted from accepting the annihilation of the Jews, but denying Hitler's knowledge of it, to outright Holocaust denial.<sup>7</sup>

Irving promptly sued Lipstadt, and her publishers, Penguin Books, for libel through the British courts. In this way he attempted to prevent her book (and any future publications by her or any other author) from labelling him a Holocaust Denier. Expert witness Robert Evans' 2001 account of the trial, *Lying about Hitler: History, Holocaust and the David Irving Trial*, details how the court eventually found in favour of the defendant and Penguin Books, upholding Lipstadt's claim that the comments were not libellous because they were all true.

### CLIMATEGATE

In December 2009 the Climate Research Unit (CRU) at the University of East Anglia (UEA) discovered that a selection of electronic information had found its way into the public domain and was causing a sensation on the internet. The event was dubbed 'climategate' in the media. Suggestions were made that leaked e-mails demonstrated what climate change sceptics had been saying for years:

- that the evidence for climate change was much weaker than was publicly declared
- that scientists were 'cherry-picking' data that supported their arguments
- that scientists were engaging in conspiracies to suppress the work of other researchers who disagreed with their views.

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<sup>7</sup> Deborah E Lipstadt, *Denying the Holocaust: The Growing Assault on Truth and Memory*, (New York: The Free Press, 1993), p. 161-63.

In March 2010 the House of Commons' Science Select Committee began an investigation into whether the incident had damaged the reputation of British scientific research. They made it clear that they were not trying to discover the truth about climate change, but to decide whether the scientists had acted appropriately or not. The Committee concluded that the scientists could have done things better, but that they had acted in accordance with normal practice in their field.

#### DETAILS

It is important for students to understand that, in the case of Irving vs. Penguin books/Deborah Lipstadt, it was Penguin/Lipstadt that were the defendants. Their defence to the libel accusations could only really be that the claims made by Lipstadt were true. As a result, the trial focussed less on Lipstadt's research and far more on Irving and whether he really was a Holocaust denier. Evans recalls how this confused much of the British press into feeling that it was Irving who was on trial and *his* right to free speech under attack. In actuality it was Irving who attempted to stifle other writers' attempts to express their opinions about his political views and integrity as a historian.

The science select committee hearing, on the other hand, focussed squarely on the scientists at the heart of CRU and asked whether they had brought British academia into disrepute. Again the finding erred on the side of orthodoxy and it must be remembered that these scientists were not being held accountable in a criminal court. Nevertheless, both the Irving trial and the 'climategate' investigation provide concrete instances around which the tension between academic orthodoxies and denialist rebuttals have received extensive public airings.

The bibliography below suggests sources connected to both examples, which could be used to develop the seminar.

## RESOURCES

### GENERAL WORKS

Rachel Carson, *Silent Spring*. (London: Penguin Modern Classics, 1962).

Mary Douglas, *Purity and Danger: Analysis of Concepts of Pollution and Taboo* (London: Routledge, 2002).

### CHALLENGING ANTHROPOGENIC GLOBAL WARMING IN THE 1990S

Sonja Boehmer-Christiansen, 'Global climate protection policy: the limits of scientific advice Part I & 2.' *Global Environmental Change* 2 (1994), 140-159 & 185-200.

David Brin, 'Climate Skeptics V. Climate Deniers' *Skeptic Magazine* 15:4 (2010), 13-17.

Ross Gelbspan, *The Heat is On* Reaig, Massachusetts (Addison-Wesley Publishing Company Inc., 1997).

Peter J. Jaques, Riley E. Dunlap and Mark Freeman, 'The organisation of denial: Conservative think tanks and environmental scepticism' *Environmental Politics* 17 :3 (2008), 349-385.

Aaron M. McCright and Riley E. Dunlap, 'Challenging Global Warming as a Social Problem: An Analysis of the Conservative Movement's Counter-Claims' *Social Problems* 47:4 (2000), 499-522.

Aaron M. McCright and Riley E. Dunlap, 'Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy' *Social Problems* 50:3 (2003), 348-373.

Simone Pulver, 'Organising business: Industry NGOs in the Climate Debates' in *The Business of Climate Change: Corporate Responses to Kyoto*, ed. Kathryn Begg, Frans van der Woerd and David Levy (Sheffield: Greenleaf Publishing, 2005), 47-60.

Armin Rosencranz, 'U.S. Climate Change Policy' in *Climate Change Policy: A Survey*, Stephen H. Schneider, Armin Rosencranz and John O. Niles (eds.), (Washington: Island Press, 2002), 221- 234.

Armin Rosencranz and Russell Conklin, 'National Policy' in *Climate Change Science and Policy*, by Stephen H. Schneider, Armin Rosencranz, Michael D. Mastrandrea and Kristin Kuntz-Duriseti, (London: Island Press, 2010), 343-356.

### DENIALISM AS PART OF THE CULTURE WARS-

Frederick Buell, *From Apocalypse to Way of Life* (London: Routledge, 2003).

Peter J. Jaques, *Environmental Skepticism: Ecology, Power and Public Life* (2009).

James Hoggan and Richard Littlemore, *Climate Cover-Up: The Crusade to Deny Global Warming* (Vancouver: Greystone Books, 2009).

Chris Mooney, *The Republican War on Science* (Basic Books, 2006).

Naomi Oreskes, 'Merchants of Doubt Talk', 3 February 2010.

<http://www.ecoshock.org/downloads/climate2010/Oreskes%20Naomi%20Climate%20Skeptics.mp3>  
(accessed 08 20, 2010).

Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (London: Bloomsbury Press, 2010).

R. Stoff, 'Denialism' and muddying the waters', *St. Louis Journalism Review* 37:296 (2007), 21 & 33.

#### DENIALISM AS A RHETORICAL DISCOURSE

P. Dethelm & M. McKee, 'Denialism: what is it and how should science respond?' *European Journal of Public Health* 19:1(2009),.2-4.

Mark Hoofnagle, 'Climate change deniers: failsafe tips on how to spot them' *Guardian*, March 11 2009: <http://www.guardian.co.uk/environment/blog/2009/mar/10/climate-change-denier>.

Rick Stoff, 'Denialism' and muddying the waters.' *St. Louis Journalism Review* 37:2967 (2007), 21 & 33.

#### ABOUT CLIMATE CHANGE SCEPTICISM AND DENIAL

David Brin, 'Climate Sceptics V. Climate Deniers' *Skeptic Magazine* 15:4( 2010), 13-17.

The Economist, 'The clouds of unknowing; The science of climate change' *The Economist (U.S. Edition)*, 20 March 2010: Briefs.

—'Spin, science and climate change' *The Economist (U.S. Edition)*, 20 March 2010: Leader.

Mike Hulme, *Why we disagree about Climate Change*. Cambridge: Cambridge University Press, 2009.

David Humphreys 'The role of science in climate change policy' in *A Warming World*, David Humphreys and Andrew Blowers (eds.), (Milton Keynes: The Open University, 2009), 57-96.

#### CLIMATE CHANGE DENIAL AND HOLOCAUST DENIAL

##### *Making the comparison*

Peter Christoff, 'Climate change is another grim tale to be treated with respect.' *The Age*, 9 July 2007: <http://www.theage.com.au/news/opinion/climate-change-is-another-grim-tale-to-be-treated-with-respect/2007/07/08/1183833338608.html>.

Joel Connelly, 'Deniers of global warming harm us' *Seattle PI*. 07 October 2007: [http://www.seattlepi.com/connelly/323181\\_joel11.html](http://www.seattlepi.com/connelly/323181_joel11.html) (accessed 08 20, 2010).

Ellen Goodman, 'No Change in Political Climate' *The Boston Globe*, 9 February 2007: [http://www.boston.com/news/globe/editorial\\_opinion/oped/articles/2007/02/09/no\\_change\\_in\\_political\\_climate/](http://www.boston.com/news/globe/editorial_opinion/oped/articles/2007/02/09/no_change_in_political_climate/).

George Monbiot, 'The threat is from those who accept climate change, not those who deny it' *The Guardian*, 21 September 2006. <http://www.guardian.co.uk/commentisfree/2006/sep/21/comment.georgemonbiot> (accessed 08 20, 2010).

Richard North, 'Why do people become climate change deniers?' *The Social Affairs Unit*, 30 June 2005: <http://www.socialaffairsunit.org.uk/blog/archives/000485.php> (accessed 08 20, 2010).

Roger Pielke Jr., 'On Language' *Center for Science & Technology Policy Research Website*, 09 October 2006. [http://cstpr.colorado.edu/prometheus/archives/climate\\_change/000952on\\_language.html](http://cstpr.colorado.edu/prometheus/archives/climate_change/000952on_language.html) (accessed 08 20, 2010).

Dennis Prager, 'On Comparing Global Warming Denial to Holocaust Denial' *Townhall*, 13 February [http://townhall.com/columnists/DennisPrager/2007/02/13/on\\_comparing\\_global\\_warming\\_denial\\_to\\_holocaust\\_denial/page/full](http://townhall.com/columnists/DennisPrager/2007/02/13/on_comparing_global_warming_denial_to_holocaust_denial/page/full) (accessed 08 20, 2010).

*David Irving vs. Penguin / Lipstadt*

Richard J. Evans, *Lying about Hitler: History, Holocaust, and the David Irving trial* (London: Verso, 2001)

Deborah E. Lipstadt, *Denying the Holocaust: The Growing Assault on Truth and Memory* (New York: The Free Press, 1993)

*Climategate*

R. Harrabin, 'March of the climate sceptics', *New Scientist*, 206:2764, 12 July 2010.

House Of Commons, Science and Technology Committee, *The disclosure of climate data from the Climatic Research Unit at the University of East Anglia, Eighth Report of Session 2009-10*. Available (10/08/10): <http://www.publications.parliament.uk/pa/cm/cmsctech.htm>, 2010.

Fred Pearce, 'Leaked climate change emails scientist 'hid' data flaws' (Article and Audio recording). *Guardian*. 01 February 2010: <http://www.guardian.co.uk/environment/2010/feb/01/leaked-emails-climate-jones-chinese> [Accessed March 22, 2010].

—. *The Climate Files* (London: Guardian Books, 2010)

—'Search for hacker may lead police back to East Anglia's climate research unit', *The Guardian*, 09 February 2010: <http://www.guardian.co.uk/environment/2010/feb/09/hacked-emails-police-investigation> [Accessed:24/03/10].

*Climate Change skeptic / denier materials and websites*

Martin Durkin, *The Great Global Warming Swindle* (Wag TV, 2007).

<http://climateaudit.org/> Steve McIntyre, a semi-retired mining expert, began this blog as a response to the climate change science blog, Real Climate (<http://www.realclimate.org/>).

<http://wattsupwiththat.com/> This blog belongs to Anthony Watts, a former meteorologist and weather presenter.

<http://www.thegwpf.org/> This organisation is chaired by Lord Nigel Lawson, ex Secretary of State for Energy and Chancellor of the Exchequer, and directed by Dr. Benny Peiser, sometime editor of *Energy & Environment* (considered a sceptical journal) and specialist in social anthropology at Liverpool John Moores University.



## APPENDIX 1

'Let's be blunt. The phrase "climate change denier" is meant to be evocative of the phrase "holocaust denier". As such the phrase conjures up a symbolic allusion fully intended to equate questioning of climate change with questioning of the Holocaust. Let's be blunt. This allusion is an affront to those who suffered and died in the Holocaust. Let those who would make such an allusion instead be absolutely explicit about their assertion of moral equivalency between Holocaust deniers and those that they criticize.'

Roger Pielke Jr., 'On Language' Center for Science & Technology Policy Research, 09 October 2006 [http://cstpr.colorado.edu/prometheus/archives/climate\\_change/000952on\\_language.html](http://cstpr.colorado.edu/prometheus/archives/climate_change/000952on_language.html)

'It is deeply pejorative to call someone a "climate change denier". This is because it is a phrase designedly reminiscent of the idea of Holocaust Denial – the label applied by nearly everyone to those misguided or wicked people who believe, or claim to believe, the Nazis did not annihilate Jews, and others, in any very great numbers.'

Richard D. North, 'Why do people become climate change deniers?' The Social Affairs Unit, 30 June 2005: <http://www.socialaffairsunit.org.uk/blog/archives/000485.php>

'There are grave risks in drawing analogies with any aspect of the Holocaust. One easily oversteps the mark, losing a valid point amid counter-accusations of hysterical overstatement, of engaging in distressing, offensive and exploitative mis-association. Even so – and because of its resonance with Holocaust denial – the term "denier" can be used to describe those who trivially reject the existence and threat of global warming. I use that analogy with great hesitation, but given what's at stake – the future of humankind rests on quick and uniform international action – it illustrates the immorality and potential damage of climate change denial'

Peter Christoff, 'Climate change is another grim tale to be treated with respect.' The Age, 9 July 2007: <http://www.theage.com.au/news/opinion/climate-change-is-another-grim-tale-to-be-treated-with-respect/2007/07/08/1183833338608.html>

'Bluntly put, climate change deniers pose a greater danger than the lingering industry that denies the Holocaust. Holocaust deniers look backward, arguing over things that happened. They do damage in terms of racism and relations between peoples...What makes the global warming denial industry so dangerous? It has the potential to preclude or delay necessary actions – caps on carbon emissions, development of new energy sources – that will assure human civilization's future on the planet.'

Joel Connelly, 'Deniers of global warming harm us' Seattle PI, 10 July 2007: [http://www.seattlepi.com/connelly/323181\\_joel11.html](http://www.seattlepi.com/connelly/323181_joel11.html)

'Almost everywhere, climate change denial now looks as stupid and as unacceptable as Holocaust denial. But I'm not celebrating yet.'

George Monbiot, 'The threat is from those who accept climate change, not those who deny it.' The Guardian. 21 September 2006: <http://www.guardian.co.uk/commentisfree/2006/sep/21/comment.georgemonbiot> (accessed 08 20, 2010).

'I would like to say we're at a point where global warming is impossible to deny. Let's just say that global warming deniers are now on a par with Holocaust deniers, though one denies the past and the other denies the present and future.'

Ellen Goodman, 'No Change in Political Climate.' The Boston Globe, 9 February 2007:  
[http://www.boston.com/news/globe/editorial\\_opinion/oped/articles/2007/02/09/no\\_change\\_in\\_political\\_climate/](http://www.boston.com/news/globe/editorial_opinion/oped/articles/2007/02/09/no_change_in_political_climate/).

'[Comparing those who question or deny the Holocaust and those who question or deny global warming] reflects a major difference between the way in which the Left and Right tend to view each other. With a few exceptions, those on the Left tend to view their ideological adversaries as bad people, i.e., people with bad intentions, while those on the Right tend to view their adversaries as wrong, perhaps even dangerous, but not usually as bad.'

Dennis Prager, 'On Comparing Global Warming Denial to Holocaust Denial.' Townhall. 13 February 2007:  
[http://townhall.com/columnists/DennisPrager/2007/02/13/on\\_comparing\\_global\\_warming\\_denial\\_to\\_holocaust\\_denial/page/full](http://townhall.com/columnists/DennisPrager/2007/02/13/on_comparing_global_warming_denial_to_holocaust_denial/page/full) (accessed 08 20, 2010).

## UNIT 11: TRANSCENDING CLIMATE CHANGE? RELIGION, SPIRITUALITY AND REDEFINING THE HUMAN-NATURE RELATIONSHIP

### INTRODUCTION AND LEARNING OUTCOMES

At the heart of any discussion about climate change must lie an analysis of religion and spiritual beliefs. Not only have religiously motivated practices and perceptions contributed to anthropogenic climate change, but spiritual beliefs have always defined the human-nature relationship. Transforming that delicate bond is the cornerstone of curbing the current climate crisis. There is a power that religion has over the attitudes, behaviours, and values of individuals, which collectively work to formulate the worldviews of society. Worldviews then determine just how individuals and societies treat one another, as well as how they view non-human species and the physical environment in which they co-exist. During much of history, religious worldviews dominated the interplay between each member of the earth's collective ecosystem, but as civilizations grew more complex, politically powerful empires came to share the ability to disseminate ideas. Since the Industrial Revolution, the impact of new ideas contrary to a sustainable future has increased substantially, culminating in modern worldviews based on consumerism and competition for material wealth. Though the influences of worldviews based on religious beliefs pale today in comparison to the political and economic power exerted over western society, it is in the human capacity for spiritual meaning that a redefinition of the human-nature relationship can take place. It ought to follow that religion and spirituality offer the greatest potential for developing a holistic consciousness capable of healing the world's ecosystem.

The urgency with which climate change must be addressed is often met with an array of emotional reactions. Religion and spiritual beliefs have cultivated processes for coping with the most intimate of human characteristics, including fear, hope, despair, and the innate capacity for healing and forgiveness. The world's religions have also emphasised concern for the less fortunate, the necessity of communal fellowship, the discipline of restraint, and the advantages of contemplation. It is for this reason that analysis of religious beliefs within the context of a climate change discussion extends to the redefining of the human-nature relationship, thereby changing practices and perceptions, in the light of contemporary conditions. For those who identify themselves as religious and adhere to a particular belief system, the answers may lie within doctrine. For those who do not identify with religion directly, the answers may lie within themselves. Some spiritual threads of this kind are oriented toward 'deep ecology' or environmentalism, in implicit if not explicit contradistinction to the influences and demands behind modern consumerism. Clarifying the dichotomy between selfish desires and spiritual needs by examining the human capacity for empathy, sacrifice, and respect, may allow for the discovery of new courses of action as well as possible compromises.

In this unit, students are introduced to the way in which the world's belief systems have manifested themselves in the physical and spiritual practices and perceptions that have contributed to anthropogenic climate change. They will also learn about the debate involving the historical role and responsibility of religion, as well as the potential offered by an alliance between environmental and religious institutions to affect positive change through global action. Through a brief case study, students will discuss one example of an alternative worldview extracted from doctrine to illuminate precedents based on a morality that can affect positive change. In the student-oriented activity,

students will employ critical thinking and analysis, as well as self-examination to produce a list of action items that potentially contribute to redefining the human-nature relationship in the face of the current crisis. Students will, therefore, learn to identify the way in which individual and group actions determine environmental conditions and how those actions are directly related to deeply held beliefs, whether considered spiritual or secular. By redefining the nature of what is sacred, they may recognise the principle that what is defined as 'sacred' is inevitably that which is 'protected'.

#### RELIGION, SPIRITUAL BELIEFS, AND CLIMATE CHANGE: AN HISTORICAL OVERVIEW

Humans are spiritual beings by their very nature. One need look no further than the physical manifestations of deeply rooted beliefs that remain in the landscape, from the Pyramids of Giza, to Stonehenge, and the elaborate burial mounds of societies past which can be found on almost every continent. Humans can be ritualistic and superstitious, but they are also creative and ambitious, continually producing monumental expressions of their spiritual ideals. Throughout history, these traits have bled into personal practices like prayer, fasting, and song, dictating the way in which humans collectively spent their time, expended their energy, and used their resources. Human perceptions translate into actions. Those actions produce the physical constructs of their environment, the moral and ethical codes by which they live, and the rituals that mark their rites of passage through life. Put simply, external expressions of internal beliefs are what differentiate humans from other species.

The internal beliefs of humans are not simple, therefore, personal decisions are not always pragmatic, nor do priorities revolve consistently around subsistence. In fact, humans often ignore or even scoff at common sense in order to appease their spiritual needs. In the past, they have carried tons of stone across difficult terrain in order to erect monuments in a specific place and time, they have performed human and animal sacrifice, and they have transformed resources of wood, shell, rock, and bone into spiritual symbols with little to no practical application. In every culture on the globe, since the beginning of human history, personal and communal spiritual expressions have been a priority for humankind, regardless of their practicality. Although these actions emanate from deep inside the human psyche, and work to appease both the needs and desires of the individual, they still inevitably have an effect on other humans, non-human species, and the environment. Therefore, actions can bear consequences and consequences often accumulate.

Consequences from actions based on religious beliefs, however, are not solely responsible for everything that humans have done to their ecosystem. Driven by political and economic incentives, world empires have not only contributed significantly to the current climate crisis, but have left in their wake a legacy of environmental and human injustices, including deforestation, resource exhaustion, animal extinctions, water and air pollution, the subjugation of peoples, and the manipulation of lesser powers. This is not a contemporary issue. The engineering feats of the ancient Greeks, Romans, and Chinese relied upon an extraordinary volume of slave labour, an abundance of natural resources, and innovative technologies to accommodate their expansive infrastructure, all of which wreaked havoc on an environment under pressure from an unprecedented population increase. The warrior expeditions of Genghis Khan, who amassed the largest geographical empire in history, and the duelling dynasties of the Hundred Years' War, who actually turned Western Europe into a battlefield for 116 years, both left behind wastelands that were previously arable and habitable terrain. By the 18<sup>th</sup> century, overseas imperialists from England, France, and Spain, were also colonists, furthering ecological devastation to the Americas, Africa, and India, spurred on in the name of science, discovery, and progress.

During the last two centuries, increasing populations, intensive agricultural practices, and dirty fuel culminated in the 20<sup>th</sup> century development and use of weapons of mass destruction, dirty energy transportation, industrial pollution, and the over-exploitation of fossil fuels. The exacerbation of ecological destruction prompted emotional responses from people of faith as well as environmentalists. This seemingly unlikely team have a long history, however, and the documentation of their efforts and ideas provide inspiration, as well as a number of antidotes for environmental ailments. Though environmentalists are continually criticised for relying too heavily on science for answers to ecological questions, the root of the environmental movement actually sprouted from very spiritual ground. For that reason, this partnership may provide a wall of defence against anthropogenic climate change, and the melding of both environmental and spiritual solutions may provide new opportunities for a sustainable future. Because worldviews propagated through political and economic power are designed to, or have the effect of, undermining environmental values and/or manipulating religious beliefs, the challenge of environmental and spiritual activists is to remove the veil ('the emperor really has no clothes'). By revealing the flawed, even arguably redundant nature of 'business as usual,' they may combat the existing rhetoric and perceptions behind non-sustainable practices. Doing so requires illuminating precedents based on a morality that can affect positive change. This includes celebrating historically influential religious texts, highlighting inspiring prophets, exploring the principles of eco-philosophy and 'deep ecology,' or adopting previously renowned and sustainable practices that embody values based upon conservation, minimalism, restraint, respect, and empathy, that may yet redefine the human-nature relationship.

This is not only a contemporary tactic. Historically, it was a combination of philosophers, scientists, and religious leaders who brought environmental problems to the attention of the public and challenged authority to evaluate the morality of their destructive behaviour. In ancient Greece, Plato and Aristotle raised concerns about deforestation, Strabo voiced his concerns about urban planning, and Xenophon taught sustainable agricultural techniques by emphasising the nurturing and reciprocal relationship between humans and the earth. In ancient China, the Emperor Qin Shi Huangdi buried alive hundreds of scholars, many of whom were Taoists. The emperor preferred the Legalist school of thought that assisted him in enforcing his draconian laws, and condemned the Taoists who taught that it was wiser to follow the laws of nature than manufacture laws to govern society.

Like Taoism, the relationship between human and nature in Hinduism is sacred. Regardless of the heterogeneity of Hindu practices, at the centre lies an ecological cosmology where the elements of air, water, the earth, fire, ether, all animate species, the directions, the rivers and the seas are considered organs of God's body, and therefore, must be respected. From that belief, *ahimsa* (non-violence) is a key component, as is karma, or the consequences of action that emphasise the value of self-control and selflessness. Similar values are present in Jainism and Buddhism, where the core principles of *dharma* include living simply, abstaining from extremes, and contributing to the society in which one lives. In Judaism and Christianity, similar practices and perceptions are especially important, as for instance during Christian Lent, while in Islam the holy month of Ramadan venerates self-restraint, patience, generosity, introspection and humility. The Qur'an defines the relationship between humans and the environment as one of unity, where humans are the responsible guardians of Allah's creation, while the Sikh Gurus of the 10<sup>th</sup> century stressed the idea that God is present in all of creation and, therefore, sacred.

Although most of the world's religions are intimately connected to some form of religious doctrine, animistic beliefs such as indigenous shamanism and European paganism, transmitted orally for thousands of years, have provided robust representations of an inclusive and sustainable human-nature relationship. The continued presence of ecocentric spiritual practices confirms that the preference for holistic consciousness is sustainable, and that valuing a respect for nature even in a mechanised world is achievable. When individual identities are intimately tied to a sense of place, and that place is honoured through worship and preservation, the human-nature relationship gives spiritual meaning and purpose to life. Most indigenous people acknowledge that the Great Spirit is in everything, so the relationship with the sacred is part of every individual action with the physical world. Animals are siblings in many indigenous cosmologies, but more importantly, all aspects of creation, whether animate or not, provide lessons for how to rightfully live as a member of a collective ecosystem.

In an attempt to redefine the human-nature relationship, traditional animism and ecological scripture both embody values that promote a more sustainable future, and provide the inspiration behind developing an ecological consciousness. The problem remains, however, that not all worldviews are driven by these examples, nor are contemporary heroes those who embody such principles. Spiritual beliefs derived from written doctrine are complex, so the interpretation and dissemination of ideas for self-interest can not only be counter-intuitive to a sustainable future, but can border on the deceptive, leading to genocides and ecocides inspired by and justified with religious dogma. When this manipulation combines with the current sense of entitlement in which humans feel they 'deserve' endless amounts of wealth, comfort, and accessibility to opportunity, the door is essentially open to over-indulgence with no concern for damage caused.

Herein lies the debate and the 'genesis' (no pun intended) of the modern environmental and spiritual movement. In 1967, Lynn White Jr. wrote 'The Roots of our Ecological Crisis' published in *Science*. In his article, White explored and condemned the way in which passages from the Judeo-Christian Bible had been interpreted to establish the prevailing western worldview that humans were created in God's image, meant to multiply, and exercise dominion over the earth. He felt this interpretation of the scripture not only condoned, but encouraged, anthropogenic ecological damage. White's bold criticism set off a firestorm of responses, both supportive and vehemently opposed. The dialogue which followed became a key impetus behind the current ecospiritual movement.

The initial reaction to White's article was two-fold. Environmental groups, scientists, and politicians saw White's analysis as a call to action and appealed to religious bodies to respond to environmental issues. Apart from a rather small contingent of 'millennialists' who believe 'The Rapture' is coming and ecological threats are merely signs of the biblical Apocalypse, the response from the majority of spiritual leaders and religious institutions was a renewed commitment to rescue and also redefine the way in which their doctrine affected spiritual attitudes. Many reached out to environmental groups to form alliances in the hope that together they could encourage a moral transformation toward more sustainable communities. Beginning in the 1980s, interfaith and environmental coalitions were organised by, for instance, the *United Nations Environment Programme*, the *Parliament of World Religions*, and the *Global Forum of Spiritual and Parliamentary Leaders*. Conferences have included 'Environment, Peace and the Dialogue of Civilizations and Cultures' held in Tehran in 2005, Earth Dialogues on 'Globalization: Is Ethics the Missing Link?' held in multiple cities every two years since 2002, and 'Spirituality and Conservation' organised by the *International Union for Conservation* in 2009. In England, the *Alliance of Religions and Conservation (ARC)*, holds conferences regularly, while in the

United States, *the National Religious Partnership for the Environment (NRP)* sponsors activities between the Jewish and Christian communities.

The power behind a worldview mandates the way in which the world's bountiful resources are perceived and managed, and the way in which humans view their place in the environment. If it is a message of human dominance and dominion over the earth, where the remaining animate and inanimate inhabitants of the ecosystem play the part of subjects to be exploited and rendered extinct, current conditions will undoubtedly worsen. If the sacred practices, sacred spaces, and sacred people of religious doctrine and animistic stories are identified as positive inspiration to enact change, they may provide an internal gauge for regulation of excessive materialism, consumption, and ecological damage. With both environmental and spiritual leaders working to redefine the way in which humans and nature interact, they may enhance the ability to maintain a sense of hope in the face of a disintegrating habitat. Because humans are innately spiritual, the desire to save the ecosystem and maintain a level of faith in humanity is deeply personal. New circumstances, regardless of the level of threat, provide new opportunities for the creation of new rules.

## CASE STUDY – REDEFINING THE HUMAN-NATURE RELATIONSHIP

A Historical Case Study Based on Lynn White's attempt to 'reject the Christian axiom that nature has no reason for existence save to serve man.'

Lynn White's article entitled 'The Historical Roots of Our Ecological Crisis,' was originally given as a lecture to the *American Association for the Advancement of Science* in 1966. To introduce his argument, he began with a number of specific historical examples that demonstrated how humans have affected the non-human environment for many millennia. He mentioned the transformation of the banks of the Nile in Egypt, the reclamation of the Zuider Zee in the Netherlands, and the fascinating dependence sparrows had on horse dung, a relationship that diminished when automobiles replaced horses in the evolution of modern transportation. He clearly acknowledged that humans have always affected the world in which they live, and took it further to enforce the fact that 'all forms of life modify their context.' But White was quick to note the tipping point, basically the last half of the 20<sup>th</sup> century, when the ecological backlash to human impact became overwhelming.

To explore this escalation toward catastrophe, White essentially found himself staring at the middle of the 19<sup>th</sup> century during 'the emergence in widespread practice of the Baconian creed that scientific knowledge means technological power over nature.' The significance of western society accepting this worldview, he asserted, exceeded all previous environmental impacts as far back to the Agricultural Revolution. He emphasised that the fusion between modern technology and science was further complicated by the increasingly democratic culture that had arisen in the modern world. Essentially, the discovery and implementation of science and technology was no longer relegated to the aristocracy. Any average person now had the power to significantly impact his or her environment.

Over the past three decades, a vast body of literature, from journal articles to monographs, has examined the effects of modern technology on the environment. However, White's lecture and subsequent article did two things that continued to set him apart from most academics. First, he specifically attributed this dramatic and detrimental shift in worldview to religion, and second, he actually offered up a possible solution to the issue, conceding that 'neither atavism nor prettification will cope with the ecological crisis of our time.' White was convinced that 'human ecology is deeply conditioned by beliefs about our nature and destiny – this is, by religion.' This meant that the relationship Christianity developed with inhabitants of the early modern world was one based on a timeline that was linear rather than cyclical; which destroyed the belief in pagan animism that held nature as sacred; and which 'established a dualism of man and nature.' In effect, this relationship opened the door to exploitation of one to serve the purpose of the other. White's claims were greeted with an uproar. A fact often overlooked by many of Lynn White's critics was that he was a Christian. Despite the firestorm that ensued after the article's publication, what still stands up to scrutiny is the alternative Christian view he offered: namely to soften the collective burden of guilt for what, in 1966, he already saw as damage out of control. His suggestion was not from 'Lynn White the scientist,' but rather from 'Lynn White the Christian,' who earnestly believed that, not only were science and technology incapable of curbing the ecologic backlash, but that changes had to reside within the human psyche and provoke the desire to either 'find a new religion, or rethink our old one.' For concerned Christians, like Lynn White, that meant exploring the pages of sacred doctrine for new inspiration.



That inspiration came in the form of ‘the greatest radical in Christian history since Christ: Saint Francis of Assisi.’ Born Giovanni di Bernardone, he founded the Franciscans, and in his sainthood, came to represent animals and nature. Prior to his spiritual conversion, Francis experienced a childhood in Italy of relative luxury, enjoying the finer things in life, due in part to the success of his father’s textile business. Deeply moved by a brief exchange with a beggar in the marketplace, he was struck with deep emotions of empathy and desire to give charity. As a young adult, he experienced nearly a year of captivity during military service that was followed by serious illness, both of which undoubtedly contributed to his eventual spiritual awakening. In full adulthood, he turned increasingly to work with the poor and sick, and eventually committed himself to a life of poverty and service to the disenfranchised.

Inspired by encouragement from Pope Innocent III in Rome, Francis inevitably garnered enough support and followers to establish both the *Order of Poor Ladies* and his community of ‘lesser brothers,’ or the *Order of Friars Minor*, which became the Franciscans. Despite being canonised only two years following his death, in life he humbly refused to be ordained as a priest. His fondness for a minimalist lifestyle, his preference for referring to all humans and animals as ‘brothers’ and ‘sisters’ in God’s creation, and his insistence on speaking and writing in the vernacular of the poor rather than Latin, all exemplify his perception of the natural world, and his place within it. His deep sense of humility encouraged his belief that humans and non-humans shared in a democracy of spirit that was due to the grace of their Creator. Although his views were contrary to most religious leaders of the 13<sup>th</sup> century, Francis was never persecuted for practising and preaching an alternative view of the human-nature relationship. Instead, his views were simply rejected by the majority of religious leaders and followers who embraced and pursued self-interest for wealth and/or political power.

In conclusion to his 1966 lecture, Lynn White proposed that St. Francis be recognised as the patron saint for ecologists, advocating further that his heterodox views of a spiritually democratic autonomy replace the belief that nature exists only to serve humans. This paradigm shift from a shallow value system to one of deep spiritual connection to ecology was precisely the direction to which many in the environmental movement would aspire, with St. Francis of Assisi himself, as their new moral and eco-spiritual hero.

In 1973, Arne Naess, a philosopher from Norway made the distinction between ‘deep ecology’ and ‘shallow ecology.’ Where ‘shallow ecology’ is the concern for ecological degradation because of how it affects humans, ‘deep ecology’ is distress over the future of nature for its own sake. Advocates of ‘deep ecology’ purposely go beyond the scientific reality of what is happening to explore the morality and ethics of the current crisis. Though they do not necessarily adhere to a specific religious doctrine, the characteristics embodied in St. Francis still apply: a deep sense of humility, respect, restraint, and dedication to ‘the other.’ If the responsibility of stewardship places humans above nature, and the worship or reverence of nature by humans places them below it, then the valuing of all aspects of nature equally, as St. Francis defined his own relationship, eliminates the hierarchy. In this way, ‘deep ecology’ seeks a level of emotional intelligence that addresses the interconnectedness of the earth’s ecosystem through the lens of an holistic consciousness, where humans are morally obligated to seek unity in nature.

In 1979, Pope John Paul II made St. Francis the formal patron of ecology. Then, in 1986, *The World Wildlife Fund (WWF)* hosted a meeting in Assisi, Italy, between spiritual leaders from five of the world’s

largest religions: Buddhism, Christianity, Islam, Hinduism, and Judaism. Their charge from Prince Phillip, the president of WWF International at the time, was to address how their belief systems could assist in the climate crisis by spiritually supporting the dignity of nature and encouraging adherents of their faiths to redefine their relationship with the natural world. The cumulative result of the meeting was publication of *The Assisi Declarations*, which acknowledged the interconnectedness of religious and environmental concerns. Subsequent meetings and appendages to the declarations have taken place over the last three decades, and included representatives from Taoism, Baha'i, Jainism, Sikhism, Shinto, and Zoroastrianism.

Shared philosophy between environmentalists and spiritualists is now redefining the human-nature relationship by establishing new meanings and beliefs that encourage humans to move beyond the climate calamity, and cope with the deep feelings of torment and hopelessness that result from ecological threats. As a result, the once belittled and disparaged St. Francis is inspiring people of both environmental and spiritual movements by serving as a role model who embodies the qualities most necessary in this time of need.

This brief historical case study offers one example of how the human-nature relationship has been redefined to address the current climate crisis. Although St. Francis of Assisi was a Franciscan associated with the medieval Catholic Church, the moral example he provides to a contemporary audience is reminiscent of a number of historical wise men from a plethora of ethnicities, religious backgrounds, and locations around the globe. Individuals who dared to promote a worldview contrary to the norm of society included the Greek philosopher Socrates, the Indian ascetic Siddhartha Gautama, the Chinese sage Mencius, and the Shawnee prophet Tenskwatawa. Although the monotheistic heroes, Moses, Jesus, and Muhammad, probably come to mind, referring to them in this case study may not be as effective. Perhaps their historical and spiritual narratives are exhausted with dialogue beyond the point where their example and witness have the same impact as individuals less familiar or understood.

## STUDENT-CENTRED EXERCISE: REDEFINING THE HUMAN-NATURE RELATIONSHIP THROUGH SELF-EXAMINATION

The historical case study presented a few ways in which religious and environmental groups have congregated in their attempt to support and disseminate a sustainable worldview for future generations. However, the student-centred exercise needs to consider the religious demographics of the classroom and work with the spiritual beliefs to which the students adhere. One of the issues instructors might consider is that many students today do not always personally relate to the spiritual or religious aspects of a discussion on climate change. Many students consider themselves secular and, though they have strong opinions about the ethical and moral obligations humans have to save the planet, they do not necessarily believe the answers lie in doctrine or religious practice. Therefore, this student activity is designed to address ways in which the human-nature relationship can be redefined through self-examination and creativity by tapping into student's personal spiritual attitudes, behaviours and values.

For this exercise, students will read two chapters in Alastair McIntosh's *Hell and High Water: Climate Change, Hope and the Human Condition*. Of course, they are welcome to read the entire book, and the Introduction is highly recommended. For the purposes of completing this exercise, the chapters entitled 'Journey to the Soul: Drawing hope from the jaws of despair,' and 'Towards Cultural Psychotherapy: Reclaiming that which gives life,' are required readings.

In his introduction, McIntosh explains his central thesis by emphasising that technical, economic and political measures cannot tackle climate change alone, and that the most important way in which the crisis can be addressed is through self-examination. At the core of the psyche lies spirituality, so whether students identify themselves as secular or religious, the roots of what give their life meaning must be explored. He is adamant that the climate crisis is not driven so much by fundamental human needs, but instead by the 'manipulated wants that find expression in consumerism.' Therefore, a 'reactivation of our inner lives' is essential to eliminating the 'corresponding emptiness, even a deathly nihilism, at the core.' He states that where humans have become vulnerable to the manipulation of marketing, they have 'lost touch with inner sensibility' and instead allowed hubris to create a 'spiral of mindless economic frenzy.'

Like Lynn White, McIntosh is offering an alternative to replace existing worldviews, but rather than exploring orthodox religious practices or prophets, he is suggesting a deeply personal approach. By reaching deep into the soul, McIntosh believes humans can better explore their capacity to face death, open their hearts to love, and reach an otherwise unattainable depth for compassion and understanding of the human condition. In an attempt to provide guidance for such a deeply personal analysis, McIntosh then provides a twelve-step programme in the hopes that his readers find grounding in the capacity for a holistic consciousness.

This exercise will engage students in personal reflection and discussion as they work through these two chapters and critically analyse the ways in which their actions and beliefs can affect change. The material may resonate best should it be divided into sections and managed as a multiple group activity.

1. Chapter 8: 'Journey into the Soul: Drawing hope from the jaws of despair.'
  - a. McIntosh is working from the premise that 'consumerism digests the energies of human life and sets loose environmental symptoms of which climate change is but the most pressing' and that 'its cutting edge is hubris.' Considering some of the examples he gives in the chapter, can you relate to the hypnotic trance to which he refers? Can you provide examples from advertising, media, personal experience?
  - b. McIntosh proposes that to overcome this trance, there must be some sense of 'presence' or 'awareness' that can defeat dysfunctional behaviour, allowing us to experience reality, reorder our priorities and brighten our lives. How does desensitisation to violence play a role in this? Can you provide examples where you are desensitised to violence? In what ways can desensitisation be overcome?
  - c. McIntosh shares a deeply personal and moving experience that helped to define his sense of purpose and meaning in the world. Can you identify with this level of loss? He says 'there can be times in life when consciousness transiently shifts and we glimpse realms of reality that manifests this love and the profound interconnection that it implies.' Have you had experiences that moved you emotionally to the point of total awareness and clarity? In what way does total humility play a part in that level of awareness? How does hubris hinder it?
2. Chapter 9: 'Towards Cultural Psychotherapy: Reclaiming that which gives life.'
  - a. How does the combination between self-restraint and imagination provide hope for both individuals and the collective in tackling the root causes of climate change? How does confessing our hypocrisy and addressing our fears free us from the paralysis?
  - b. McIntosh says, 'Global warming is but one of many presenting symptoms of the materialism that has placed us in this situation. Other symptoms include natural resource depletion, the degradation of the poor, the pollution and despoliation of beauty, discrimination against women and minorities, and always, underlying them all, the hydra's head of war.' McIntosh attributes this to the following formula:

HUBRIS = Pride Violence Ecocide

Attending to the climate crisis means engaging oneself in self-examination and finding ways in which individuals can make sacrifices and lifestyle changes, but also ways in which they can work with others to create a collective consciousness. In so doing, the possibility for a spiritual awakening offers a more powerful energy to 'counter the addiction of consumerism.' Therefore, McIntosh has created a '12-step' programme to 'heal the dissociation of sensibility that has left so many struggling to be satiated.'

- Step 1. *We must re-ignite the inner life*
- Step 2. *We must value children's primal integrity*
- Step 3. *We must cultivate psychospiritual literacy*
- Step 4. *We must expand our concept of consciousness*
- Step 5. *We must shift from violent to nonviolent security*
- Step 6. *We must serve fundamental human needs*
- Step 7. *We must value mutuality over competition*
- Step 8. *We must make more with less*
- Step 9. *We must regenerate community of place*
- Step 10. *We must build strong but inclusive identities*
- Step 11. *We must educate for elementality*
- Step 12. *We must open to Grace and Truth*

Students are to read the explanations McIntosh gives for each of the twelve steps in this chapter and complete the following tasks:

1. In 2-3 sentences, explain each step.
2. Give 1-2 examples of ways in which you would carry out each step on a personal level.
3. Provide suggestions for how a collective might carry out each step.
4. For each step, provide an historical example of how the process has been carried out in the past.

EXAMPLE: Step 11: *We must educate for elementality*:

1. This is a process of creating a sense of inclusivity between humans, animals, and nature that is embedded in the educational experience from childhood to adulthood. It means that a lifetime of learning cultivates a solid understanding of the way in which humans are an intimate part of their ecosystem, but also acknowledges the way in which every element of that ecosystem works to support the others. This places importance on humans, animals, plants, soils, water, snow, the directions, wind, and the sun, without placing any one element above the another, and encourages a sense of love and appreciation for 'the other.'

2. I would practice self-restraint in the way I consume animal and plant resources, and cultivate a sense of appreciation when I do. I would endeavour to understand the way I fit into the collective eco-system and then teach others how the many elements of my environment contribute to the integrity and stability of the biotic web created by them.
3. Community groups and educational institutions can create activities that take place outside, include specialists in the arts and sciences, and address the magic and mysteries of nature. They can also work to serve the purpose of exploring the human-nature relationship, how it has transformed through time, and how it affects our actions.
4. The shape of the circle has represented the connectedness of all things in many Native American ceremonies and art. It is the shape of the Medicine Wheel, which not only represents the four directions, and cycle of life, but creates an inclusive design where all of the Great Spirit's creation exists. Black Elk said 'the Great Spirit is within all things: the trees, the grasses, the rivers, the mountains, and all the four-legged animals, and the winged peoples.' Though the Lakota hunted the Buffalo, they did not just eat his meat. Every part of the Buffalo became part of the Lakota life. The hide was used for clothing, housing, and medicine bags. The stomach was used to carry water and food. The horns were symbols in ceremonial rituals. The sinews were used to string the bow and sew the hides. The liquid from the eyes was used to waterproof materials. The Lakota did not just kill the Buffalo, but gave thanks for his sacrifice, and then provided him with new sacred meaning after physical life.

Students are encouraged to discuss or write about their emotional reactions to this exercise, especially whether they feel anxiety or frustration with the topic of 'Religion, Spirituality and Climate Change' or the process of self-examination. They may also have misgivings about the 12-step approach, or strong opinions about the alternatives to a redefining of the human-nature relationship. Alastair McIntosh has determined these 12-steps. Perhaps students can suggest others or wish to discuss ideas for a different programme to affect change.

## RESOURCES

### WORLD RELIGIONS AND ECOLOGY

Abubakr Ahmed Bagader, et al., *Environmental Protection in Islam*, King Abdulaziz University, Saudi Arabia, online book: <http://www.islamset.com/env/index.html>. See especially 'General Introduction to Islam's Attitude Toward the Universe, Natural Resources, and the Relation Between Man and Nature.'

Nicholas Black Elk, *Black Elk Speaks: Being the Life Story of a Holy Man of the Oglala Sioux*, as told through John G. Neihardt (Flaming Rainbow), University of Nebraska Press (Lincoln and London: 1979).

Frederick Denny, *Islam and Ecology: A Bestowed Trust Inviting Balanced Stewardship*, <http://ecologyandislam.wordpress.com/2010/01/03/islam-and-ecology-a-bestowed-trust-inviting-balanced-stewardship/>

Richard C. Foltz, *Worldviews, Religion, and the Environment: A Global Anthology*, Wadsworth/Thompson Learning (Belmont CA: 2003).

Richard Foltz, Frederick Denny, and Azizan Baharuddin (eds), *Islam and Ecology*, Harvard University Press (Cambridge: 2003).

Roger S. Gottlieb, *This Sacred Earth: Religion, Nature, Environment*. Routledge (New York & London: 1996).

Seyyed Hossein Nasr, 'Islam, the Contemporary Islamic World, and the Environmental Crisis,' in *Islam and Ecology*, edited by Richard Foltz, Frederick Denny & Azizan Baharuddin, Harvard University Press (Cambridge: 2003).

David R. Kinsley, *Ecology and Religion: Ecological Spirituality in Cross-Cultural Perspective*. Prentice Hall (Englewood Cliffs, New Jersey: 1995).

Religions of the World and Ecology Book Series, see Harvard Divinity School Website for comprehensive list: <http://www.hds.harvard.edu/cswr/about/history/ecology.html>  
<http://www.hds.harvard.edu/cswr/resources/print/catalog.html#rwe>

Lambert Schmithausen, 'The Early Buddhist Tradition and Ecological Ethics,' in *Journal of Buddhist Ethics*, 4 (1997) <http://www.buddhistethics.org/4/schm1.html> and for a biography on Buddhism and Ethics, see <http://www.buddhistethics.org/7/harvey001.html#treatment>

Leslie Marmon Silko and Vine Deloria Jr., *God is Red: A Native View of Religion*, Putnum Publishing Group (New York: 1973)

Hava Tirosh-Samuelson (ed.), *Judaism and Ecology*, Harvard University Press (Cambridge: 2002).

Mary Evelyn Tucker and John A. Grim, *Worldviews and Ecology: Religion, Philosophy, and the Environment*. Orbis (Cranbury, New Jersey: 1994).

Mary Evelyn Tucker, *Buddhism and Ecology: The Interconnection of Dharma and Deeds*, from the Religions of the World and Ecology series, Harvard University Press (1998).

Mary Evelyn Tucker and John A. Grim, 'Religion and Ecology: Can the Climate Change?' in *Daedalus: Journal of the American Academy of Arts and Sciences*, 130(4): 1-306 (Fall, 2001).

LYNN WHITE AND ST. FRANCIS OF ASSISI

*The Assisi Declarations*, <http://www.nyo.unep.org/eaf/eafadec.pdf>

Phil Hoebing, O.F.M., 'St. Francis and the Environment,' in *Divine Representations: Postmodernism and Lay Spirituality*, edited by Ann Astell, Paulist Press (1994).

Pope John Paul II, *World Day of Peace Message: Peace with God the Creator, Peace with all of Creation*, 1990, where he refers to St. Francis of Assisi. <http://conservation.catholic.org/ecologicalcrisis.htm>

Timothy C. Weiskel, *The Environmental Crisis and Western Civilization: The Lynn White Controversy*, the Harvard Divinity School. <http://ecoethics.net/bib/1997/enca-001.htm>

Lynn White, 'Historical Roots of Our Ecological Crisis,' *Science*, 155 (1966), 1203-1207.

CALLS TO ACTION

Alliance of Religions and Conservation, World Wide Fund for Nature (WWF). <http://www.arcworld.org/>

Thomas Berry and Mary Evelyn Tucker, *The Sacred Universe: Earth, Spirituality and Religion in the Twenty-first Century*, Columbia University Press (New York: 2009).

Anne Chaon and Marlowe Hood, 'Religion gets behind fight against climate change,' *Associated Foreign Press*, 2 November 2009,  
<http://www.google.com/hostednews/afp/article/ALeqM5gKNAe7FBCCw0F6ynGITwcqY2RJQ>

'For God's Sake: Religious Organizations Preach Environmental Stewardship: More People See Compelling Links Between Religion and the Environment' from *Earth Talk*,  
<http://environment.about.com/od/activismvolunteering/a/religion.htm>

'Is God Green?' with Bill Moyers, *Moyers on America*,  
<http://www.pbs.org/moyers/moyersonamerica/green/index.html>

Paul Eccleston, 'Christians told: Give up carbon for Lent,' 5 February 2008, *The Telegraph*,  
<http://www.telegraph.co.uk/earth/earthnews/3324223/Christians-told-Give-up-carbon-for-Lent.html>

*First Nations Environmental Network*, 'Voice for Mother Earth,' <http://www.fnen.org/?q=node/35>

Helen Grady, 'Religious talk to fight climate change,' Analysis, BBC Radio 4,  
<http://news.bbc.co.uk/1/hi/8468233.stm>



*The Indigenous Environmental Network*: 'A network of Indigenous Peoples empowering Indigenous Nations and communities towards sustainable livelihoods, demanding environmental justice and maintaining the Sacred Fire of our traditions.' <http://www.ienearth.org/>

Paul Nussbaum, 'Increasingly, Evangelists are Embracing Environmentalism,' in *The Philadelphia Inquirer*, 27 May 2005.

Andrew C. Revkin, 'Religion's Role in the Climate Challenge,' in *The New York Times*, 3 November 2009.

#### ENVIRONMENTALISM AND DEEP ECOLOGY

Thomas Berry, *Ethics and Ecology*, a paper delivered by Thomas Berry at the Harvard Seminar on Environmental Values, 1996, <http://www.earth-community.org/images/EthicsEcology1996.pdf>

Roger S. Gottlieb, *A Greener Faith: Religious Environmentalism and Our Planet's Future*. Oxford University Press (Oxford: 2006).

Garrett Hardin, 'The Tragedy of the Commons,' *Science* 162:859, (December 1968), 1243-1248.

J. Donald Hughes, *An Environmental History of the World: Humankind's Changing Role in the Community of Life*, Routledge Studies in Physical Geography and Environment (New York: 2001).

Aldo Leopold, 'The Land Ethic,' in *A Sand County Almanac*, Oxford University Press (Oxford: 2006).

Sallie McFague, *A New Climate for Theology: God, the World, and Global Warming*, Fortress Press (Minneapolis: 2008). Also, see the Study Guide prepared by Ulrike R. M. Guthrie at [http://www.augsburgfortress.org/media/downloads/0800662717\\_studyguide.pdf](http://www.augsburgfortress.org/media/downloads/0800662717_studyguide.pdf)

Arne Naess, 'Identification as a Source of Deep Ecological Attitudes,' in Peter C. List, (ed.), *Radical Environmentalism*, Wadsworth (Belmont, CA: 1993) 24-38.

Michael Shellenberger and Ted Nordhaus, 'The Death of Environmentalism: Global Warming Politics in a Post-Environmental World.' *Grist*, 13 January, 2005.

#### RESOURCES FOR STUDENT-CENTRED EXERCISE

Alastair McIntosh, *Hell and High Water: Climate Change, Hope and the Human Condition*, Birlinn Limited (Edinburgh: 2008).

Alastair McIntosh, 'Where now, "Hell and High Water?"' published in *ECOS*, Journal of the British Association of Nature Conservationists, Vol. 30, No. 3/4, (December, 2009). <http://www.alastairmcintosh.com/articles/2009-ECOS-HHW-Climate.htm>

Alastair McIntosh, *Hell and High Water* website: <http://www.alastairmcintosh.com/hellandhighwater.htm>

Author interview on climate change with World Development Movement <http://www.youtube.com/watch?v=EzTmivEVZIU>

## UNIT 12: TRANSCENDING CLIMATE CHANGE? A RETURN TO POLITICS

### INTRODUCTION

This concluding unit encourages students to think critically about the shape of contemporary environmental politics in general, and the politics of climate change in particular. Rather than accepting the politics of climate change as a consensual necessity, it suggests some of the possible problems and questions - as well as potential - of climate politics. It raises some basic questions. What is the meaning of climate change politics, and what does the nature of that politics tell us about social organization? How should civil society organize if it collectively wishes to address the issue of climate change? Can individuals and groups contribute to addressing the issues, and what does it mean to do so? Is change possible under the existing political order? Students should be seeking to unify what they have learnt across all the other units in the module in a way that seeks to address their knowledge to questions of civic engagement in a critical manner.

#### *Learning Outcomes:*

- A basic understanding of some of the parameters of present-day climate politics.
- A capacity to contribute critically to understanding and critiquing climate politics, strengths and weaknesses.
- A realization that historically-grounded political and social processes share an important relationship to climate policy, and hence, as the product of more than simply the application of technical 'expertise'

### RISK SOCIETY AND ENVIRONMENTAL POLITICS

There is a wide range of material that investigates environmental movements in general, and the politics of climate change in particular. One of the key interpretations of environmentalism has been Ulrich Beck's account of what he calls the 'Risk Society'. For Beck (and collaborators such as Anthony Giddens) contemporary environmentalism should be seen as part of a wider epochal break within modernity itself. Classical modernity, which endured from the Enlightenment to the outbreak of the Second World War, is characterized as being primarily concerned with the generation of social 'goods'. Its main aims were the pursuit of economic growth, expansion of scientific knowledge and technological progress, and the redistribution of the benefits of these through social welfare.

Since 1945, however, Beck argues that this form of modernity has started to be transformed into a new type of modernization. In the West the advance of technology and widespread extension of consumption, along with significant social changes such as the growth of divorce rates had led to social life becoming a more flexible and unstable social experience for individuals. Risk has consequently become an increasingly important factor in affective experience and social and political life. Rather than the production of 'goods', politics increasingly comes to reflect concerns about the risk of exposure to 'bads' such as pollution, urban blight, or climate change. Within this 'risk society' the avoidance of the negative consequences of economic development and scientific advance becomes increasingly important. Environmental politics can be seen then as a paradigmatic form of a 'post-materialist' politics in which the mitigation of risk is paramount. This form of modernity Beck calls reflexive modernization because it is a modernity that is required to constantly deal with problems it has itself created.

The concepts of the 'Risk Society' and 'reflexive modernization' have played a significant role in the interpretation of environmental politics. In emphasizing modernity, technology and the role of experts, Beck offers a significantly different account of the origins of ecological risk to that of, say, Marxist Rift Theory, rather than critiquing capitalism the fundamental tenets of modernity per se are challenged. For this reason, Beck's arguments have been questioned by eco-socialists like Joel Kovel and James O'Connor, for whom the category of 'modernity' is problematic because it places its emphasis on cultural phenomena rather than relations of production in understanding the origins of environmental politics. For these thinkers it is capitalism, rather than modernity, which provides the social and economic context within which environmental crises emerge and politics operate. Profit, rather than technological and scientific change, is the source of environmental crises and determines the political context within which resistance to environmental degradation has to be organized. For eco-socialists a key problem facing climate politics is the fact that major corporations have privileged access to government and can influence decisions in their own interest. This gives them a structural advantage over grass-roots organization, even within the risk society. From this point of view measures such as the Kyoto protocol or the COP-15 negotiations are games played by international institutions dominated by capitalist interests and divorced from democratic imperatives. As Kovel argues:

*[M]easures to mitigate atmospheric carbon are puerile without bringing down the capitalist ruling class and breaking its power over climate protocols. Only a massive uprising from below can accomplish this...*

(Kovel, 'Ecosocialism, Global Justice and Climate Change' (2008), 13).

#### CLIMATE POLITICS, APOCALYPTICS AND DEMOCRACY

Both 'reflexive modernization' theorists and 'eco-socialists' agree on the basic premise that increasing levels of atmospheric carbon dioxide present a potentially devastating problem for global society, perhaps even threatening the end of human civilization or the species itself. These premises are commonly at the core of climate change politics. However, there are some significant detractors from this view. Marxist theorists like Erik Swyngedouw and Slavoj Zizek, for example, have challenged the ideological consequences of these ideas. They have questioned one of the fundamental tenets of climate politics: apocalypticism. For Zizek, the politics of climate change are particularly associated with the 'ecology of fear', a discourse that emphasizes the fundamental dislocation of nature in contemporary society and the emergency nature of the response required to restore order to it. These beliefs have, he claims, substantially undermined the critical capabilities of climate politics, which instead have become absorbed by a post-political global consensus politics, or populism. The example of the demand to keep global average temperature increases below two degrees Celsius he sees as an arbitrary figure that simplifies the real complexity of the climatic system by externalizing it. In other words, it makes it an object of narrow scientific and technical expertise thereby eliminates questions of social influence on the climate. By these means a laudable aim to contain and reduce carbon dioxide emissions becomes reduced to an essentially administrative problem devoid of any political content.

This is a profound critique of climate politics. At its core is an interpretation of the global polity, which emphasizes the de-politicization of both nation states and global institutions. Global capitalism is seen as unchallengeable and all problems are reduced to a question of managing the existing system. Consensus and 'Populism' rather than ideological confrontation are the characteristics of this post-democratic order. Climate politics plays into these terms of reference by emphasizing the role of scientific knowledge, and solutions based uncritically on neo-liberal values, such as the carbon trading schemes

introduced by the Kyoto Protocol. Rather than challenging the capitalist basis of climate change, then, the politics of climate change has been co-opted into a 'post-democratic' populism.

Swyngedouw goes on to investigate the relationship between this post-democratic condition and climate politics. He criticizes eco-socialism because it accepts the fundamental premises of climate crisis and apocalypse. He argues that the dominant discourses around climate change externalize climate change as a problem requiring technical/managerial solutions thereby reinforcing the managerialist ideology of post-political society. Rather than accepting this mainstream representation of what is an adequate political response to climate change Swyngedouw argues that:

Social-environmental conflict...should not be subsumed under the homogenizing mantle of a populist environmentalist-sustainability discourse, but should be legitimized as constitutive of a democratic order. This, of course, turns the climate question into a question of democracy and its meaning. It asserts the horizon of a recuperated democracy as the terrain (space) for expressing conflict, for nurturing agonistic debate and disagreement, and, most importantly, for the naming of different possible social-environmental futures

E. Swyngedouw, 'Apocalypse Forever', (2010), 229.

As such, the general background of debate over climate politics really raises two key questions, which students will wish to consider further in a seminar context:

1. Is the fundamental social cause of anthropogenic climate change modernity itself or the capitalist version of modernity? What does this mean for political organization?
2. Have climate politics been absorbed into a post-democratic order. Is there a threat to democratic ideals from uncritical acceptance of the apocalyptic concept of a climate emergency?

## CASE STUDY

This background provides an excellent basis for critical engagement with the 'failure' of the 2009 United Nations Climate Change Conference, held between 7 and 18 December 2009. Although the Copenhagen Accord was signed at the end of the conference, the hoped-for Framework document outlining how global co-operation on reducing carbon emissions after 2012 would operate failed to emerge. This meant there was no agreement on the targets and mechanisms for addressing anthropogenic climate change, and no clear agreement on what would replace the Kyoto Protocol (1997). This was widely represented as a major set-back for global efforts for concerted action. However, critics, including many global justice activists who were critical of the prominence of carbon trading at the COP-15 negotiations and the impact of any agreement on the global poor, were neither surprised, nor necessarily disappointed by the result.

The COP-15 negotiations and their result, make for an excellent case-study and insight into the workings of climate politics, both in terms of the formal inter-state negotiations and the much wider political activism around the meeting - as illustrated in plentiful online sources. As many as 30,000 participants were registered to take part in the Conference of Parties, and it is worth emphasizing that such meetings are more than opportunities for governments to negotiate with one another, but include substantial representation of Non-Governmental Organizations (more than 20,000 registered participants). Indeed, Fisher has argued that it was the over-wieldy nature of the conference and the measures taken to rationalize participation actually resulted in the exclusion of many civil society participants that was one of the causes of its failure.

However criticism of COP-15 emanating from global justice activists was also a significant and memorable feature of Copenhagen.

This is perhaps also indicative of the increasing voice of eco-socialist and other critics of the political and governmental structures dealing with climate change. Thus, the major powers at COP-15, the USA, European Union, China, Russia, in particular, have been widely accused of using climate change negotiations to further their own national, or even imperial interests. The critique from many in this eco-socialist camp, indeed, predicted that the Conference would result in complete failure as a result of Western nations' one-sided bargaining with other developing nations, plus a lack of willingness to address their own carbon emissions.

The divergence between participating NGOs and non-participating opponents of carbon trading schemes, has been another indicator of an emerging, but fundamental, split in the politics of climate change. This was further complicated by the close connection between global street actions and protests and the many NGOs and other organizations present at Copenhagen.

Mass mobilization of protests for a 'meaningful' outcome from the conference was partly an attempt to increase the lobbying strength of NGOs and governments through campaigns such as Stop Climate Chaos. However, Newell and Paterson's hope in their 1998 critique 'A climate for business', that campaigners would be able to exploit fractures in global capital - between those global corporations with an interest in preventing action and the finance and insurance fractions of global capital, whose interests are manifestly threatened by climate change - did come to pass at Copenhagen. What this clearly demonstrates is the still significant gulf between the organizing strategy and tactics of 'grass-

roots' climate change campaigners and their ability to impact upon the international nation-state system as exemplified in the COP process. This is a question that students might wish to follow up in seminar work.

## STUDENT-CENTRED EXERCISE

Rob Hopkins, *The Transition Handbook: From Oil Dependency to Local Resilience* (2008).

<http://www.transitionnetwork.org/>

An interesting student-centred exercise for this unit might involve looking more deeply at a particular grass-roots, focused, climate change movement, in this case the Transition Movement.

<http://www.transitionnetwork.org/>

Another good choice, among many, would be the Climate Camp movement which has excellent online coverage of its activities and history. <http://climatecamp.org.uk/>

The Transition Movement presents itself as a grassroots community-based knowledge and resilience building initiative; it is very much focused on practical preparation for a move towards a low-carbon economy rather than on campaigning for action by political leaders. Students should be seeking to compare this strategy with those of the climate politics campaigners outlined above, and perhaps situate themselves in response to them. Which is the more appropriate or efficacious route: a critical civic engagement with (or indeed, against) the national and international institutions which are negotiating climate change issues, or a wholesale rejection of such an engagement in favour of a grassroots, self-help model?

This may be an ideal opportunity for a classroom debate (which would also enable students to use knowledge gained from the module as a whole). Designated groups might offer presentations for or against the Transition idea, where appropriate by reference to the more overtly public-engagement route, as identified at the COP meetings.

The text, Rob Hopkins *The Transition Handbook: From Oil Dependency to Local Resilience* (2008), offers arguments for participation in Transition Initiatives, but there are numerous videos of Hopkins lecturing about Transition to audiences that often give a very accessible introduction to his ideas. The book has been developed from experiences in developing the 'Transition Town' concept in Totnes. There is a strong emphasis on 'awareness raising' and the development of a consciousness of both climate change and peak oil as issues, as well as on skills development. The Totnes Transition Network is currently developing an Energy Descent Action Plan, which encourages thought about how Totnes (as a model for many other transition communities) might work as a town in a low-energy economy in 2030. Futurity, therefore, is a key aspect of the Transition concept.

There are really two critical assumptions underpinning Hopkins' text:

- The existence of a 'Dual Challenge': the combined impact of climate change and peak oil on our present social and economic system. As a consequence, the transition from a fossil fuel dependent economy to a less energy intensive economy is not merely desirable but necessary, and *must* happen. Governments have not yet made preparations for this change, but citizens acting on their own initiative *can*.
- Resilience: That through recovery of traditional skills and knowledge and a relocalisation of production it is possible to return to more resilient economy that can survive a future oil shock and the environmental consequences of climate change.

It is probably not desirable to pre-judge how students might respond to the Transition concept, but there are clearly some key questions that arise, which should be apparent from the general context outlined above. The first is the observation that the Transition Movement is focused on the practice of moving from oil dependency to a post-oil society and culture. How would this happen? The Transition Movement assumes that individuals and communities have significant agency in determining the nature and levels of energy use in their lives and communities. This is partly founded on the assumption that 'transition' is inevitable and, therefore, must happen. This raises interesting and important questions about the relationship of social practice to social theory, and the viability of the Transition concept when faced with antagonistic political and social forces.

Another key question that might be addressed is that of *representation* in Transition Movement discourse and of the environmental movement in general. The Transition Handbook begins its case with the idea that both the climate change and peak oil problems have been allowed to fester due to a social 'oversight', although forgetfulness might be a better term. But it might seem to any student that this is hardly an adequate explanation when both these phenomena have attracted so much media attention and controversy. It might be desirable to ask how environmental movements present their cases in moral terms, and the assumptions they make (often controversial) about human nature. After all, if human nature is forgetful and careless, is not any hope of meaningful political action immediately rendered utopian? Similarly, in chapter six, Hopkins deploys a psychological analysis of addiction as a means of understanding the assumed popular resistance to change. But it is surely questionable whether resistance to change can be understood as the result of 'dependence' rather than a more practical recognition of the social and personal costs of change. For instance, what would be the gender consequences of a more labour-intensive form of social organization? Not all work is either enjoyable or creative and in many societies the heaviest work is often left to women. Does transition adequately face up to -either the labour or gender politics of its proposals?



## RESOURCES

### GENERAL

A. Giddens, *The Politics of Climate Change* (Polity, 2009).

U. Beck, *Risk Society: Towards a New Modernity* (Sage Publications, 2007 edn.).

U. Beck, *Ecological Politics in an Age of Risk* (Polity, 1995).

U. Beck, 'Climate for Change, or How to Create a Green Modernity', *Theory Culture Society*, 27 (2010), 254-266.

D.R. Fisher, 'COP-15 in Copenhagen How the Merging of Movements Left Civil Society Out in the Cold' *Global Environmental Politics*, 10 (2010), 11-17.

J. Kovel, 'A Conference that Will Live in Infamy', *Capitalism Nature Socialism*, 21 (2010), 1-2.

J. Kovel, 'Ecosocialism, Global Justice and Climate Change', *Capitalism Nature Socialism*, 19 (2008), 4-14.

P. Newell and M. Paterson, 'A climate for business: global warming, the state and capital', *Review of International Political Economy* 5: 4 (1998) 679-703.

E. Swyngedouw, 'Apocalypse Forever?: Post-political populism and the Spectre of Climate Change', *Theory Culture Society*, 27(2010), 213-232.

See also the special issue of *Theory and Society*, March 2010.

### ONLINE SOURCES

For resources on the Transition Movement: <http://www.transitionnetwork.org/>

George Monbiot's blog on climate change, science and politics: <http://www.monbiot.com/>

Rob Hopkins on 'Transition': <http://www.youtube.com/watch?v=kGHRWptCvg0>

Michael Löwy on Ecosocialism: [http://www.youtube.com/watch?v=92qgr\\_vQMpo](http://www.youtube.com/watch?v=92qgr_vQMpo)

Documents from the Ecosocialist Network, including the *Ecosocialist Manifesto*:  
<http://www.ecosocialistnetwork.org/Docs.htm>

The Campaign Against Climate Change, a socialist and trade unionist climate campaign group:  
<http://www.campaigncc.org/>

Stop Climate Chaos, a coalition of NGOs, charities and co-operatives: <http://www.stopclimatechaos.org/>

Contraction and Convergence, the Global Commons Institute project to bring about global per capita equity in carbon entitlements, in relationship to the UNFCCC objectives to avoid dangerous climate change.: <http://www.gci.org.uk/>

'The Wave' Protest – London 2009: <http://www.youtube.com/watch?v=OjMOxLJVMRk>

Climate Camp: <http://climatecamp.org.uk/>

Slavoj Zizek on Ecology and Ideology: <http://www.youtube.com/watch?v=iGCfiv1xtoU>