

The Science of Risk Communication

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NOAA recognizes that communicating risk and influencing human behavior is central to almost every facet of their mission and operations (see report by NOAA Social Science Committee from April 2016, <http://www.ppi.noaa.gov/wp-content/uploads/Risk-Communication-and-Behavior-Best-Practices-and-Research-Findings-160425.pdf>). Moreover, NOAA's small team of social scientists are well-versed in the literature of risk communication and have already generated pragmatic best practices based on that published literature—especially hurricane and tornado warnings, and announcements of flood vulnerability.

What is missing is a research program of discovery aimed at finding new approaches for NOAA to use when alerting the public that certain places are a bad place to build a home, or to present climate science and what it tells us about impacts on people, or to caution fishery communities about the peril of over-exploitation, or to gain a better response to the prospect of repeated extreme weather events. There also remains more to be discovered about hurricane, tsunami, tornado, and flooding warnings. **There are two reasons this research gap warrants immediate action:**

- **NOAA will be a willing and eager implementer of research findings.** NOAA recognizes that it cannot rely on coercion and requires the public cooperation when it conveys a wide variety of “at risk” messages.
- **NOAA can be a testbed for experiments on risk communication, and more generally on addressing uncertainty while still trying to convey a clear message.** There is no other federal agency (other than perhaps homeland security) that on a daily basis must provide the public with information regarding risk, vulnerability, and possible course of action.

NOAA need not do all of this research itself—although it should maintain an adequate in-house social science team to take up the research and turn it into actions, and to help shape the research questions and design. There are two, not mutually exclusive routes for NOAA to catalyze the risk communication research it needs. Both routes entail extensive collaboration with external experts.

#1. A highly leveraged, cost effective pathway to obtaining the research NOAA needs would be a NOAA/University/Private sector partnership that convened a series of workshops that would generate specific research questions and sketches of research design that could address NOAA's needs. These workshops would be brainstorming sessions involving 5 to 10 researchers from a variety of disciplines and a handful of NOAA social scientists and operations leaders. An initial set of topics for these workshops (one topic per workshop) might include the following:

- graphical display or visualization of risk (Vulcan foundation as potential private partner)
- climate altered property and human risk (re-insurance companies and The Nature Conservancy as potential private partners)
- small probability events and the need to nonetheless influence behavior (human health industry as potential private partner)
- matching the message to audience (political polling and marketing consultants as potential private partners)
- cognitive psychology and behavioral economics theory of behavior change (architectural and design firms as potential private partners)

#2. Apply the Vulcan process (<http://www.vulcan.com/>) to a gathering of 50-80 innovative thinkers from diverse disciplines under the banner of “risk communication”. In the Vulcan process, pioneered by Paul Allen’s innovation group, participants submit online 3 ideas for high priority research. At the beginning of the day, all submitted questions are available in a list. Then the large group breaks into 10-15 groups of six who sit at a table for about an hour and take their original questions – combine them, drop some, alter them and generate 3-4 research topics from the table. The attendees are reshuffled and create new tables and new combinations and repeat this through several “generations”. **As the day goes on tables go from producing 3 ideas, to 2 ideas, and finally only 1 idea from each table.** At the end of the day there is a small set of questions—perhaps five, that then become the focus for an RFP. In a sense this process simulates evolution – recombination, mutation, and selection. It also harnesses the creativity of a large group of people and does not allow any one voice to dominate. All this in one day, and minimal paperwork!

It is important to note the type of research likely to emerge from either a portfolio of workshops or the Vulcan process is likely to be of modest expense because it does not require ship time, expensive equipment, supplies, etc. It does, however, require the time of NOAA scientists working in tandem with the best academic researchers. For this reason, in contrast to a wide-open call for proposals, the workshops or the Vulcan process described above would quickly generate particular research endeavors that both NOAA and academic colleagues felt would be high priority and doable. Moreover, both the workshops and the “Vulcan process” could be the first step in establishing the collaborations and relationships necessary to execute the research.

LEADING THINKERS TO CONSIDER INVITING TO WORKSHOPS

Scott Barrett: Scott Barrett is a Columbia professor of natural resource economics and is a leading scholar on international issues such as disease eradication and climate change. He studies how society can use norms, laws, treaties, resolutions, and other institutions to promote international cooperation. Much of his research links action-taking towards climate change and psychology.

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Glynis Breakwell (from <http://www.bath.ac.uk/about/organisation/senior-management/staff-profiles/vice-chancellor/>): Professor Dame Glynis Breakwell DBE, DL was appointed Vice Chancellor of the University of Bath in 2001. She is one of Europe's leading social psychologists and in 2014 was named in the Science Council's list of '100 leading UK practising scientists'. Dame Glynis is an active public policy adviser and researcher specialising in leadership, identity processes and risk management and has produced over 20 books including, most recently, the second edition of *The Psychology of Risk*.

Astrid Dannenberg (from <http://economics.gu.se/english/Units+and+Centra/environmental-economics/about-eeu/staff/astrid-dannenberg>): Dannenberg now works at the Earth Institute at Columbia University. Astrid's research interests lie primarily in global sustainable development issues. Her research uses game theoretic models and economic experiments. In particular, the research focuses on human decision making and how institutions can be designed to promote cooperation and to identify and remove barriers to cooperation.

Suraje Dessai (from <http://www.see.leeds.ac.uk/people/s.dessai>): Suraje Dessai is Professor of Climate Change Adaptation at the Sustainability Research Institute in the School of Earth and Environment at the University of Leeds. His current research and teaching focuses on the management of climate change uncertainties, perception of climate risks and the science-policy interface in climate change impacts, adaptation and vulnerability. Suraje has published 45 peer-reviewed papers in journals such as *Science* and *Global Environmental Change*, 9 book chapters and edited 2 journal special issues.

Ann-Christine Duhaimé: Dr. Duhaimé is a neurosurgeon at Harvard who has recently become interested in how the brain's hard-wiring dictates our drive for stimulation and consumption. She is writing a book on the neurological underpinnings of environmental behavior.

John Fien (from [http://www1.rmit.edu.au/browse/About%20RMIT%2FContact%2FAll%20contacts%2FStaff%2Fby%20name%2FF%2FID=7pmopchepf1fz;STATUS=A?QRY=%2B\(professor\)](http://www1.rmit.edu.au/browse/About%20RMIT%2FContact%2FAll%20contacts%2FStaff%2Fby%20name%2FF%2FID=7pmopchepf1fz;STATUS=A?QRY=%2B(professor))) : Fien is a Professor of Sustainability in the Innovation Leadership programme of RMIT University, where he is responsible for supporting research on social, environmental and economic sustainability across the Business and Design and Social Context Portfolios. An interdisciplinary background in education and training, natural resource management, public participation and sustainable consumption equip him to work across this broad sustainability agenda and to develop partnerships of university research teams, business and industry, government, NGOs, schools and communities.

Lynn Frewer (from <http://www.ncl.ac.uk/afrd/staff/profile/lynnfrewer.html#background>): Lynn Frewer is a professor of Food & Society at Newcastle University. Frewer has academic interests in all areas of food and society, including those areas which require transdisciplinary collaboration between the social and natural sciences. Lynn is also interested in translating the results of research into actional policy recommendations. Currently, her research focuses on understanding and measuring societal and individual responses to risks and benefits associated with food, health, sustainability, and safety and developing strategies to promote better risk communication on the whole.

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J.G. Hollands: J. G. Hollands is a professor in the Mechanical & Industrial Engineering Department at the University of Toronto. His research focuses on engineering psychology, and, more specifically, the use of visuals to portray statistics.

Branden Johnson (from <http://www.decisionresearch.org/researcher/branden-johnson/>) : Johnson specializes in risk perception and risk communication. Dr. Johnson has served as Chair of the Risk Communication Specialty Group, and is a Fellow, of the Society for Risk Analysis (among other positions there) and as President of the Risk Assessment and Policy Association, and on National Research Council committees on drinking water contaminants and human biomonitoring. He is on the editorial board of Risk Analysis, and has been a reviewer for multiple journals (from political science, psychology and geography to risk and the environment) and national and international agencies (both basic and applied research).

Daniel Kahan (from <https://www.law.yale.edu/dan-m-kahan>): Dan Kahan is the Elizabeth K. Dollard Professor of Law and Professor of Psychology at Yale Law School. In addition to risk perception, his areas of research include criminal law and evidence.

Roger Kasperson (from <http://www2.clarku.edu/faculty/facultybio.cfm?id=68>): Kasperson is a research professor and distinguished scientist at the Graduate School of Geography at Clark University. His current research focuses on bridging science and practice pertaining to issues relating to global vulnerability and environmental change, integrating sustainability into policy in the EU, and improved approaches for the assessment and management of high uncertainty risks.

Jon Krosnick at Stanford (from <http://climatepublicopinion.stanford.edu/sample-page/about/>): Jon Krosnick is a social psychologist who does research on attitude formation, attitude change and political behavior. He is a leading expert on public opinion regarding climate change and what type of messages influence the public. Much of his work is done under contract and does not get published. Some of what he has learned runs counter to conventional wisdom-but is “deep-sixed” because the organization that paid for the work finds his result inconvenient.

Jeffrey Lazo: Lazo works at the National Center for Atmospheric Research in the Research Applications Laboratory and developed the Weather Systems and Assessment Program. He works with a group of researchers who together study communication, understanding, value, and use of weather information as well as its economic impacts. He works extensively with NOAA.

Rebecca Morss (from <https://staff.ucar.edu/users/morss>): Rebecca E. Morss is a Senior Scientist in the Mesoscale and Microscale Meteorology Laboratory at the National Center for Atmospheric Research in Boulder, Colorado. She studies meteorological, socioeconomic, and public policy aspects of weather, including floods, hurricanes, and other hazards. Her recent research includes work on the communication and interpretation of hazardous weather risk; use of weather and climate information in decision making; design of meteorological and oceanographic observing networks; and extreme weather in the climate context.

Anthony Patt (from <http://www.hes.ethz.ch/people/person-detail.html?persid=197701>): Professor Patt’s research addresses questions related to climate change policy. His focus is on adaption to climate change and the resultant costs for society, as well as on analyzing the

benefits of different energy systems. His group collects and analyses data on people's beliefs, attitudes and decisions, and examines on the basis of models how human, technical and natural elements interact. He is a professor in the Environmental Science department. His most recent research indicates that uncertainty about climate futures is nowhere near as problematic as uncertainty about climate solutions when it comes to public thinking and public response.

Samuel Ratick: Ratick was the Legislative Assistant for Energy and Environment to Senator Daniel Patrick Moynihan and worked as an environmental scientist for the U.S. EPA. He researches analytical methods and mathematical models and their relationship to environmental management and assessment, and he currently studies climate change vulnerability.

Ortwin Renn (from <http://www.iass-potsdam.de/en/people/prof-dr-ortwin-renn>): Professor Renn is a Scientific Director at the Institute for Advanced Sustainability Studies (IASS) in Potsdam (Germany). He researches risk governance, sustainable development, public participation, technology assessment and foresight, and public responses to technological change.

Matthew Seeger (from <https://comm.wayne.edu/profile/aa4331>): Seeger is a dean of the College of Fine, Performing and Communication Arts and a professor of communication at Wayne State University. Seeger's research interests concern crisis and risk communication, crisis response and agency coordination, health communication, the role of media in crisis, crisis and communication ethics, failure of complex systems and post-crisis renewal.

Paul Slovic (from <http://www.decisionresearch.org/researcher/paul-slovic-ph-d/>): Paul Slovic, a founder and President of Decision Research and Professor of Psychology at the University of Oregon, studies human judgment, decision making, and risk analysis. He and his colleagues worldwide have developed methods to describe risk perceptions and measure their impacts on individuals, industry, and society.

John D. Sterman (from <http://mitsloan.mit.edu/faculty-and-research/faculty-directory/detail/?id=12066>): John D. Sterman is the *Jay W. Forrester Professor of Management* at the MIT Sloan School of Management and a Professor in the MIT Institute for Data, Systems, and Society. He is also the Director of the MIT System Dynamics Group and the MIT Sloan Sustainability Initiative. Sterman's research centers on improving decision-making in complex systems, including corporate strategy and operations, energy policy, public health, environmental sustainability, and climate change.

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