Communicating Global Warming More Effectively

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Introduction

- Some Americans are skeptical of climate science and this may be due to the way in which climate outcomes are communicated often excluding uncertainty information for fear that users might mistake it for lack of consensus (Shackley, Risbey, Stone, & Wynne, 1999). However, evidence suggests uncertainty estimate increase trust in related domain of weather forecasting (Joslyn & LeClerc, 2012).
- Few Americans are sufficiently concerned about climate outcomes. This may be due in part to a misunderstanding that as soon as we begin reducing carbon emissions, atmospheric concentrations of CO2 and global average temperature will decline at the same rate (Ranney Clark 2016). This may in turn, lead people to think that a quick fix is possible.
- Targeted communication strategies may address these issues. However they may backfire among some groups (e.g. Republicans) because of the strong influence of prior beliefs (Hart, Nisbet and Myers, 2015) .

Research Questions

1. Are people more trusting of climate projections that include uncertainty estimates?
2. Do people mistake uncertainty estimates for lack of agreement among climate scientists?
3. Are people more **concerned** when informed about the basic mechanism behind global warming, including the delay in time between emission reduction and temperature fall?
4. Do these effects differ by political party?

Method

Task: M-Turkers (n = 1,320) either read a short paragraph on the mechanism behind global warming or not. Half of the participants who read the paragraph were informed of the delay between emission reduction and temperature fall. All participants were subsequently informed of the projected change in temperature and precipitation by the end of this century compared to the end of the last century (e.g. …"the average yearly temperature will increase by 7°F."). For half of the participants projections were accompanied by a 90% predictive interval (e.g. "…the average yearly temperature will increase by 7°F…with a **90% chance** that the increase will be between **4°F and 11°F.")**. Finally, all participants informed their political orientation.

Independent Variables (between subjects)

- Paragraph Manipulation: No info; Basic GW Info; Basic GW Info + Delay
- Projection: Single-value (Deterministic); Single-value + 90% Predictive interval (Probabilistic)
- Political orientation: Democrats; Independents; Republicans

Dependent Variables:

- Agreement: "How much agreement is there among scientists about climate change"
  - Likert scale (1-6; No agreement – Complete agreement)
- Trust: "How much do you trust scientists' that, by the end of this century, …."
  - Likert scale (1-5; Not at all – Completely)
- Urgency: "The only way to avoid possible future serious changes in the climate is to take action to stop them now":
  - Likert scale (1-5; Strongly Disagree - Strongly Agree)

Paragraph Manipulation

GW Information paragraph was adapted from Ranney and Clark (2016):

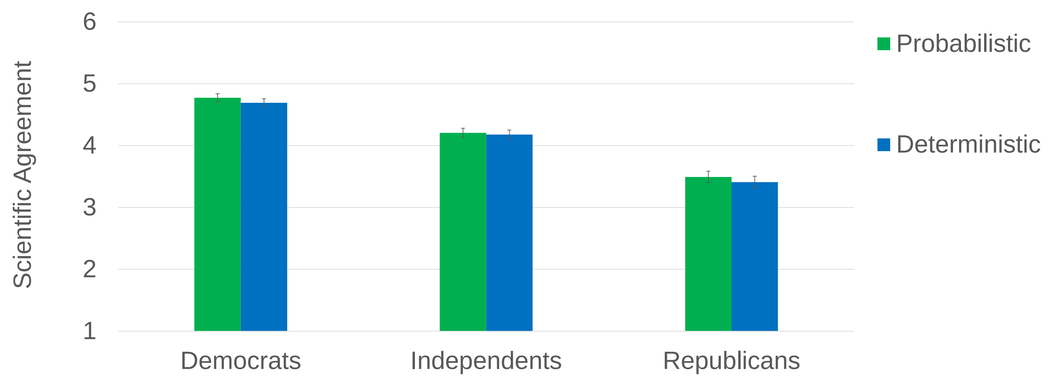
- Scientists tell us that human activities are changing Earth's atmosphere and increasing Earth's average temperature. What causes these climate changes? First, let's understand Earth's "normal" temperature: When Earth absorbs sunlight, which is mostly visible light, it heats up. Like the Sun, Earth emits energy—but because it is cooler than the Sun, Earth emits lower energy infrared wavelengths. Greenhouse gases in the atmosphere (methane, carbon dioxide, etc.) let visible light pass through but absorb infrared light—causing the atmosphere to heat up. The warmer atmosphere emits more infrared light, which tends to be re-absorbed—perhaps many times—before the energy eventually returns to space. The extra time this energy hangs around has helped keep Earth warm enough to support life as we know it. However, since the industrial age began the quantity of atmospheric carbon dioxide and methane has increased (even as energy from the sun stays basically the same), causing *extra* infrared light absorption and *further* heating Earth above its typical temperature range.

*If we start reducing greenhouse gas emissions **today**, and reduce them every year, concentrations in the atmosphere would continue to rise for **100** years.*
*The global average temperature would rise for **200** years.*
*And only fall after **300** years.*

Half of the participants who were given the paragraph were given this information at the end.

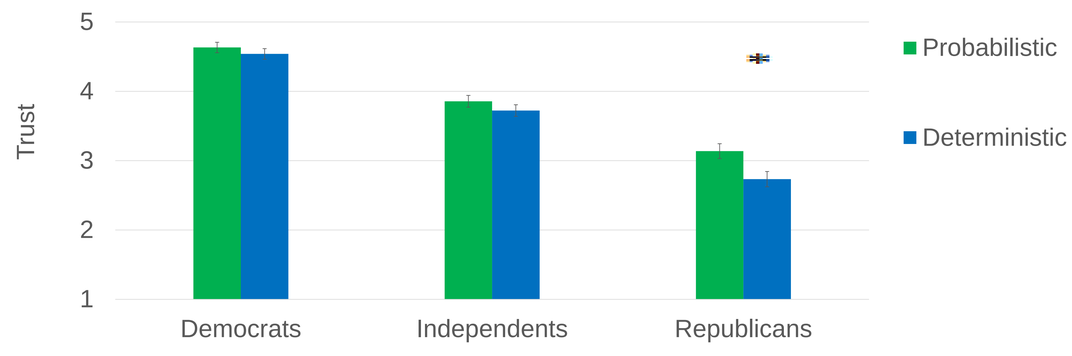
Both groups were equally trusting of the information they were given, t (411) = .483, NS.

Results: Scientific Agreement



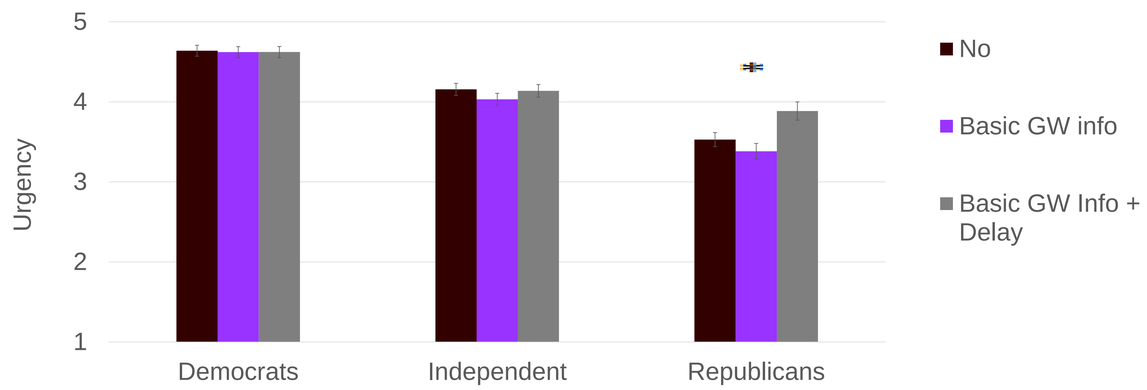
No reduction in perceived scientific agreement with probabilistic compared to deterministic forecasts

Results: Trust



Trust was higher for probabilistic than deterministic forecast: F (1, 1,302) = 7.06, p < .01 (Cohen's D = .142), in particular among Republicans, t (281) = 2.33, p = .02 (Cohen's D =.186).

Results: Urgency



Urgency was greatest among those given GW Info + Delay, F (2, 1311) = 4.23, p =.015 (Cohen's D = .16), in particular among Republicans, t (187) = 2.49, p =.04 (Cohen's D = .31).

Conclusions

- People are more trusting of climate projections that include uncertainty estimates and do not mistake outcome uncertainty for lack of scientific consensus about the fact of global warming.
- Informing people of the delay between emission reduction and the reduction in CO2 concentrations and global average temperature increases perceived urgency.
- These effects are, surprisingly, stronger (rather than weaker) among Republicans.

References

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- Shackley, S., Risbey, J., Stone, P., & Wynne, B. (1999). Adjusting to policy expectations in climate change modeling. *Climatic Change*, *43*(2), 413-454.

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