

After Fukushima: Climate science, nuclear power, and global warming

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Présentation de l'enseignement / Introduction to the course

Only a few years ago, credible scenarios projected that climate change might lead up to 30 nations to launch new nuclear power programs between 2015 and 2030. These programs would build as many as 600 new nuclear power stations worldwide, reducing global carbon emissions by 11 percent or more and helping to shift the world energy economy away from fossil fuels. But in March 2011, a massive earthquake and tsunami devastated northeastern Japan, causing core meltdowns in three reactors at the Fukushima Daiichi nuclear power plant. Hydrogen explosions at the reactors spewed radioactive materials into the air, rendering the region near the plant uninhabitable for generations to come. As Japan reeled, industry spokespeople insisted that the accidents were a fluke. Newer, "inherently safe" reactor designs, they argued, could not suffer such accidents. Nuclear power remained an important, highly effective means of combating climate change.

Nevertheless, in the aftermath of the accident, Germany, Switzerland, and Belgium have officially renounced nuclear power. Other European countries seem likely to follow suit, as does Japan. Yet investments in nuclear systems create conundrums not easily addressed with a single political decision. Germany announced long-term plans to make up its electricity shortfall from renewable sources. But in the near term, ironically, it will be forced to rely more heavily on fossil fuels — or to import nuclear-generated electricity from France. The technopolitical history of nuclear power thus weighs heavily on the future of energy in a warming world.

This course offers essential historical perspective on contemporary debates. It presents accessible reviews of climate change science and risks, and of nuclear power and its risks. In addition, the course offers a sophisticated conceptual toolbox drawn from science & technology studies (STS), anthropology, economic sociology, cultural studies, and postcolonial studies.

Objectifs pédagogiques / Pedagogical Goals

Students will emerge better equipped to understand not only debates about nuclear power and climate change, but also a variety of historical and contemporary issues surrounding energy futures and the politics of science and technology.

They will also develop the following skills:

- Reading and critiquing sophisticated texts in the social sciences
- Persuasive argumentation in written and oral form
- Analytic and synthetic reasoning
- Thinking "outside the box"

Modalités d'évaluation / Written work and grading

- 2 posts to the online class forum (~5000 characters each), 50% of the grade (25% per post).
Details: Two discussion questions for the online forum will be posted each week for sessions 2 through 11. For each question, 15 students (selected in advance) will participate in the online forum. Students will need to read the week's assignment in order to post. Each student will participate in two such forums (one in each half of the term).
- 1 final paper (8-10 pages), 50% of the grade
Details to be announced later.

Detailed descriptions of each assignment will be handed out separately.

Plagiarism

We assume that you will do all the written assignments yourself, and that when you make use of the words and ideas of other writers, you will quote and cite them correctly. Nevertheless, we are obligated by SciencesPo policy to verify that you have done so. You are therefore required to process all assignments through the Urkund anti-plagiarism system. Please refer to the assignments for further details.

Plan du cours / Course schedule

Séance n°1 | 4 September | Introduction

The problem of climate change. Fukushima and the problem of nuclear power. What do you think and know about climate change? About nuclear power?

Séance n°2 | 11 September | Climate change: what risks? what costs?

Risks of damage to natural ecosystems, agriculture, and the built environment. Risks of conflict over climate-related resources such as water. Scenarios and models used to analyze and predict risk, energy supply and demand, and economic outcomes.

Readings and video:

- K.M. Campbell, J. Gullledge, et al., *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (2007), Part II ("Three Plausible Scenarios of Future Climate Change") and Conclusion (*pp. 37-55 and 103-109*)
- Sir Nicholas Stern, *Stern Review: The Economics of Climate Change* (London: HM Treasury, 2006), Chapter 3 (*pp. 56-84*). Much of the information in this chapter is summarized in its tables.

Video:

- American Association for the Advancement of Science on the consequences of climate change, <http://www.youtube.com/watch?v=khmFBUrM2ko>

Optional readings and video:

- K.M. Campbell, J. Gullledge, et al., *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (2007), Part I ("Can History Help Us with Global Warming?") (*pp. 23-55*)
- Sir Nicholas Stern, *Stern Review: The Economics of Climate Change* (London: HM Treasury, 2006), Chapters 4-6 (*pp. 92-167*). Chapter 6 describes the process of economic modeling of climate change impacts in considerable detail.

Séance n°3 | 18 September | The technopolitics of nuclear power

How technology and politics shaped each other in the emergence of nuclear power. Connections between nuclear power and nuclear weapons. Nuclear exceptionalism. The concept of *technopolitics*.

Readings:

- Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (MIT Press 2012), excerpts from chapter 1 (**pages 6-16, 22-29**)
- Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (MIT Press, new edition 2009), chapter 2 (**pages 55-90**)
- Henry Sokoloski, "The High and Hidden Costs of Nuclear Power," *Policy Review* 162 (Aug. & Sept 2010): **pages 53-68**

Optional reading:

- Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (MIT Press 2012), rest of chapter 1
- Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (MIT Press, new edition 2009), Introduction (**pages 1-17**)

Optional films:

- **Atomic Café** (US atomic enthusiasm, 1940s-1960s):
- <http://www.youtube.com/watch?v=NOUtZOqgSG8&feature=watch-now-button&wide=1>
- **Dr. Strangelove, or How I Learned to Stop Worrying and Love the Bomb**
Not available on YouTube, but this film is easy to find – we'll leave it up to you to do so.

Séance n°4 | 25 September | Climate science and global infrastructures

History of knowledge about Earth's weather and climate. Carbon dioxide theories of climate change from the late 19th century to the present. How instruments, computers, and people work together to create coherent images of global weather and climate.

Readings:

- Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (MIT Press, 2010), Introduction, Chapter 1, and Chapter 7 (**pages xiii-xxiv, 1-25, and 139-186**). In Chapter 7, you can skip pages 150-166, but please pay special attention to the section on "How Climate Models Work" (**pages 143-149**).
- Hans von Storch and Nico Stehr, "Climate Change in Perspective: Our Concerns About Global Warming Have an Age-Old Resonance," *Nature* 405 (2000): **page 615**
- Mike Hulme, "Problems With Making and Governing Global Kinds of Knowledge," *Global Environmental Change* 20, no. 4 (2010): **pages 558-64**

Optional reading:

- Edwards, *A Vast Machine*, Chapters 2-4 and Chapter 6

Séance n°5 | 2 October | How do we know what we know about radiation effects ?

The technopolitics of detecting and measuring radiation. Scientific and public controversies over what counts as a "radiation effect." Dissident science and citizen science. A global perspective on nuclear risk.

Readings:

- Harry Collins and Trevor Pinch, "The Science of the Lambs: Chernobyl and the Cumbrian Sheep Farmers," in *The Golem at Large: What You Should Know about Technology* (Cambridge University Press, 1998): **pages 113-25**

- Adriana Petryna, "Biological Citizenship: The Science and Politics of Chernobyl-Exposed Populations," in *Landscapes of Exposure: Knowledge and Illness in Modern Environments*, OSIRIS 19 (2004), **pages 250-265**
- Gabrielle Hecht, *Being Nuclear*, chapter 6 (**pages 177-212**)

Optional reading:

- Gabrielle Hecht, *Being Nuclear*, chapter 7 (**pages 213-250**)
- Yannick Barthe, "Cause politique et 'politique des causes'. La mobilisation des vétérans des essais nucléaires français", *Politix*, vol. 23, n°91, 2010, **pages 77-102**

Optional films:

***Silent Bombs for the Motherland* (Soviet nuclear testing in Kazakhstan):**

Uploaded in 4 parts – link to Part 1 (links to others on the website): <http://www.youtube.com/watch?v=5aUVQikVKJQ>

***Blowing Up Paradise* (French nuclear testing in Polynesia):**

<http://www.youtube.com/watch?v=lnv1Fw2rp50&feature=related>

***Silent Storm* (British nuclear testing in Australia):**

<http://www.youtube.com/watch?v=vDOUeniCNKM&feature=related>

***Radio Bikini* (US nuclear testing in the Pacific):**<http://www.youtube.com/watch?v=4c14uudVDG8>

Séance n°6 | 9 October | How do we know what we know about climate change ?

Paleoclimatology (the study of climates of the distant past) and planetary climatology (comparing the climates of Mars and Venus to that of Earth). Problems of the historical instrument record and contemporary debates over climate knowledge.

Readings and video:

- Richard Alley, *Earth: The Operator's Manual* (W.W. Norton, 2011), Chapters 10-11 (**pages 120-140**)
- Edwards, *A Vast Machine*, Chapters 11 and 13 (**pages 287-322 and 337-355**)
- Sir David Attenborough on human vs. natural causes of climate change, <http://www.youtube.com/watch?v=SgobgWdbXxo>

Optional:

- Myanna Lahsen, "Seductive Simulations? Uncertainty Distribution Around Climate Models," *Social Studies of Science* 35, no. 6 (2005): **pages 895-922**
- Edwards, *A Vast Machine*, Chapters 10 and 12 (**pages 250-286 and 323-336**)

Séance n°7 | 16 October | Costs and price in nuclear systems

What gets included and excluded in calculations about the cost of the nuclear kilowatt-hour. Scenarios and projections included in calculations, and how these vary by time and place. The meaning of "price" in these debates.

Readings:

- Hecht, *The Radiance of France*, Chapter 8 (**pages 271-323**)
- Paul Joskow & John E. Parsons, "The economic future of nuclear power," *Daedalus* (Fall 2009): **pages 45-59**.

Optional:

- Hecht, *The Radiance of France*, Chapter 3 (**pages 91-130**)
- Hecht, *Being Nuclear*, Chapters 2 and 4 (**pages 55-82 and 107-140**)

Séance n°8 : | 23 October | Climate politics

History and current state of the major international treaties, national politics and policies (especially in France, China, and the United States). Climate change from the perspective of the “developing world.” Initiatives by cities, communities, and non-governmental organizations. History and politics of carbon pricing. Alternatives to carbon markets, such as “cap-and-dividend.”

Readings:

- Pew Center on Global Climate Change, “Climate Change 101: International Action” (2009)
- Pew Center on Global Climate Change, “Emissions Trading in the European Union: Its Brief History” (2009)
- Donald Mackenzie, “The Political Economy of Carbon Trading,” *London Review of Books* 29:7 (2011), 29-31
- Wikipedia entries on [Kyoto Protocol](#), [Carbon Emission Trading](#), and [Clean Development Mechanism](#). Explore the links to other articles as well.
- Ulrich Beck, “Climate for Change, or How to Create a Green Modernity,” *Theory, Culture & Society* 27, no. 2-3 (2010): 254-66

Optional :

- Visit <http://www.czes.org/international/key-country-policies>. Read at least one article about a country’s policy (be sure to check the date on the article, since many of these public). If your country is not listed, choose China, India, or the European Union.
- E. Ostrom, “Nested Externalities and Polycentric Institutions: Must We Wait for Global Solutions to Climate Change Before Taking Actions At Other Scales?,” *Economic Theory* (2012): 1-17
- Mike Hulme, “Reducing the Future to Climate: A Story of Climate Determinism and Reductionism,” *Osiris* 26, no. 1 (2011): 245-66.

Séance n°9 | 6 November | Nuclear Renaissance?

Nuclear industry’s embrace of global warming, and the rebranding of nuclear power as “carbon free.” The “nuclear renaissance.” Nuclear power and political systems in the contemporary world.

Readings:

- Timothy Mitchell, “Carbon Democracy,” *Economy and Society* 38:3 (2009): **pages 399-432**.
- Hecht, *Being Nuclear*, chapter 10 (**pages 319-339**)
- José Goldemberg, “Nuclear Energy in Developing Countries,” *Daedalus* (Fall 2009): **pages 71-80**
- Raminder Kaur, “Nuclear power vs. people power,” *Bulletin of the Atomic Scientists* (9 July 2012): <http://www.thebulletin.org/web-edition/op-eds/nuclear-power-vs-people-power>

Optional:

- Michel Callon, foreword to new edition of Hecht, *The Radiance of France* (**pages xi-xxiii**)
- Global Chance, *Nucléaire: le déclin de l’empire français*. n° 29 (avril 2011).

Séance n°10 : | 13 November | Climate knowledge and trust

The human side of science. People tend to discount facts that disconfirm their strongly held opinions, and tend to trust messengers rather than messages. Scientific expertise has been undermined by the rise of Internet information sources such as blogs and social media, but new possibilities for citizen involvement in science may also strengthen confidence in climate knowledge.

Readings:

- Richard C.J. Somerville, and Susan Joy Hassol, "Communicating the Science of Climate Change," *Physics Today* 64, no. 10 (2011), pages 48-53
- A. Leiserowitz, E. Maibach et al., "Global Warming's Six Americas, June 2010," Yale Project on Climate Change (2010)
- Tom Clynes, "[The Battle Over Climate Science: Climate scientists routinely face death threats, hate mail, nuisance lawsuits and political attacks. How much worse can it get?](#) » (2012)
- Paul C. Stern, "Psychology: Fear and Hope in Climate Messages," *Nature Climate Change* 2, no. 8 (2012), pages 572-573

Séance n°11 | 20 November | Fukushima

What happened at Fukushima, and how can we use the tools of social science to help us understand the reactor meltdowns? How does the history of nuclear power in Japan help us understand the accidents? How are citizens in Japan dealing with the aftermath?

Readings:

- Daniel Aldrich, "Post-Crisis Japanese Nuclear Policy: From Top-Down Directives to Bottom-Up Activism," *East-West Center* No. 103 (January 2012).
- **FURTHER READING TO BE ANNOUNCED.**

Séance n°12 | 27 November | Concluding debates

How should the world approach nuclear energy after Fukushima? How should it address climate change? The instructors will set a number of questions on such topics; each will be publically debated, in class, by teams of students. Details will be provided in class.

Bibliographie / Bibliography

The following books are available on Amazon.com and should be purchased well in advance of the course. Two are available via Kindle – even if you don't have a Kindle, you can download the Kindle software onto your laptop and read the book that way.

Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (MIT Press 2011). **Available in a Kindle edition.**

Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (MIT Press 2012). **Available in a Kindle edition.**

Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (MIT Press, new edition 2009). **Not available in Kindle, but also available in French under the title *Le rayonnement de la France* (La découverte 2004).**

All other course readings are listed in the syllabus. For some, we have provided web links. All others will be made available online at <http://pne.people.si.umich.edu/PDF/AFK2012.zip>