CHARACTERIZING RISK-BASED TRADE-OFFS TO SUPPORT CLIMATE CHANGE DECISIONS

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DECISION RESEARCH

Climate change policy decisions are difficult, for many reasons

- Multiple stakeholders (many publics & technical experts)
- Multiple dimensions of value, including ethical/moral
- Entangled values and facts: more than “just” science
- Multiple alternatives (mitigation & adaptation)
- Uncertain consequences (many cannot be resolved)
- Geographically diverse inputs and consequences
- Short-, medium-, & long-term outcomes
- Many levels of decision makers (local, state, national)
- Sequential, interdependent choices
- Limited opportunity for feedback (what can I do?)

Each of these reasons makes for problematic trade-offs

- Different stakeholders view the problems differently
- Numerous alternatives complicate and confuse
- Uncertain consequences are hard to think about and lead to lack of trust (if they don't know, why should I act?)
- Ethical and moral issues can block open dialogue
- Sequential choices multiply trade-offs: where to focus?
- Inter-temporal choices lead to passivity (wait and hope?)
- Multiple levels of decision making leads to apathy: how to engage and motivate citizens?

So question is: How can policy makers characterize climate change so as to encourage citizens' informed decisions?

Not a new story: It's often hard to distinguish facts (What is) from values and perceptions (What matters)

Anticipate multiple perspectives – Different people will have different opinions about what is going on (facts) and what matters to them (values).

My focus today: A decision-science perspective on why trade-offs are problematic for climate change choices

1. **Articulating objectives**
2. **Identifying consequences**
3. **Integrating S1 and S2 thinking**
4. **Making choices across diverse concerns**
5. **Understanding & presenting uncertainty**
6. **Integrating risks and benefits**
7. **Addressing ethical and moral issues**

1. Difficulty in articulating objectives: Climate change policies involve many unfamiliar actions and technologies

Even when confronted with familiar choices, people find it hard to articulate what matters to them (objectives)

(Bond, Carlson & Keeney, 2008)

It is much harder to articulate objectives when faced with unfamiliar choices (e.g., local, state, or national adaptation and mitigation polices for CC)

Concept of **Constructed Preferences**: when preferences are not fully formed, both values and choices will not simply be *revealed* but will be be *constructed* in relation to peoples' mental models, their understanding of what is being asked of them, and the various cues provided to them.

(Lichtenstein & Slovic, 2006)

One response: Define values more precisely using performance measures / attributes

- Why? Because vague objectives are poor basis for making decisions & create misunderstanding …

- Example: “employment benefits”
  - Sources of ambiguity: What types of jobs? For whom? Over what time periods? What wage levels (living wage)? Effects on families? Effects on worker health?
- Example: “national security”
  - Sources of ambiguity: Economic security? Military security? US public? US corporations? Foreign allies?
- Example: costs
  - Sources of ambiguity: Who pays? Discount rate over time? Uncertainty in cost estimates? Distributional / equity considerations?

Common error: Using performance measures that don't fit the problem

- Many concerns don't have ready measures
  - Social concerns: community identity, livability, family ties
  - Psychological concerns: worry, anxiety, happiness
  - Environmental concerns: ecosystem health, resilience
  - Cultural concerns: sacred sites, continuity of traditional practices
- One proposal: use economic metrics as "summary." Fit easily into existing BCA model, but
  - Not easy to understand
  - Often create frustrated and marginalized participants
- Better solution: natural metrics and constructed indices for stakeholders' articulated concerns
  - Measures are more transparent, facilitate public involvement

Example: performance measures that do fit the problem (CC mitigation/adaptation for coastal community, Washington state)

- Objectives used to generate and evaluate different management alternatives:
  - Physical health
  - Psychological health
  - Economic health (jobs/structures) and opportunities
  - Community connections / liveability
  - Natural resources security (cultural uses of local resources)
  - Aesthetics
  - Trust in management/officials
  - Self-determination for community members
- These concerns reflect more than conventional science: include local knowledge, community values, “intangibles”

2. Difficulty in defining consequences

We care about different CC alternatives (mit/adaptation) because they result in different consequences

Predicting consequences is always difficult – uncertainty related to both internal and external factors

Especially difficult in context of CC policies:

- Different people have different views of the problem and why it matters
- Many medium and long-term CC policy responses are associated with **Upstream Technologies** – actions that remain in the design or experimentation phase
    - large scale geo-engineering (carbon capture/solar radiation)
    - relocation of communities (e.g, Alaska coast)
    - forced relocation of species
    - incorporation of nanotechnologies

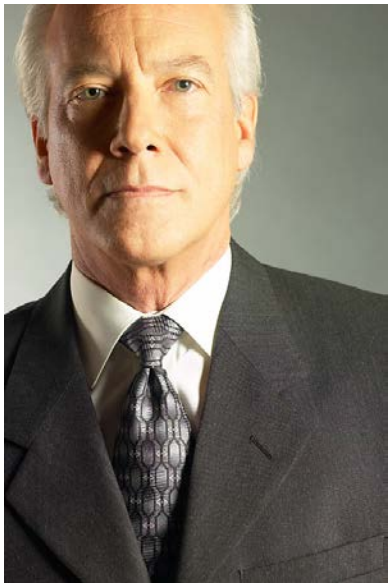
Bottom line: even for “experts” it is difficult to predict consequences

“How am I supposed to think about consequences before they happen?”

Leads to frustration among scientists, community members, resource users, & decision makers

"It's frustrating. We provide good scientific data that decision makers just ignore"

(gov't scientists/consultants)



"It's frustrating. We have so many things to take into account when setting policy – and no one is ever happy" (decision makers)

Response: use structured Decision Making techniques to make choices more transparent & cognitively friendly

SDM

- Objectives hierarchies
- Means-ends diagrams
- Influence diagrams
- Decision trees
- Strategy tables and portfolio builders
- Consequence tables
- Uncertainty presentations / Value of information
- Expert judgment elicitations
- Risk profiles and risk tolerance
- Adaptive management trials
- Values – based surveys

3. Integrate S1 and S2 Thinking

S1, Automatic: quick, little effort: based on simple associations, recent experiences, simplified judgment rules

S2, Deliberative: slower, effortful, based on weighting and balancing, incorporates strategies and justification

(Kahneman, 2011)

Why is this important in the context of CC trade-offs? Because both modes of thinking are involved in generating and evaluating alternatives

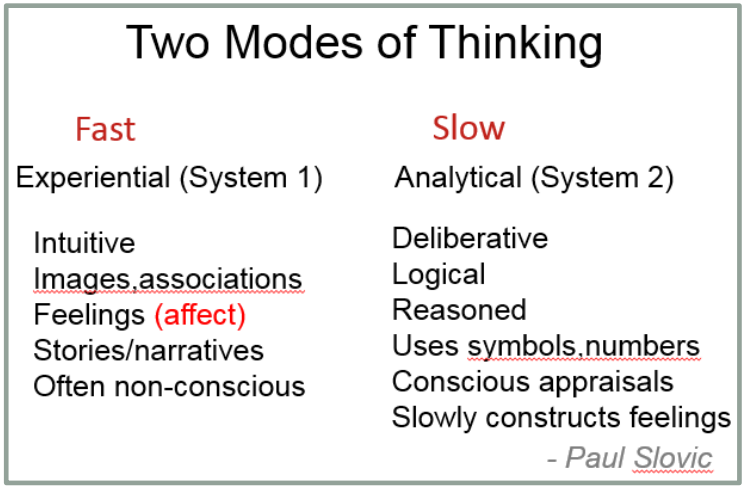
Tension between S1 and S2 responses influences how everyone (expert and public) makes choices

Question: How to engage both S1 and S2 as part of dialogue (expert/public) and when making choices?

Example: Rank Intervention Scenarios to Prevent Genocide – Ranking Exercise with Experts (Gregory, Slovic, Harstone & Frank, 2016)

Two ranking exercises were used to structure dialogue:

- Direct Ranking (Alternatives based, holistic)
- Swing Weighting (Values based, decomposed)
- Neither approach is "correct." Both allow participants to gain insight into their priorities
- Direct ranking most common: "Here are some options, let's pick the best one."
- Direct ranking more associated with System 1
- Swing Weighting more aligned with System 2 Thi



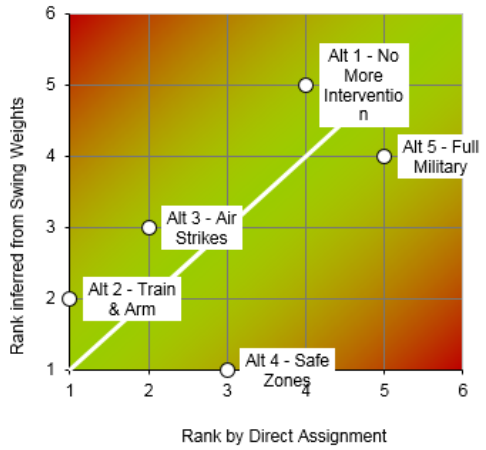
Alternatives-based ranking vs. Values-based ranking

- Chart results on graph: direct ranking vs. swing weighting
- If alternatives are ranked the same, all results will line up along 45 degree line (number 2 on DR = number 2 on SW)
- If alternatives are ranked differently, then many results will be off the 45 degree line
- This comparison leads to dialogue, encouraging participants to:
  - Shift their own value weights – something new has been learned
  - Focus more closely on the problem at hand (facts inform positions)
  - Ask for new information – what is the p that Event x will take place?
  - Re-assess their feelings (risk tolerance) about likelihood of outcomes

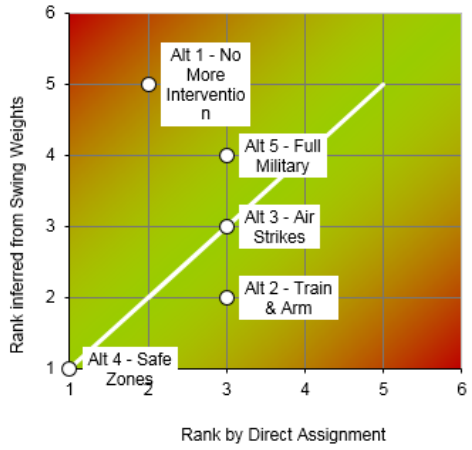
Genocide Intervention Scenarios – Results

Chart 9: Weighting Consistency Check By Person

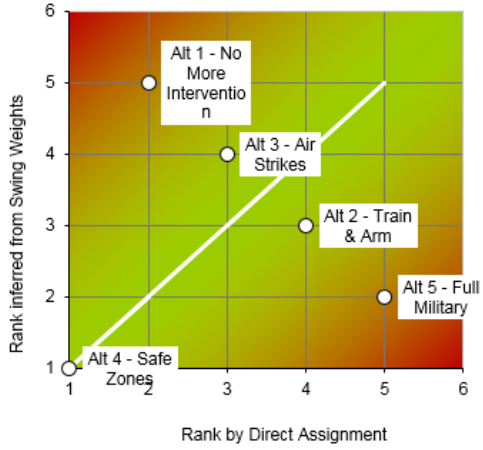
Highlighted Person: Participant 1



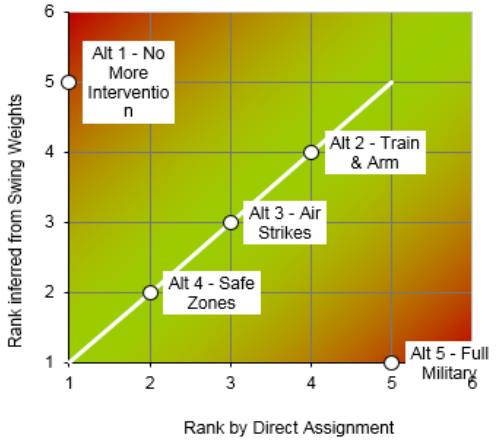
on: Participant 2



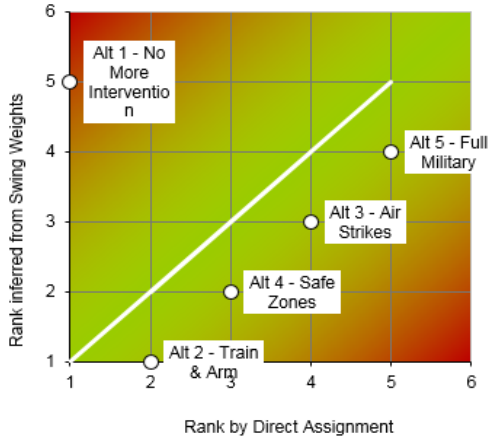
son: Participant 3



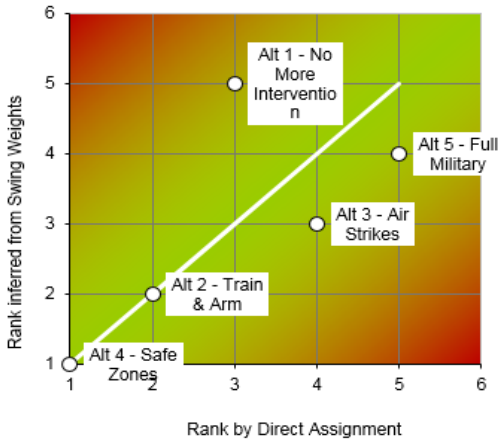
Highlighted Person: Participant 5



son: Participant 9



on: Participant 10



4. Difficulty in making choices across multiple dimensions of value

Climate change policy choices typically result in diverse impacts: economic, environmental, social, cultural, governance, health, etc

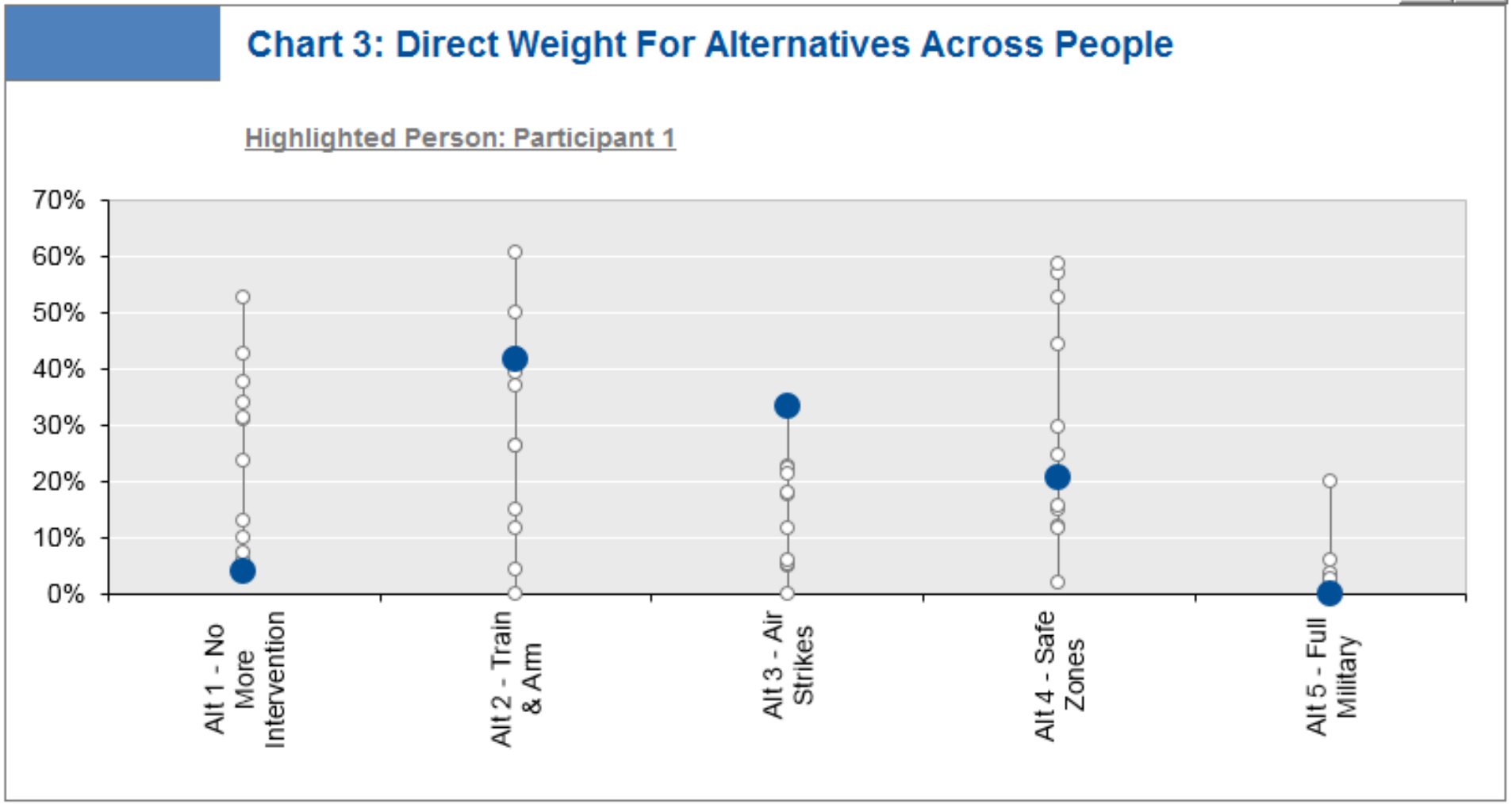
How well do people make multi-attribute choices? Not well.

Prominence effect:

- Slovic, 1975: difficult choices systematically decided in favor ot alternatives superior on the most important attribute
- Tversky,Sattath & Slovic,1988: prominent attributes weighted more heavily in choices than expressed preferences

- *Bottom line: when making choices, people tend to over-value the most prominent dimension(s) because of the need to justify or defend such actions*

One key to improving choices is dialogue: Compare priorities of group members and ask Why?



Second key to improving difficult choices: Simplify choices through analysis

- First, need to get citizens engaged and interested
- Next encourage people to more clearly define multiple objectives of concern (what matters) - *dialogue*
- Then compare alternatives in terms of how well they satisfy these objectives
- More than science/facts: people need to see comparisons among management options in terms of what matters to them -- *analysis*
- Note: This means changes in how policy makers/experts typically address choices: more structure, clearer definition of objectives and performance measures, etc.

Raises the provocative question: how good are Decision Makers at making Decisions?

Combining Objectives and Alternatives: Consequence Table for CC Adaptation, Rural Coastal Community

Objective	Attribute	Measures	Alternatives A, B, C
Minimize Mgt Costs	Cost	Dollars $	
Maintain Environmental Health	Productivity of salmon	Biomass (kgs)	
Maintain Cultural Traditions	Continuity of ceremonies	Constructed scale 1-4	
Improve Human Health	Number of doctor visits	No. of visits	

5. Understanding uncertainty

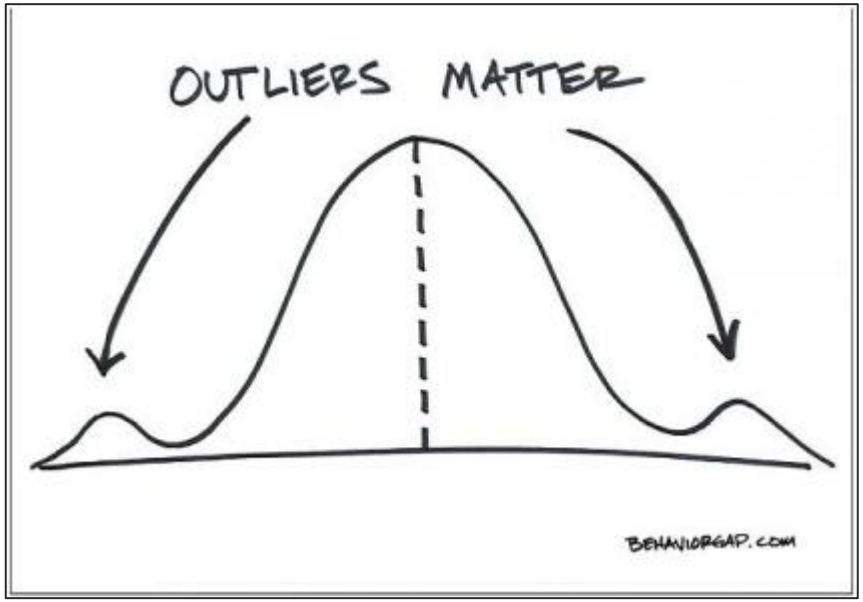
Central to CC policy discussions, both among experts and in multi-stakeholder deliberative contexts

Good scientific analysis is necessary but not sufficient:

- Insufficient attention paid to communication of uncertainty
- Commonly assumed that we know more about future effects than we do (overconfidence, seduction of numbers)
- Emphasis on complex studies and models rather than how well people understand them
- Non-expert, non-science stakeholders can be/feel marginalized
- Leads to a loss of trust and – often – difficulties in implementing plans (analysts and decision makers yield to lawyers???)

Expert Predictions of Uncertainty Display Overconfidence and Often Provide a Poor Guide to Outcomes

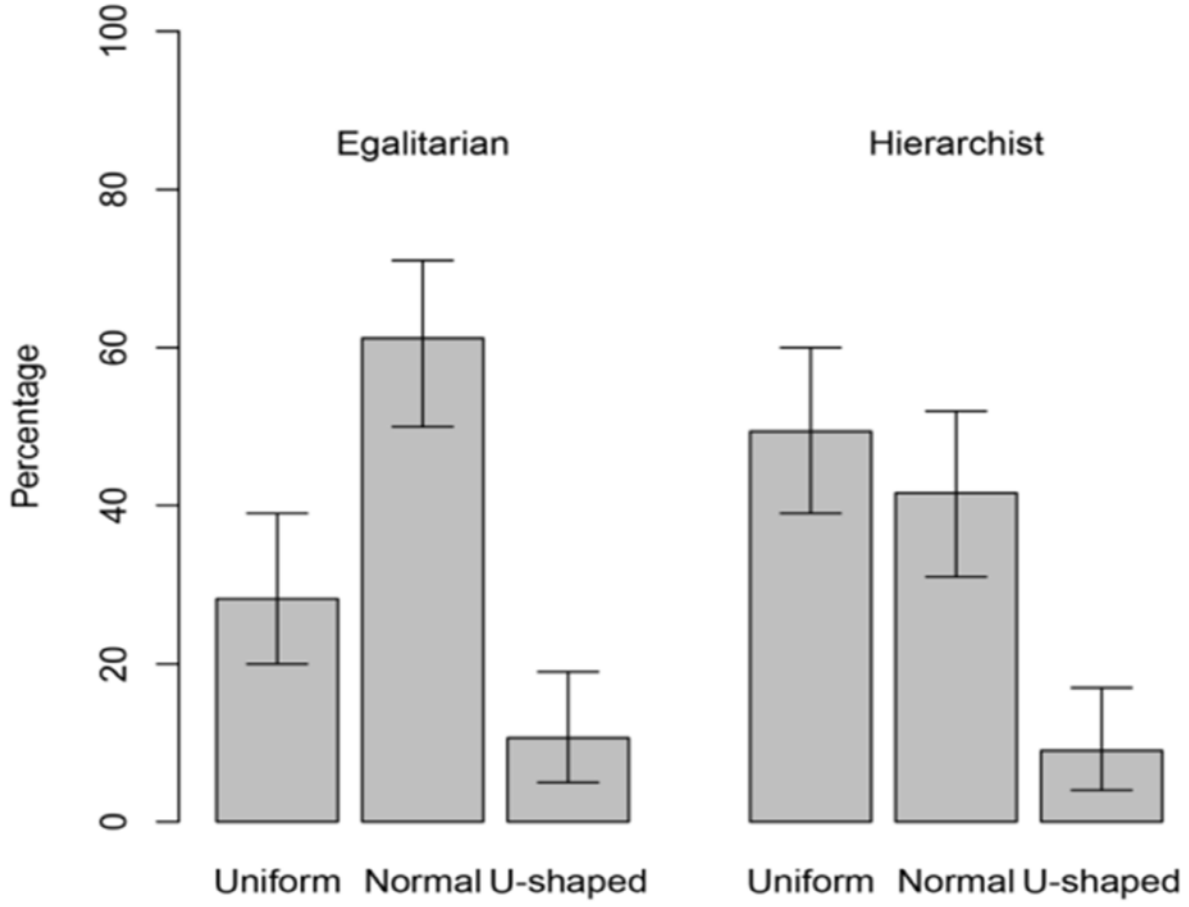
- Uncertainties may look well-characterized when they're not
- Averages from past events may poorly characterize the future – big issue for CC
- The "fat tails" associated with extreme events are important when designing responses – do important thresholds exist?
- Actual values far too often lie outside even the "extreme range" predicted by experts – need for debiasing training



Little guidance exists for choosing among different presentations of Uncertainty (key to understanding)

- Communicating probabilistic distributions
  - Verbal expressions of probabilities
  - Numerical probabilities: frequencies, percentages
  - Two-point ranges (low-high), three point ranges (low-best estimate-high), 5-point summaries (low-25%-median-75%-high) or Box-whisker diagrams (IPCC)
  - Full probability distributions
- Communicating adaptive management options
  - Learn over time while remaining flexible
- *Remember there is no "perfect" representation: people will re-interpret uncertain information in light of their numeric abilities and worldviews*

People re-interpret uncertain information so as to align with their worldviews ("see what they want to see") -- motivated cognitions



Study 1: Distributional perceptions for participants with hierarchist-egalitarian worldviews (Dieckmann, Peters, Gregory, 2016, in prep)

6. Integrating risks and benefits (part of every CC decision involving trade-offs)

Usual presumption:

- people want “the facts” about Benefits, Costs, Risks of actions
- provide them with this information and they can make informed decisions (cost-benefit analysis)

Research suggests: Not so simple …

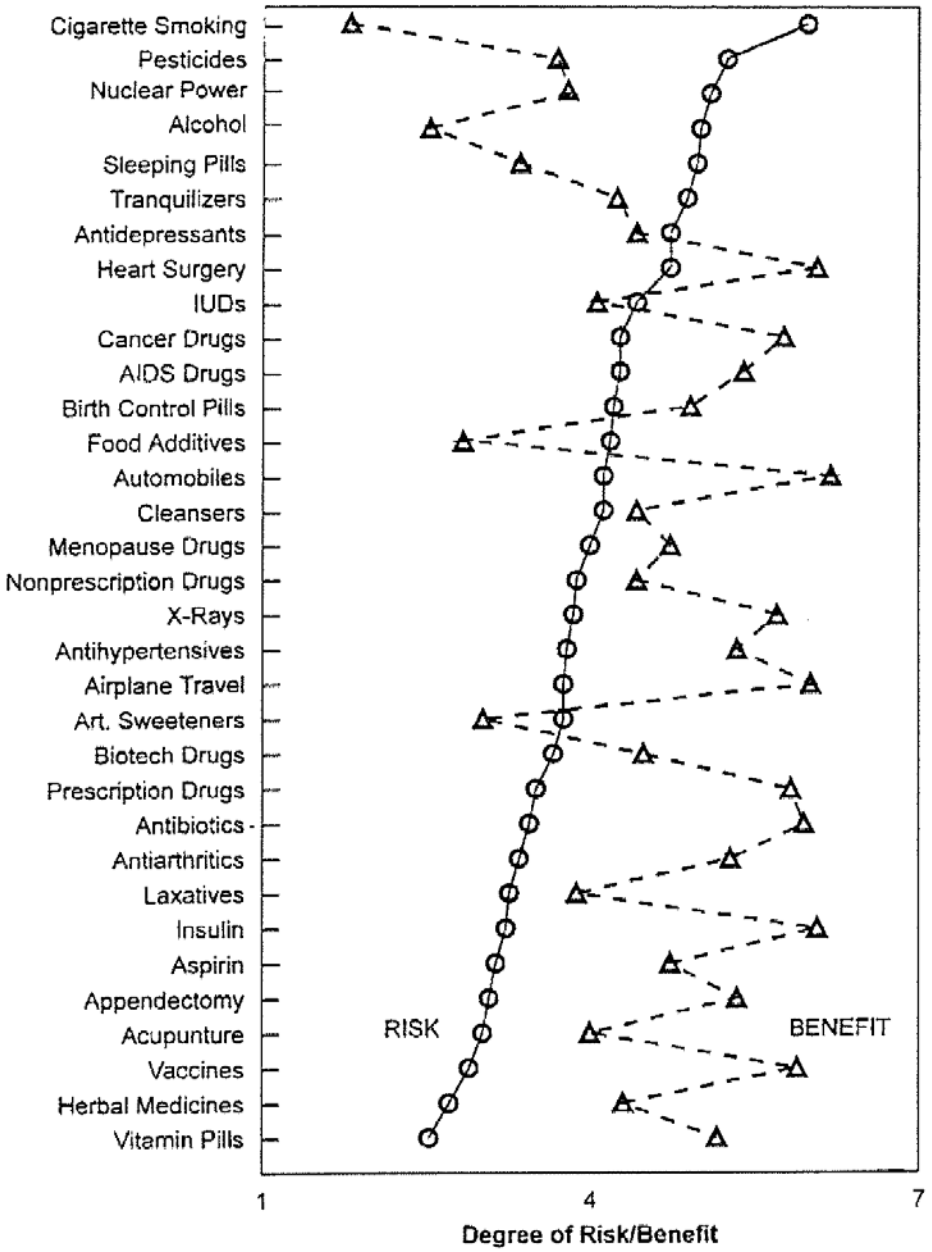
- Prominence, constructed preferences, motivated cognitions
- Also high correlation between estimated levels of benefits and risks.
- So for some: integrating Rs and Bs is difficult, takes efforts
- For others: there is no Integration (and thus no tough trade-offs to make): What’s Bad is Easy! (clear and simple!!!)

Perceived risk and benefit ratings

If people are favorably disposed toward a technology, they rate it as offering large benefits and imposing little risk.

If people fear or dislike a technology, they focus on its disadvantages and not its benefits

(Alhakami, A. S., & Slovic, P, 994)



7. Addressing moral and ethical tradeoffs

- It's hard to get people to dialogue about the Bs, Cs, Risks of commonplace events and actions
- It's even more difficult for people to dialogue about morally or ethically troubling alternatives (think: abortion or gun control).
- For CC, these include:
  - Carbon sequestration in oceans
  - Geo-engineering (e.g., enhanced solar radiation)
  - Abandonment of specified urban areas, or
  - Species relocation

  These policy responses to climate change may be seen to require excessive manipulation of nature, unworkable new national / international governance structures, etc.

Addressing moral tradeoffs: What to do?

- Conventional approaches to eliciting public opinions / dialogue do not work well
  - Large-sample opinion polls (superficial)
  - Large-sample surveys (S1 dominates S2; high refusal rates)
  - Town-hall meetings (Off-topic, Hard to integrate information)
  - Key informant interviews & small-group meetings (small N)
  - Adversarial forums (biased information via courts)

- New approaches show promise
  - Multi-method: Interviews + small-groups + large surveys (research by N. Pidgeon and colleages in the UK)
  - Deliberative polling
  - Decision pathway surveys

Example: A pathways approach for engagement on climate change / geo-eng (Gregory, Satterfield & Hasell, PNAS,2016)

- Logic: explore links between science & values via defensible & common sense order of questions:
  - Explicit decision context (nested social and policy context)
  - Specific policy objectives
  - Preferred policy options (alternatives)
  - Comparison of consequences (Benefits, Costs, Risks)
  - Reflection on key trade-offs; revise opinions?
  - Reconcile and summarize responses to policymakers
- Introduce tutorials to help fill information gaps and overcome mis-information
  - Climate change science background, with figure
  - Climate engineering backgrounder (Sun-reflection & CO2 removal)

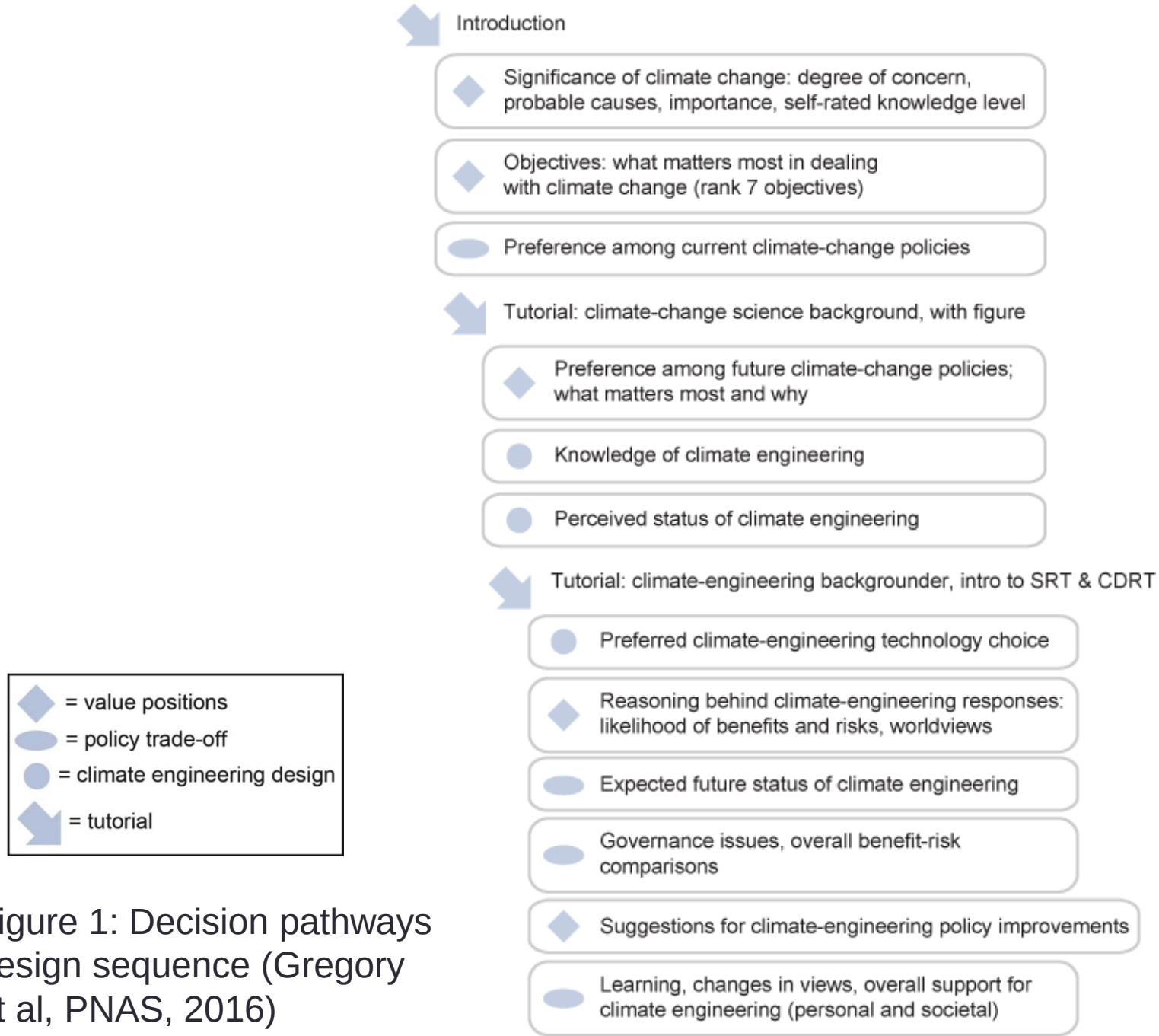
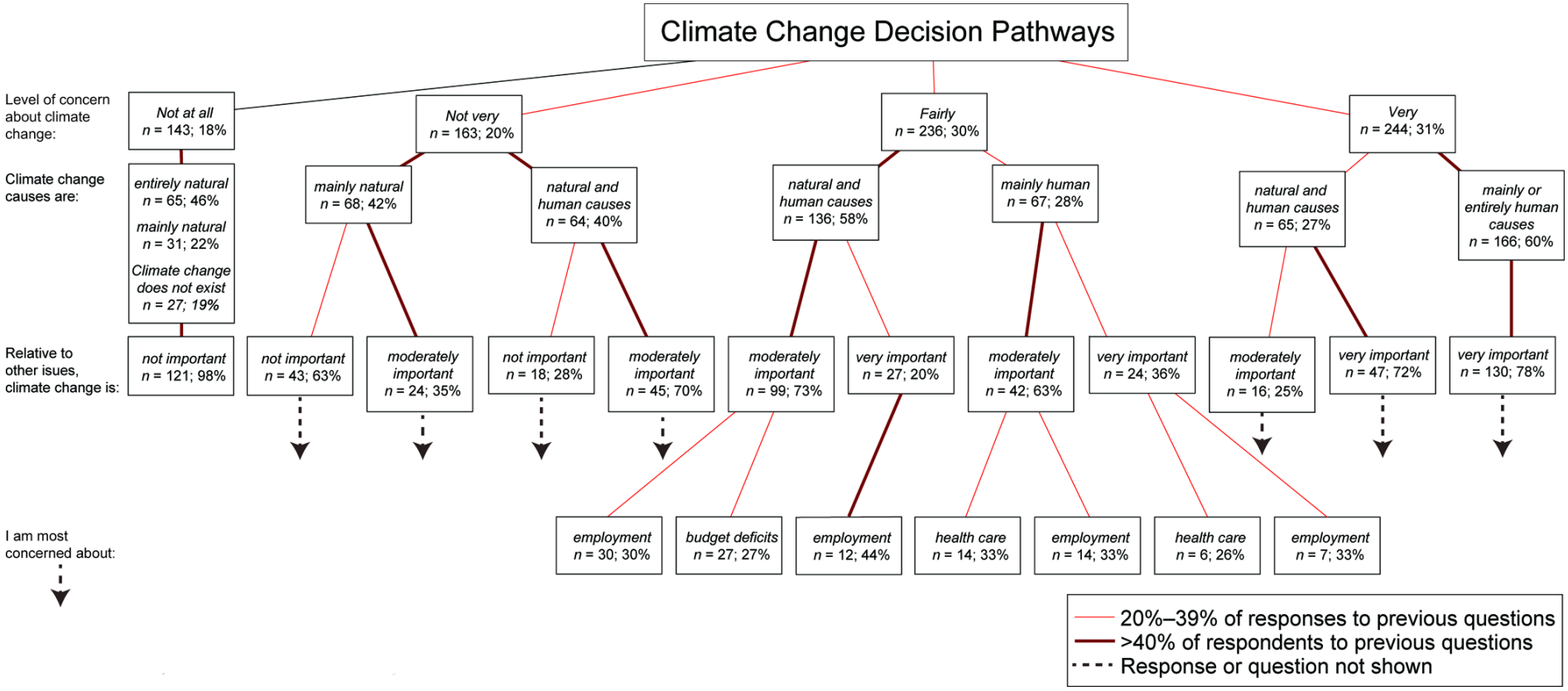


Figure 1: Decision pathways design sequence (Gregory et al, PNAS, 2016)

Overall pathway results



Main Climate Change decision pathways (PNAS, 2016)

Pathway survey results: climate change policies

- Four main pathways – not at all concerned, not very concerned, fairly concerned, very concerned. Significantly higher self-ratings of knowledge levels among those not concerned about CC
- Recognition of broader social context leads to clear distinctions among the specified objectives (avoid high costs, promote equity, encourage innovation, protect future generations, …)
- Majority of those “most concerned” favored implementing CE policies, immediately or after further research
- Those “not concerned” want to slow down and wait, or want further testing because “governments not ready to oversee/regulate programs”
- Tradeoffs under Uncertainty: widespread skepticism about benefits vs. risks of CE technologies: all 7 categories of risk associated with CE techs rated as more likely than any of the 7 categories of benefits

Our results:

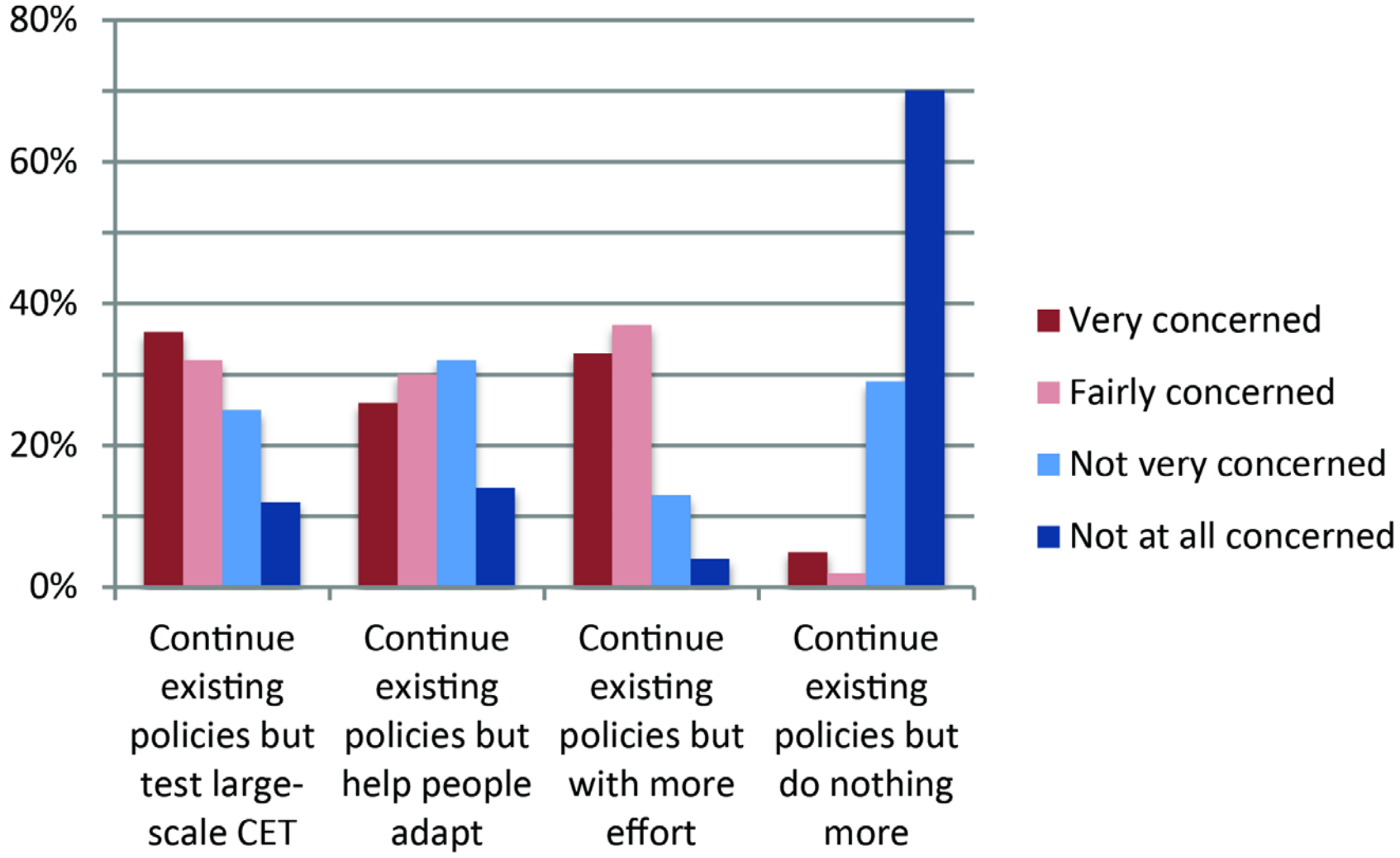


Figure 2: Preference among future climate policies

Discussion and Conclusion: Characterizing Risk-Based Trade-offs in Climate Change Policies

Lots of great ideas for dealing with climate change, but implementation and moving forward often blocked due to

- Confusion about choices among multiple dimensions of value
- Worries about uncertainty in consequences
- Widespread mistrust of science and governance
- Frustration: many concerns that matter to stakeholders are ignored (social, cultural, & psychological concerns)
- Process gaps: failure to pay attention to behavioral realities (S1 & S2 thinking, constructed preferences, “real” dialogue)

Key CC Policy Questions:

How to help people become better informed about <u>both</u> the facts and about their own values?

How can we learn to listen to what people are telling us and establish an improved contract for deliberation: you talk, we listen.

Characterizing Risk-Based Trade-offs: A Decision Sciences Perspective

Thank you!

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