SRA 2011 Global Catastrophic Risk Sessions
December 4-7, Charleston, South Carolina.
http://www.sra.org/events_2011_meeting.php

Symposium 1: Global catastrophic risk
Chair: Anthony M. Barrett
Specialty groups: Decision Analysis and Risk; Risk Communication; Economics & Benefits Analysis

Title: Communicating the importance of global catastrophic risk
Author: Seth D. Baum, Department of Geography, Pennsylvania State University

Title: Towards consensus on global catastrophic risk reduction objectives
Authors: Anthony M. Barrett (presenter), ABS Consulting; Seth D. Baum, Department of Geography, Pennsylvania State University

Title: Partnership Optimization Decision Support System (PODSS): Improving partnership development and resource allocation in disaster recovery operations using game theory
Authors: John B. Coles (presenter), Jun Zhuang, SUNY Buffalo

Title: Assessment of methods for estimating existential risks: Part I
Authors: Bruce E. Tonn (presenter), Dorian A. Stiefel, University of Tennessee, Knoxville

Title: Assessment of methods for estimating existential risks: Part II
Authors: Dorian A. Stiefel (presenter), Bruce E. Tonn, University of Tennessee, Knoxville

Symposium 2: Catastrophic climate change
Chair: Seth D. Baum
Specialty groups: Economics & Benefits Analysis; Risk Policy & Law

Title: International differences in risk tolerance and implications for global climate policy
Authors: Mark E. Borsuk (presenter), Peng Ding, Michael D. Gerst, Adam Bernstein, Richard B. Howarth, Dartmouth University

Title: Public understanding of Solar Radiation Management and its implications on future research
Authors: Ashley M. Mercer (presenter),1 David W. Keith,1 Jacqueline D. Sharp2
1 Institute for Sustainable Energy, Environment and Economy, University of Calgary
2 Energy and Materials Research Group, Simon Fraser University

Title: Risk governance of nano-geoengineering
Authors: Luke Hollenkamp, Jennifer Kuzma (presenter), Humphrey School of Public Affairs, University of Minnesota

Title: Risk-risk tradeoffs in climate engineering
Author: Jonathan B. Wiener, School of Law, Duke University

Symposium 1: Global catastrophic risk
Chair: Anthony M. Barrett
Specialty groups: Decision Analysis and Risk; Risk Communication; Economics & Benefits Analysis
Abstract: Global catastrophic risks (GCRs) are risks of events that could significantly harm or even destroy civilization at the global scale. GCRs are thus risks of the highest magnitude, regardless of probability. Major GCRs include climate change, pandemics, nuclear warfare, and potential new technologies. This symposium features diverse perspectives on how to effectively assess and respond to GCRs through research, policy, and other means.

Title: Communicating the importance of global catastrophic risk
Author: Seth D. Baum, Department of Geography, Pennsylvania State University
Abstract: The reduction of global catastrophic risk (GCR) has been identified by a growing group of researchers as a top societal priority. However, many of these researchers also express concern that GCR is not receiving enough attention, either from the research community or from the general public. In response to this concern, this presentation presents approaches to communicating the importance of GCR to broad audiences. The presentation draws on insights from research on risk and science communication, professional practice in popular media and the arts, and firsthand experience in GCR communication. Emphasis is on how GCR researchers from all disciplines can more effectively communicate the importance of GCR in a broad range of settings.

Title: Towards consensus on global catastrophic risk reduction objectives
Authors: Anthony M. Barrett (presenter), ABS Consulting; Seth D. Baum, Department of Geography, Pennsylvania State University
Abstract: The reduction of global catastrophic risk (GCR) has emerged as a clear priority from certain risk analytic perspectives. However, GCR reduction raises several contentious issues, on which conflicting views can often be found among communities currently active in GCR assessment and reduction. In this presentation, we review these contentious issues with an eye towards what consensus might exist for specific GCR reduction objectives. The contentious issues include: discounting and time scales of analysis; trade-offs between objectives; and values regarding the fate of humanity in the contexts of technological change and diverse eschatological beliefs. We review issues in assessing trade-offs of GCR reduction options, analyze areas of agreement and disagreement in views, and discuss implications for GCR research and policy.

Title: Partnership Optimization Decision Support System (PODSS): Improving partnership development and resource allocation in disaster recovery operations using game theory
Authors: John B. Coles (presenter), Jun Zhuang, SUNY Buffalo
Abstract: The Partnerships Optimization Decision Support System (PODSS) approach provides a dynamic planning and coordination tool for surviving agencies to allocate resources under any circumstance in an accessible and scalable way. Disasters have increasingly become a

dominating phenomenon in the last 10 years, including the recent shocking statistics that followed the Haitian earthquake of 2010 and the unprecedented number tornados that tore through the United States in the spring of 2011. Such disasters have also resulted in increasingly publicity for ineffective agencies that have failed to cooperate and coordinate during relief and recovery operations. It is clear that a new, more effective paradigm for coordinated response is needed. It is essential that relief efforts that focuses on how to optimize a dynamic environment and do not rely on extensive a prior mitigation. Agencies (i.e. organizations, militaries, governments, businesses and individuals) have come to recognize the need for an adaptive approach to response, regardless of the type or size of the disaster. Combining game theory with multi-period optimization, the proposed system provides a scalable approach to partnership and resource management. Using utility functions to predict interagency partnership payoffs, PODSS applies game theory to solve a mixed integer program that provides recommendations for resource allocation at the agency level. This system allows agencies to identify what partnerships to form and, once formed, how much of their resources should be dedicated to each project. By placing an effective tool in the hands of individuals, governments, and all other agencies, our system provides a framework for survivor centric recovery.

Title: Assessment of methods for estimating existential risks: Part I
Authors: Bruce E. Tonn (presenter), Dorian A. Stiefel, University of Tennessee, Knoxville
Abstract: In recent years, many researchers and commissions have pronounced that the risk of human extinction is quite high but none of these estimates have been based upon a rigorous methodology suitable for estimating existential risks. This presentation assesses three methods that could be used to estimate the probability of human extinction. Methods assessed include: simple holistic elicitation; whole evidence Bayesian; and evidential reasoning using imprecise probabilities. Assessment criteria include: how well the approach describes causal relationships between events that could lead to human extinction; level of elicitation efforts required of experts; ease of approach implementation; transparency of inputs into risk estimates; and acceptability of the approach.

Title: Assessment of methods for estimating existential risks: Part II
Authors: Dorian A. Stiefel (presenter), Bruce E. Tonn, University of Tennessee, Knoxville
Abstract: This presentation focuses on four ‘model’-based methods that one could use to estimate existential risks. The term ‘model’ is being used emphasize that the approach contains a method for structuring how multiple factors interact with each other in a causal fashion that ultimately could lead to human extinction. The most established method to be discussed is known as Bayesian networks. Three other innovative methods are also considered: influence modeling based on environmental scans; simple elicitation using human extinction scenarios as anchors; and computationally intensive possible worlds modeling. The four methods are also assessed about how well the approach describes causal relationships between events that could lead to human extinction; level of elicitation efforts required of experts; ease of approach implementation; transparency of inputs into risk estimates; and acceptability of the approach.

Symposium 2: Catastrophic climate change
Chair: Seth D. Baum
Specialty groups: Economics & Benefits Analysis; Risk Policy & Law

Abstract: Climate change is among the most significant catastrophic risks that global society faces. This session features a range of perspectives on catastrophic climate change and responses to it. Scholarship a diverse range of fields including economics, engineering, law, policy, and psychology bring insight to how severe the threat of climate change is and how the threat can be addressed through measures including incentives, institutions, and geoenengineering.

Title: International differences in risk tolerance and implications for global climate policy
Authors: Mark E. Borsuk (presenter), Peng Ding, Michael D. Gerst, Adam Bernstein, Richard B. Howarth, Dartmouth University
Evaluation of public policies with uncertain outcomes requires an accurate characterization of social preferences regarding risk. Unfortunately, the preference models used in most integrated assessments of climate policy do not adequately describe the risk attitudes revealed by typical investment decisions. Here, we adopt an empirical approach to social preference description using global historical data on investment returns and the occurrence of rare economic disasters. We improve on earlier analyses by employing a Bayesian inference procedure that allows for nation-specific estimates of disaster probabilities and preference parameters. This provides a stronger test of the underlying investment model than provided by global calibrations and generates some compelling hypotheses for further study. Specifically, results suggest that society is substantially more averse to risk than typically assumed in integrated assessment models of climate change. Additionally, there appear to be systematic differences in risk preferences among nations. We use a recently-developed model of multi-attribute negotiation to explore the implications of these international differences on the chances of reaching a global climate treaty.

Title: Public understanding of Solar Radiation Management and its implications on future research
Authors: Ashley M. Mercer (presenter),[1] David W. Keith,[1] Jacqueline D. Sharp[2]
1 Institute for Sustainable Energy, Environment and Economy, University of Calgary
2 Energy and Materials Research Group, Simon Fraser University
Abstract: Geoengineering (or climate engineering) has recently become the subject of serious debate within scientific and political circles. A geoengineering technique called solar radiation management (SRM)is designed to reflect incoming sunlight, with the objective of slowing and partially offsetting greenhouse gas driven climate change. Intentionally manipulating the Earth's climate is very controversial, and to date there has not been a broad public dialog on the use of SRM. Experts assume that the public is unaware of its existence and cannot contribute to the debate. This research provides an international baseline assessment of the general public's awareness and opinions of geoengineering and SRM. An internet-based survey was administered to nationally representative samples in Canada, the United Kingdom, and the United States (n = 2,893). The results suggest that 8% and 45% of the population correctly understand the terms geoengineering and climate engineering respectively, with awareness levels similar across the three countries. On average there was slight support for the use of geoengineering as a solution to global warming, although a substantial share of the population does not yet have an opinion. Distinct supporter and detractor groups were identified. The results have important implications for the role of public engagement in future research programs on high-risk emerging climate technologies.

Title: Risk governance of nano-geoengineering
Authors: Luke Hollenkamp, Jennifer Kuzma (presenter), Humphrey School of Public Affairs, University of Minnesota
Abstract: Geoengineering includes the large-scale and intentional manipulation of climate and is under consideration to counteract anthropogenic climate change through stabilizing the Earth's temperature. Nanotechnology is another emerging technology involving the manipulation of matter at the atomic and molecular scales to impart novel properties. To our knowledge, no formal studies of risk governance for the convergence of nanotechnology and geoengineering (NanoGeo) have been conducted. This paper's goals are to explore the convergence of NanoGeo, examine risk analysis and societal issues pertaining to it, and ultimately assess the adequacy of existing international governance frameworks that may be applicable to the marriage of these two novel and rapidly-developing fields. Three analytical frameworks are used for our analysis. First, an upstream oversight assessment (UOA) approach is employed to examine how references to nanotechnology have emerged in geoengineering literature and media, and to select relevant case studies of NanoGeo for further analysis. Second, existing and potentially-relevant international governance mechanisms are identified and judged based upon a multi-criteria decision analysis (MCDA) approach to determine their applicability and effectiveness for risk governance of the NanoGeo case studies and NanoGeo more broadly. Finally, the International Risk Governance Council's (IRGC) framework for stakeholder involvement is used to assess the adequacy of international governance mechanisms for dealing with complexity, uncertainty, and ambiguity associated with NanoGeo.

Title: Risk-risk tradeoffs in climate engineering
Author: Jonathan B. Wiener, School of Law, Duke University
Abstract: The risk of potentially catastrophic climate change, and the cost of greenhouse gas (GHG) emissions abatement, have spurred interest in techniques for engineering the climate through solar radiation management (SRM), such as injecting reflective particles into the upper atmosphere. Such geoengineering projects may pose risk-risk tradeoffs, which might include, for example, excessive global cooling; moral hazard undercutting GHG abatement; pollutant deposition; adverse regional and distributional impacts; and abrupt warming if SRM were discontinued while GHG concentrations remain high. Sound decisions will depend on evaluation of these risk-risk tradeoffs and a search for risk-superior options. Recognizing these risks, some have advocated international governance strategies to restrain hasty deployment of SRM, because there may be incentives to be the first mover in deploying SRM (the converse of incentives to free ride in emissions abatement). And some have advocated research on SRM in order to understand it better, reduce the risks of hasty deployment in a crisis, and assist in the selection of the best (lowest overall risk, highest net benefits) option. But such research may pose its own risk-risk tradeoffs, because research on SRM might lower its costs and/or clarify its regional distributional impacts, either of which may exacerbate the race to deploy first. Lower cost, typically viewed as an advantage of SRM over GHG abatement, may encourage unaccountable states or non-state actors to race to deploy SRM. Clearer understanding of regional distributional impacts may encourage actors to deploy SRM first, selecting the SRM project that most favors the deployer, and preempting (deterring) the deployment of other SRM projects which might have superior regional distributional impacts but would yield excessive aggregate global cooling if deployed second or third. These tradeoffs suggest the need for careful

attention to the strategic incentives, governance regimes, research programs, information sharing, accountability and reversibility of SRM.