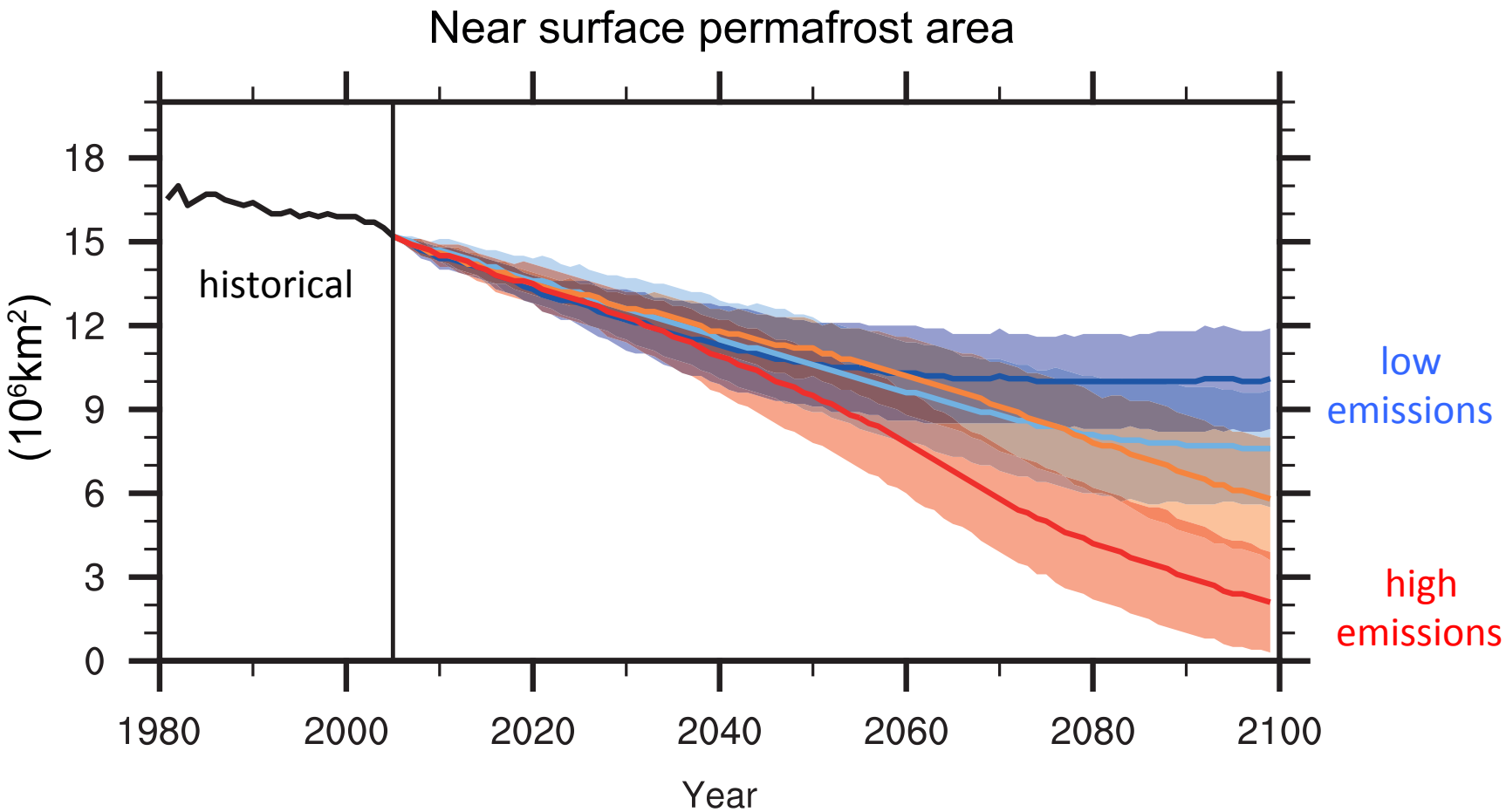
Managing Climate Risks in the Arctic: Navigating Trade-Offs Between Diverse Values Under Deep Uncertainty

Klaus Keller (klaus@psu.edu)
Department of Geosciences, Penn State
Department of Engineering and Public Policy, CMU

Arctic Workshop, October (2015)

Picture by Elliot Brown

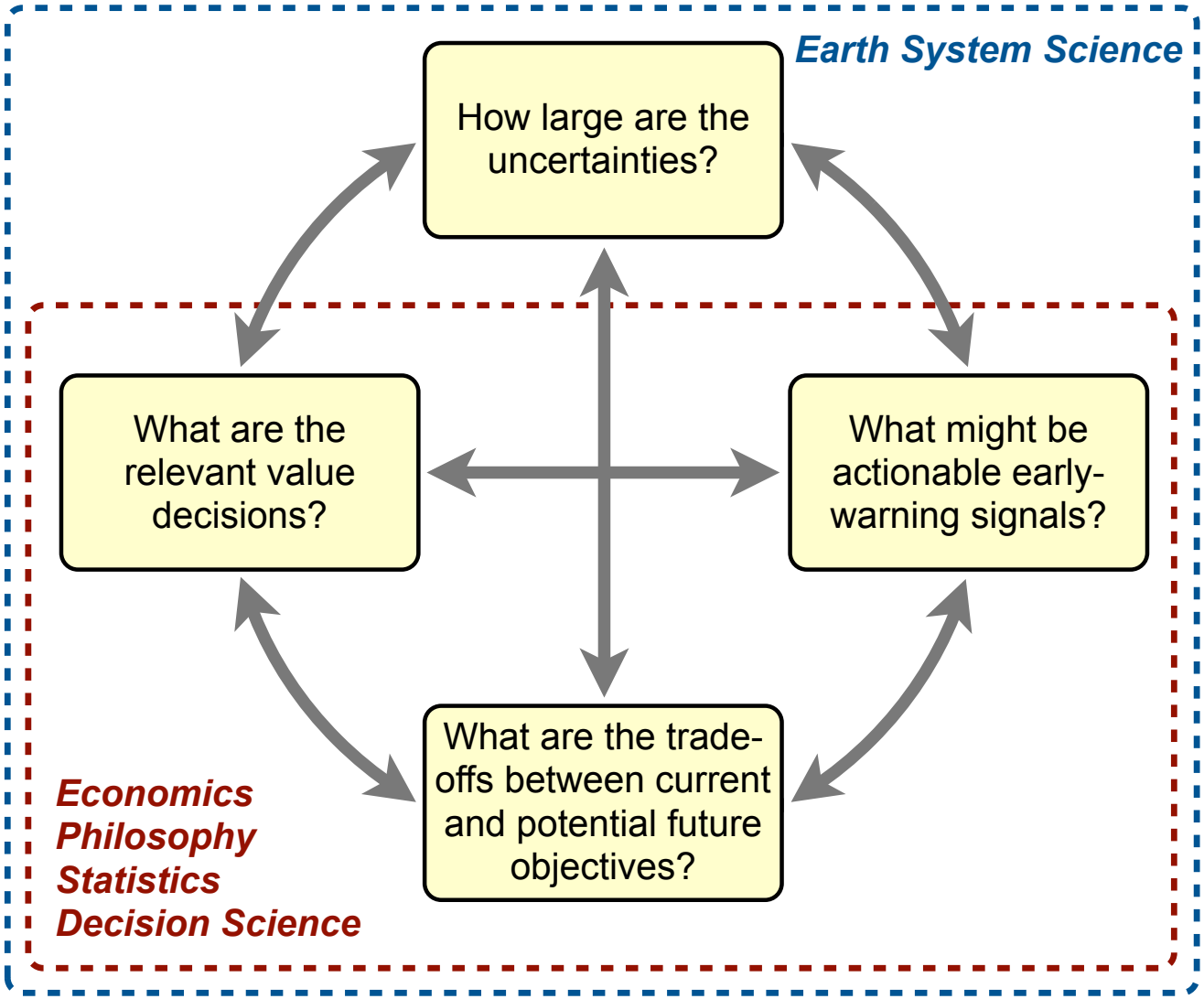
The committed warming alone is projected to drive nontrivial impacts.

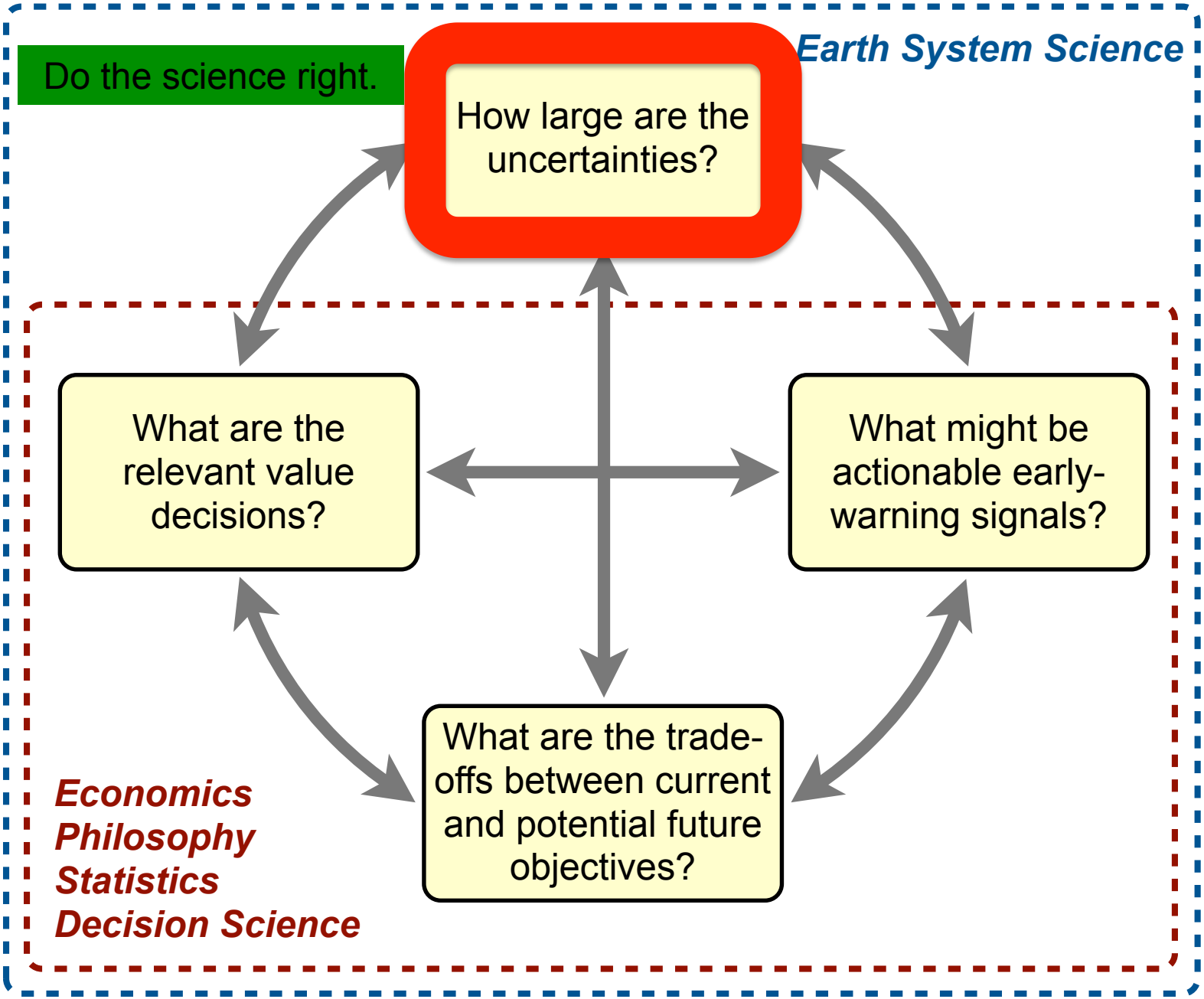


Annotated and extracted from Alexander et al (2013) (SPM IPCC Figure TS.18).

So what?

Climate risk management poses transdisciplinary research questions.




Do the science right.
Earth System Science
How large are the uncertainties?
What are the relevant value decisions?
What might be actionable early-warning signals?
What are the trade-offs between current and potential future objectives?
Economics
Philosophy
Statistics
Decision Science

“Strategies for dealing with climate change must incorporate and quantify **all the relevant uncertainties** [...]”.

Do decision makers see all “relevant uncertainties”?

Quote from Drouet et al (2015) (emphasis mine)

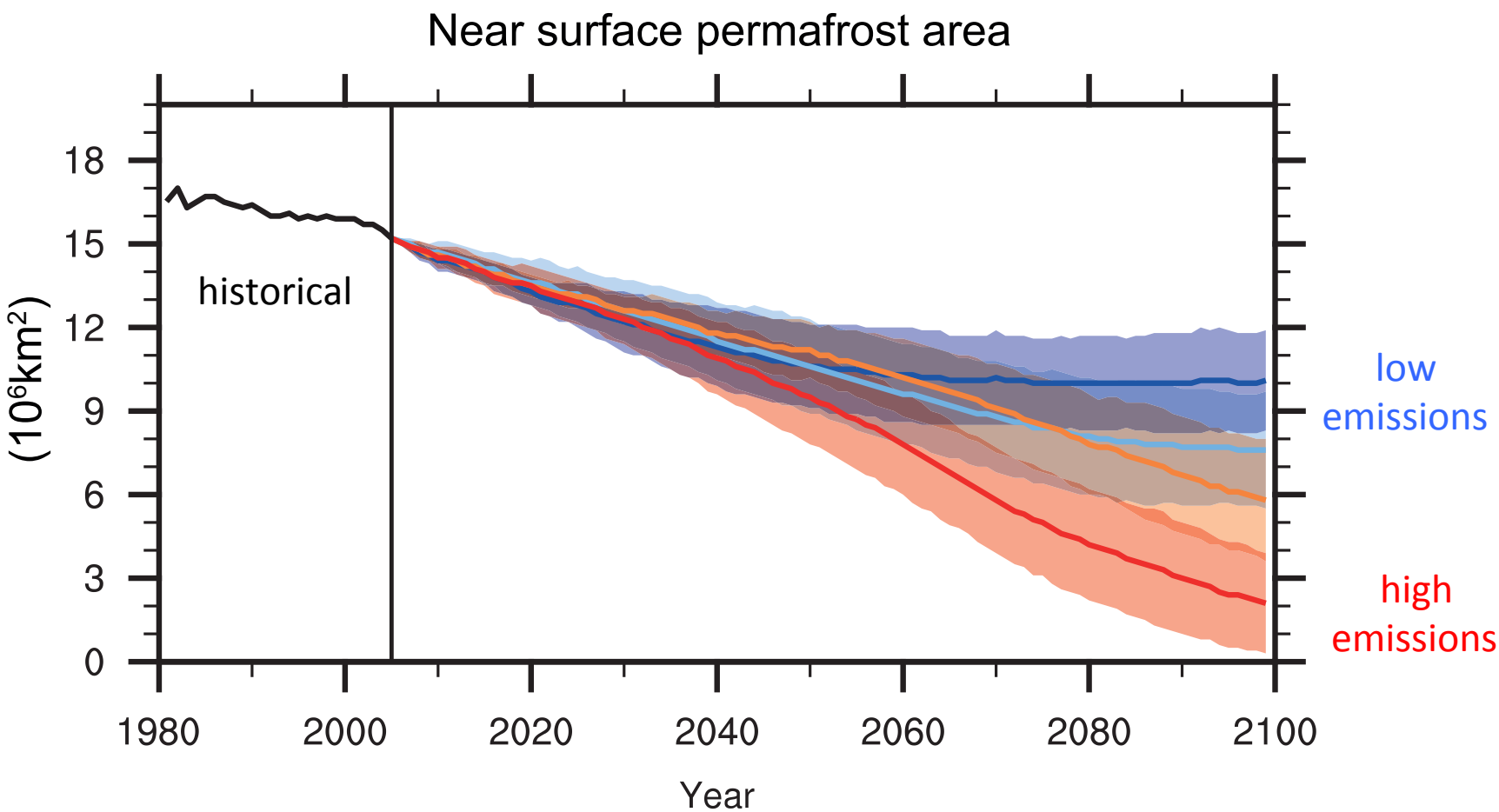
Users of Earth System Projections

Often interpret scenarios as **equally likely and spanning the range of relevant uncertainties.**

Often produce storylines **without probabilities and cutting of decision-relevant tails**.

Producers of Earth System Projections

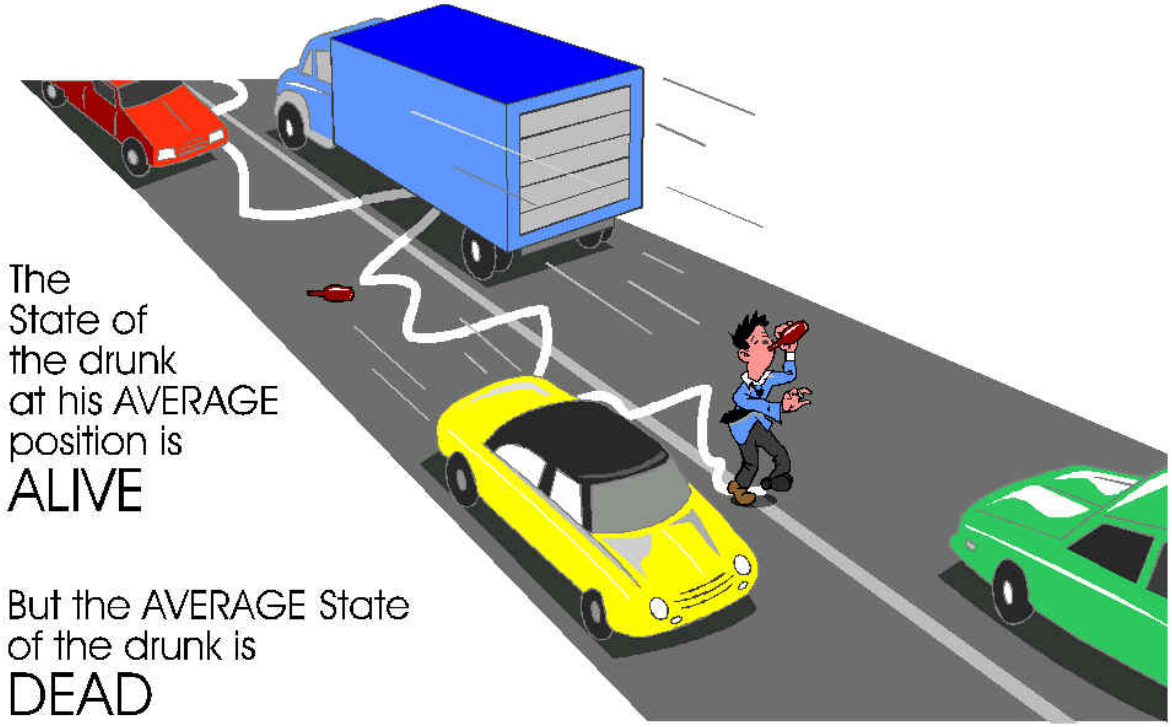
The communicated uncertainties often represent the **range of different best estimates**.



Annotated and excerpt from figure in Alexander et al (2013), SPM IPCC Figure TS.18.

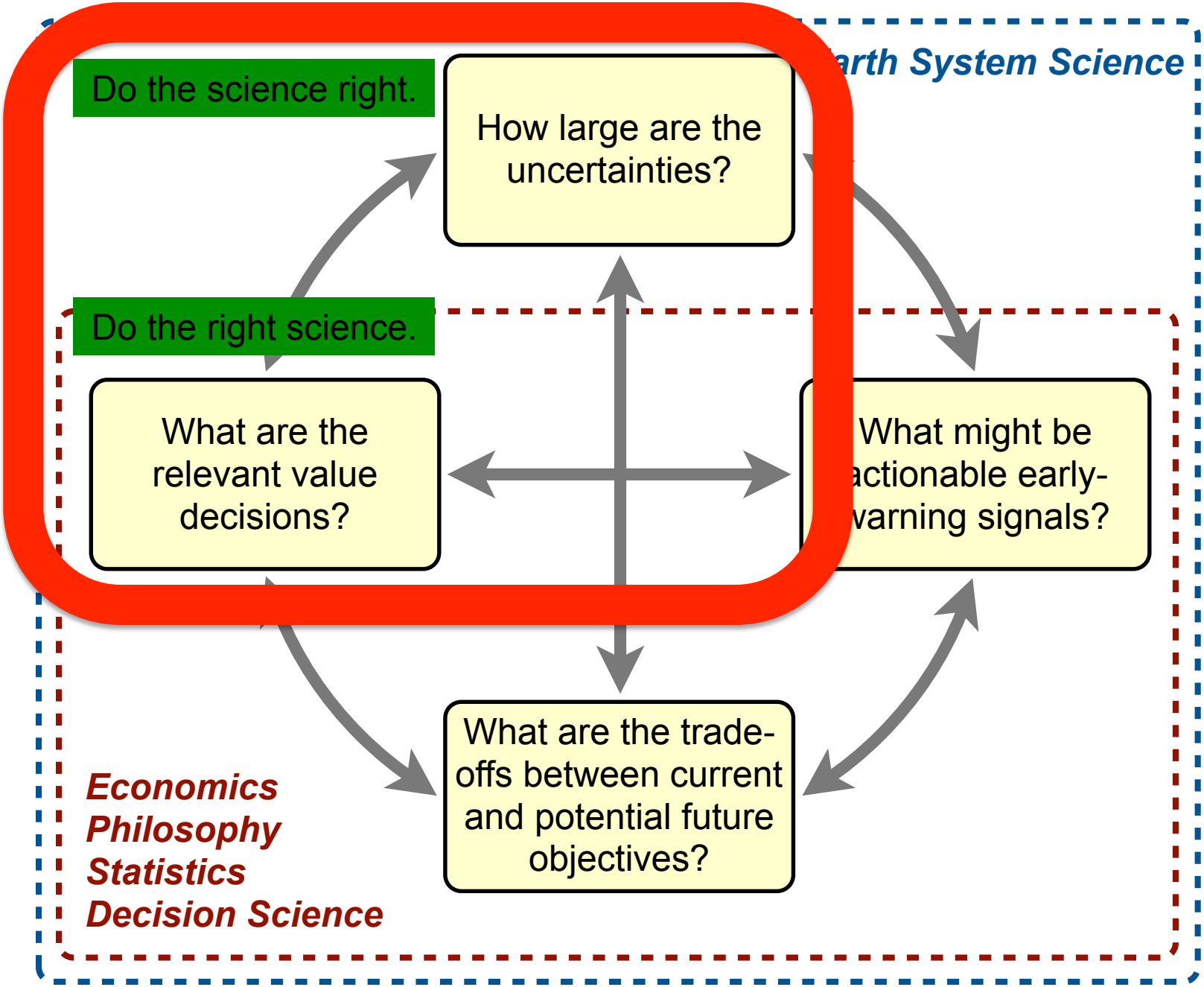
"shading indicates the inter-model spread (one standard deviation)."

Climate projections often provide the average of best estimates. What could go wrong?



How does this apply to climate change?

http://web.stanford.edu/~savage/flaw/


arth System Science
Do the science right.
How large are the uncertainties?
Do the right science.
What are the relevant value decisions?
What might be actionable early-warning signals?
What are the trade-offs between current and potential future objectives?
Economics
Philosophy
Statistics
Decision Science

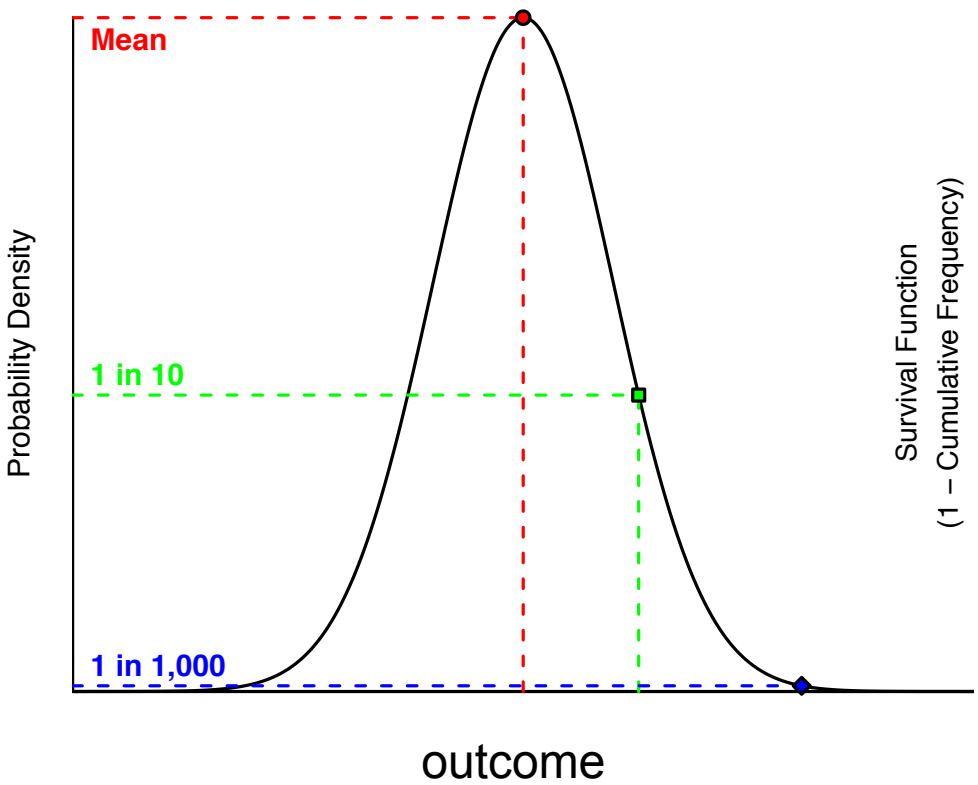
Decision makers *often* care about the upper tail.

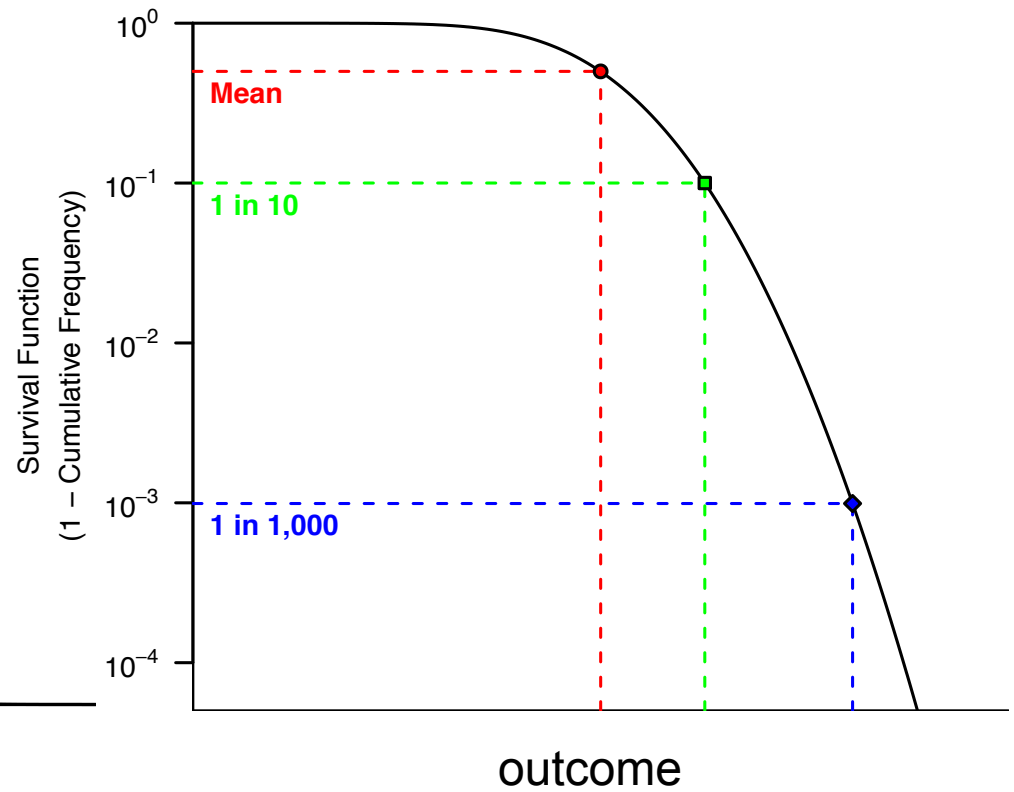
Region/Country	Standard of Protection (per y)
The Netherlands	1/4000–1/10,000
New Orleans (USA)	1/100
Vietnam	1/50[b]

Excerpt from Table 1 from Jonkman (2013)

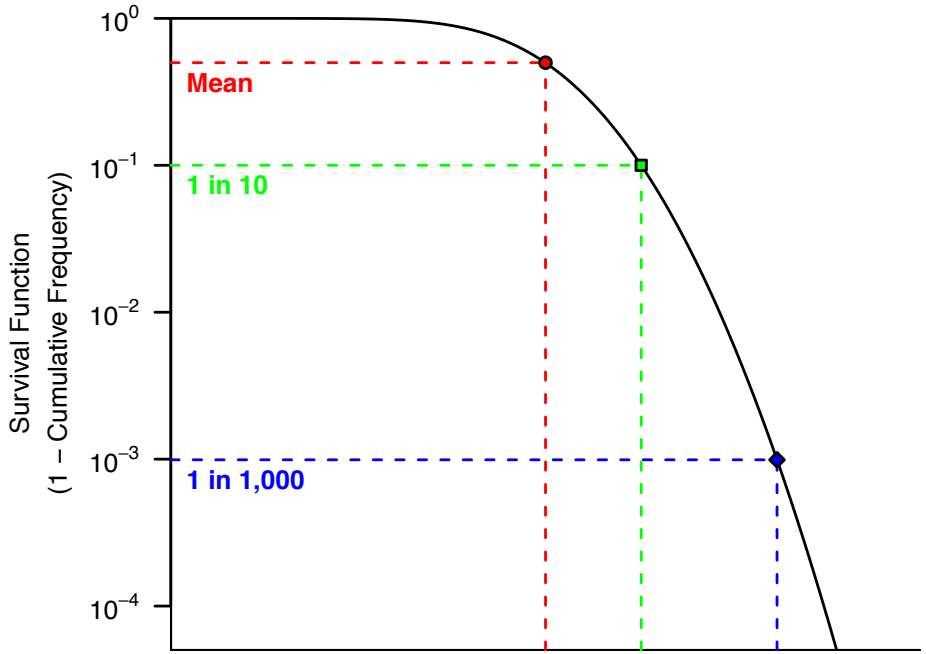
How far our are these tails?

High reliabilities require information about the upper tail of the probability density function.



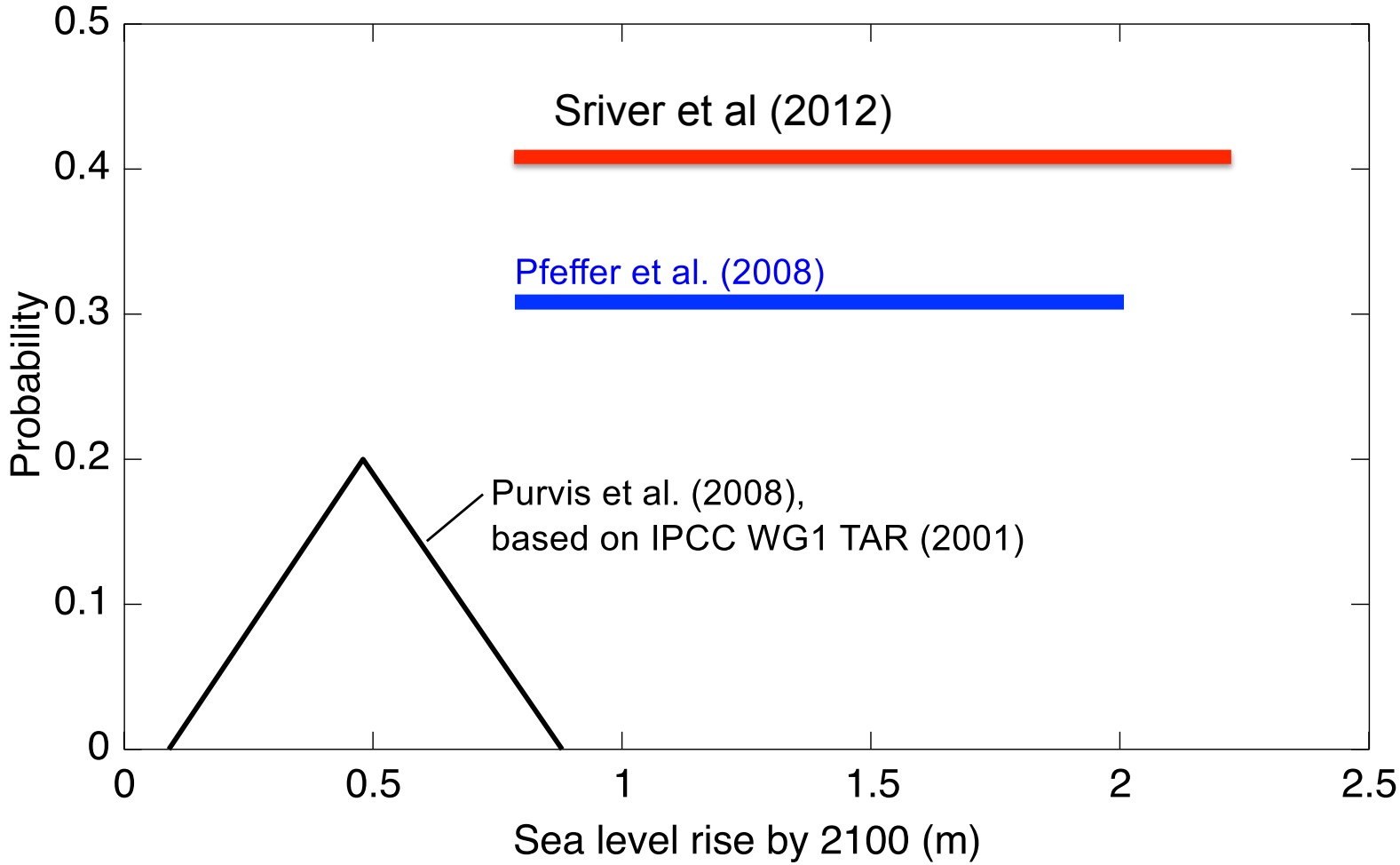


Are these decision-relevant tails provided or cut off?



http://doctorbarkman.blogspot.com/2012/12/dog-tail-shapes-and-sizes.html

Misinterpreting climate projections can be hazardous.

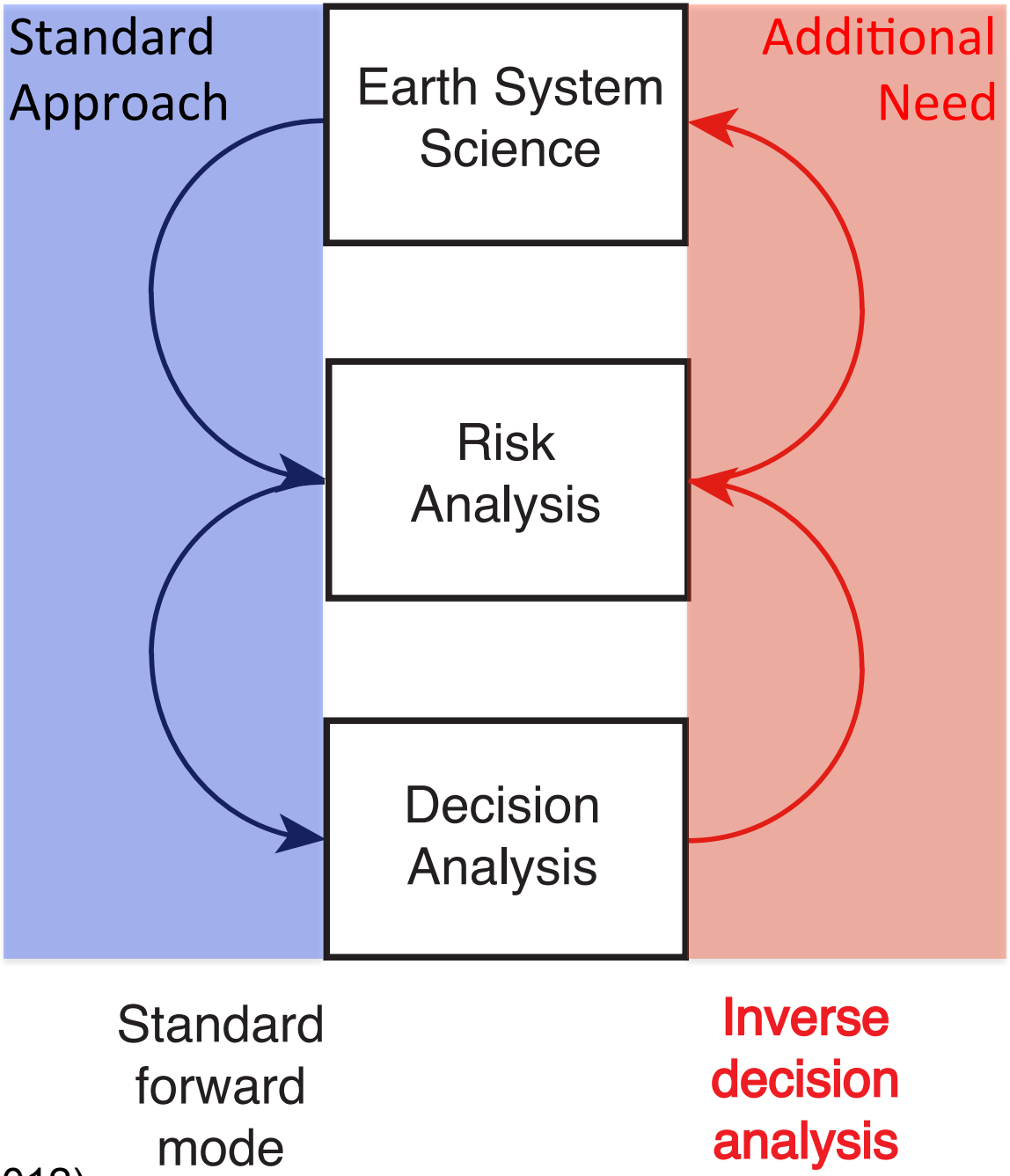


Modified from Keller and Nicholas (2013)

How can we bridge this gap?

Picture by Elliot Brown

Managing the climate risks requires transdisciplinary interactions in an environment of share discovery.



e.g. Lempert, Sriver, and Keller (2012)

Thank You

- Penn State Center for Climate Risk Management (clima.psu.edu)
- Research Network for Sustainable Climate Risk Management (scrimhub.org)
- Questions: Klaus Keller (klaus@psu.edu)

This work was partially supported by the National Science Foundation through the Network for Sustainable Climate Risk Management (SCRiM) under NSF cooperative agreement GEO-1240507. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.