

## **Assessing and Governing Long-term Risks**

*16:460:629 Seminar in Earth System Science / 33:833:685 Seminar in Public Policy /*

*16:378:502 Seminar in Human Dimensions of Environmental Change*

*Rutgers, the State University of New Jersey, Spring 2015<sup>1</sup>*

*Thursdays 2:00-5:00pm, 168 Civic Square Building, 33 Livingston Ave., New Brunswick*

### **Professor Rachael Shwom**

Email: [Shwomrac@rci.rutgers.edu](mailto:Shwomrac@rci.rutgers.edu) / Twitter: @rlshwom

Office: 202 Cook Office Building, School of

Environmental and Biological Sciences

### **Professor Robert Kopp**

Email: [Robert.Kopp@rutgers.edu](mailto:Robert.Kopp@rutgers.edu) / Twitter: @bobkopp

Office: 225 Wright Lab, Busch Campus / 248 Civic Square Building



Long-term risks can be thought of as risks where the probability and/or magnitude of harm increases on a multi-decadal timescale. Long-term risks can arise from purely social causes (e.g., those associated with political or economic institutions, violence, and technology), but often arise from the interaction of humans with the Earth system (e.g., climate change; ozone depletion; resource depletion; pandemics; flood and seismic risk in areas subject to increasing development). In the past, many such risks – such as pandemics and earthquakes in the pre-scientific world – arose without the potential for foresight and were blamed on supernatural causes. Today, there are many that are within human knowledge. Nonetheless, long-term risk governance remains challenging for multiple reasons, including that uncertainty in projected hazards often increase the further we project into the future.

Risk governance “includes the totality of actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analyzed, and communicated and management decisions are taken,” (Renn and Roco, 2006: 157). Risk governance can be broken into two spheres of assessment and risk management. The assessment sphere is concerned with generating knowledge or “analyzing and understanding” the risk. The risk management sphere uses this knowledge to make decisions and implement actions. This class will focus on specific ways to assess and manage longer –term risks by learning about case studies where long term risks have been identified and specific tools (such as the info-gap and robust decision-making method) that have been developed to govern long-term risks.

In this class we will be exploring:

- 1) Dimensions of long-term risks
- 2) Identification and assessment of long-term risks
- 3) Tools for governing long-term risk

At the end of this class you will be able to:

- 1) Interpret and understand the dimensions of long term-risks
- 2) Identify and apply appropriate tools to manage long term risks

---

<sup>1</sup> Note for Princeton students: PU students can register via the Rutgers Exchange Program (<http://bit.ly/18Hmalg>). Please note that the Rutgers term is longer than the Princeton term. The first day of class is January 22. The last day of class is April 30.

Course Schedule (subject to revision)

Date	Topic	Readings
1/22/2015	Class Intro	<ol style="list-style-type: none"> <li>1. Syllabus</li> <li>2. Renn, O. 2008. "Concepts of Risk: An Interdisciplinary Review Part 1: Disciplinary Risk Concepts." <i>GAIA-Ecological Perspectives for Science and Society</i> : 50-66.</li> <li>3. Cooke, Roger. 2009. "Brief History of Quantitative Risk Assessment" <i>Resources</i>: 8-9.</li> </ol>
1/29/2015	What are the dimensions of Long Term Risk and Risk Governance?	<ol style="list-style-type: none"> <li>1. Bostrom, N. and Milan M. Cirkovic. 2008. "Introduction" in <i>Global Catastrophic Risks</i></li> <li>2. Rosa, E. Renn, O. and McCright, A. 2015. "Chapter 9: Risk Governance: A Synthesis" in <i>The Risk Society Revisited: Social Theory and Governance</i></li> <li>3. International Risk Governance Council. 2013. "Preparing for Future Catastrophes: Governance principles for slow-developing risks that may have potentially catastrophic Consequences"</li> </ol>
2/5/2015	Long Term Risk Pre-Assessment – Horizon Scanning, Worst Case Scenarios	<ol style="list-style-type: none"> <li>1. Amanatidou, Effie, et al. 2012. "On concepts and methods in horizon scanning: Lessons from initiating policy dialogues on emerging issues." <i>Science and Public Policy</i> 39:2: 208-221.</li> <li>2. Sutherland et al., 2015. "A horizon scan of global conservation issues for 2015." <i>Trends in Ecology &amp; Evolution</i> 30: 17-24.</li> <li>3. Clarke, Lee. "Thinking about Worst-Case Thinking." <i>Sociological Inquiry</i> 78.2 (2008): 154-161.</li> <li>4. Ten Brinke, W. B. M., et al. "Contingency Planning for Large-Scale Floods in the Netherlands." <i>Journal of Contingencies and Crisis Management</i> 18.1 (2010): 55-69. <i>Confirmed Speaker:</i> Chip Clarke, Rutgers University</li> </ol>
2/12/2015	Long Term Risk Pre-Assessment - Risk Perception and Framing (Dr. Shwom only)	<ol style="list-style-type: none"> <li>1. Yudkowsky, Eliezer. 2008. "Cognitive Biases potentially affecting judgment of global risk" in <i>Global Catastrophic Risk</i>.</li> <li>2. Weber, Elke U. "Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet)." <i>Climatic Change</i> 77.1-2 (2006): 103-120.</li> </ol>

		<p>3. Beamish, Thomas D. "Waiting for crisis: Regulatory inaction and ineptitude and the guadalupe dunes oil spill." <i>Social problems</i> 49.2 (2002): 150-177.</p>
2/19/2015	Long-term Risk Assessment – Estimating Future Risks	<p>1. Houser, T., Kopp, R., Hsiang, S. M., Delgado, M., Jina, A., Larsen, K., ... &amp; Wilson, P. (2014). <i>American Climate Prospectus: Economic Risks in the United States</i>. Rhodium Group. (Executive Summary and Chapters 1-3)</p> <p>2. Cooke, Roger M., and Louis H. J. Goossens. "Expert judgement elicitation for risk assessments of critical infrastructures." <i>Journal of Risk Research</i> 7.6 (2004): 643-656.</p> <p>3. Kaplan, S., &amp; Garrick, B. J. (1981). On the quantitative definition of risk. <i>Risk analysis</i>, 1(1), 11-27.</p> <p>4. Kriegler, E., Hall, J. W., Held, H., Dawson, R., &amp; Schellnhuber, H. J. (2009). Imprecise probability assessment of tipping points in the climate system. <i>Proceedings of the National Academy of Sciences</i>, 106(13), 5041-5046.</p> <p>5. Bamber, J. L., &amp; Aspinall, W. P. (2013). An expert judgement assessment of future sea level rise from the ice sheets. <i>Nature Climate Change</i>, 3(4), 424-427.</p>
2/26/2015	Long-term Risk Assessment – Estimating Future Risks	<p>1. Woolhouse, Mark. "How to make predictions about future infectious disease risks." <i>Philosophical Transactions of the Royal Society B: Biological Sciences</i> 366.1573 (2011): 2045-2054.</p> <p>2. Lofgren, Eric T., and Nina H. Fefferman. "The untapped potential of virtual game worlds to shed light on real world epidemics." <i>The Lancet infectious diseases</i> 7.9 (2007): 625-629.</p> <p>3. Pandemics in Global Risk book. <i>Confirmed: Dr. Nina Fefferman</i></p>
3/5/2015	Long-term Risk Assessment – Communicating Uncertainties <b>SNOW DAY</b>	<p>1. Fischhoff, Baruch, and Alex L. Davis. "Communicating scientific uncertainty." <i>Proceedings of the National Academy of Sciences</i> 111.Supplement 4 (2014): 13664-13671.</p>

		<p>2. Cooke, Roger. 2015. "Commentary: Messaging climate change uncertainty" <i>Nature Climate Change</i> 5 (1-3).</p> <p><i>To be discussed first hour of 03/12/2015</i></p>
3/12/2015	Long-term Risk Assessment- Integrating Concerns of Future Generations	<p>1. Arrow, K., Cropper, M., Gollier, C., Groom, B., Heal, G., Newell, R., ... &amp; Weitzman, M. (2013). Determining benefits and costs for future generations. <i>Science</i>, 341(6144), 349-350.</p> <p>2. Giglio, S., Maggiori, M., &amp; Stroebel, J. (2014). Very long-run discount rates (No. w20133). National Bureau of Economic Research.</p> <p>3. Shrader-Frechette, Kristin. "Duties to future generations, proxy consent, intra- and intergenerational equity: The case of nuclear waste." <i>Risk analysis</i> 20.6 (2000): 771-778.</p> <p>4. Lehtonen, Markku. "Opening up or closing down radioactive waste management policy? Debates on reversibility and retrievability in Finland, France, and the United Kingdom." <i>Risk, Hazards &amp; Crisis in Public Policy</i> 1.4 (2010): 139-179.</p> <p>5. Discussion of potential paper topics</p>
3/19/2015	Spring Break	Spring Break
3/26/2015	Long-Term Risk Tolerability and Acceptance – Judgment of the Seriousness of Risks	<p>1. Fischhoff, Baruch. "Acceptable risk: A conceptual proposal." <i>Risk</i> 5 (1994): 1.</p> <p>2. Kunreuther, Howard, and Paul Slovic. "Science, values, and risk." <i>The annals of the American academy of political and social science</i> (1996): 116-125.</p>
4/2/2015	Long –Term Risk Management: Precautionary Principle and its Tools	<p>1. Foster, Kenneth R., Paolo Vecchia, and Michael H. Repacholi. "Science and the precautionary principle." <i>Science</i> 288.5468 (2000): 979-981.</p> <p>2. MacGarvin, Malcolm. Late lessons from early warnings: the precautionary principle 1896-2000. Office for Official Publications of the European Communities, 2001. Case: Fisheries  <a href="ftp://ftp.elet.polimi.it/outgoing/Marino.Gatto/SanPaolo/PrecautionaryPrinciple1896-2000.pdf">ftp://ftp.elet.polimi.it/outgoing/Marino.Gatto/SanPaolo/PrecautionaryPrinciple1896-2000.pdf</a></p>
4/9/2015	Long –Term Risk Management: Robust Decision-Making (Dr. Kopp only)	<p>1. Lempert, Robert J., and Myles T. Collins. "Managing the risk of uncertain threshold responses: comparison of robust,</p>

		<p>optimum, and precautionary approaches." <i>Risk analysis</i> 27.4 (2007): 1009-1026.</p> <p>2. Hallegatte, Stéphane. "Investment decision-making under deep uncertainty-application to climate change." Policy Research Working Paper 6193 (2012). <i>Guest Speaker Dr. Roger Cooke</i></p>
4/16/2015	Long-Term Risk Management: Insurance Tools (Dr. Shwom only)	<p>1. Kleindorfer, Paul R., and Howard Kunreuther. "The complementary roles of mitigation and insurance in managing catastrophic risks." <i>Risk Analysis</i> 19.4 (1999): 727-738.</p> <p>2. Camerer, Colin F., and Howard Kunreuther. "Decision processes for low probability events: Policy implications." <i>Journal of Policy Analysis and Management</i> 8.4 (1989): 565-592. <i>Invitation: Dr. Howard Kunreuther</i></p>
4/23/2015	Long –Term Risk Management: Tools for Facilitation Public Participation	<p>1. Paul C. Stern and Thomas Dietz, eds. <i>Public participation in environmental assessment and decision making</i>. Washington, DC: National Academies Press, 2008)</p> <p>2. Payne, C. and Shwom, R. "Public Participation and Norm Formation for Risky Technology: Adaptive Risk Governance of Solar Radiation Management" Forthcoming in <i>Climate Law</i></p>
4/30/2015	Cases of Long term risk governance <b>Final Paper Due</b>	15 minute presentations on a long-term risk that has been governed in the past (examples/ideas discussed earlier)

Please purchase Bostrom, Nick, and Milan M. Cirkovic, eds. *Global catastrophic risks*. Oxford University Press, 2011. [http://www.amazon.com/Global-Catastrophic-Risks-Nick-Bostrom/dp/0199606501/ref=sr\\_1\\_1?ie=UTF8&qid=1421085206&sr=8-1&keywords=Global+catastrophic+risks](http://www.amazon.com/Global-Catastrophic-Risks-Nick-Bostrom/dp/0199606501/ref=sr_1_1?ie=UTF8&qid=1421085206&sr=8-1&keywords=Global+catastrophic+risks)

The rest of the texts can be found on sakai website for the class.

### Student Responsibilities and Assessment

Students are expected to (1) attend all class sessions and participate in discussions; (2) rotate through leading discussions; and (3) write a final research paper. The paper, which is due on the last day of class and should be of publishable quality, will require you to research a topic of past or current long term risk and apply some aspect of long-term risk governance to your topic. Co-authored papers with class students are acceptable. You will present your framework and findings to the class on the last day.