Risky business: Engaging the public on sea level rise and inundation

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A B S T R A C T

To examine whether U.S. public opinion may become as sharply polarized on adaptation responses as it has been on mitigation policies, we surveyed a sample of urban coastal residents in Maryland ($n = 378$). We then tested the impact of a community deliberative event ($n = 40$) with small-group sea level rise discussions as a depolarization strategy. Cultural worldviews which contribute to politically polarized beliefs about climate were predictive of perceptions of sea level rise risk. Living close to flooding hazards also significantly predicted respondents' perceptions of household or neighborhood risks, but not of risks to the entire county. The event significantly increased topic knowledge among all participants and, among those with a worldview predisposing them to lower risk perceptions, significantly increased problem identification and concern about impacts. These results suggest small-group deliberation focused on local problem-solving may be an effective tool for reducing the polarizing effects of cultural worldviews on decision-making.

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1. Introduction

Discussions of adaptation responses to climate change have only recently begun appearing in Americans' public discourse (Moser, 2012, 2009). Some have cautioned these efforts could be forestalled if cast within the same politically charged context as greenhouse gas emission reductions (Kates, 1997; Moser, 2012; Moser and Luers, 2008). Nevertheless, a wide range of adaptation approaches are underway (Hoss et al., 2014; Markolf et al., 2015; Woodruff and Stults, 2016). Emerging research examines how the public views these measures, particularly at the local scales of likely implementation (Canfield et al., 2015; Carrico et al., 2015; Howe, 2011; Javeline, 2014; Moser, 2014). Of these studies, a subset specifically address public engagement on sea level rise (SLR) (Covi and Kain, 2015; Kahan, 2015; MacInnis et al., 2015; Moser, 2013; Wong-Parodi and Fischhoff, 2015), one of the effects of climate change raising significant societal concerns (Hinkel et al., 2015).

In adaptation planning, communication among decision-makers, technical experts, stakeholders and the public about impacts and solutions can influence efforts at all levels; moreover, unsuccessful communication can become a barrier to policy adoption (Hurlimann et al., 2014; Moser and Ekstrom, 2010). Conflicting cultural worldviews about how society should function—e.g., prioritization of individual freedoms versus the collective good—generate miscommunication and disagreement about policy goals (Greene, 2013), contributing to dissension over climate change risks (Kahan, 2012a).

This study aims to assess factors influencing public opinion on SLR risks at a local level and evaluate roles for public engagement to advance community decision-making for climate adaptation. We first tested whether cultural worldviews influence public perceptions of SLR risks at three geographic scales: home, neighborhood, and county. We subsequently investigated whether a community deliberative event providing scientific background, and localized impact and policy information would lessen the influence of cultural worldviews, and consequently decrease issue polarization. County-level SLR inundation and flooding projections were prepared for this project (Dewberry, 2012), then incorporated into the event and analyses.

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1.1. Study location

Anne Arundel County, Maryland, lies within the heavily urbanized Northeast "megalopolis" (Gottmann, 1961), just 10 miles east of Washington, D.C., and directly south of Baltimore. Its shoreline sits along the northwest border of the Chesapeake Bay. The rate of SLR in the region is about a quarter of a centimeter a year (Boon et al., 2010), among the highest on the Atlantic Coast, and appears to be accelerating (Sallenger et al., 2012). This contributes to the severity of storm surges, inland extension of the coastal floodplain, and future permanent inundation (Boon, 2006; Maryland Commission on Climate Change, 2008). Under moderate rates of relative SLR, more than 8 square kilometers of the county could be submerged by 2050 (Batten, 2012). By 2100, that number could double, and projected storm surges and tidal inundation places $1.5 billion in building values alone at risk.

1.2. Public perceptions of SLR risk

Risk perceptions about climate change have been studied worldwide for three decades (Capstick et al., 2015; Klima, 2016; Nisbet and Myers, 2007; Taylor et al., 2014). Fewer surveys specifically focus on SLR perceptions (GfK Custom Research North America, 2013; Responsive Management, 2014, 2010). One national survey found that most in the U.S. believe global warming will cause SLR (73%) and that it will be a serious problem (76%) (GfK Custom Research North America, 2013). If climate change is an arguably intangible threat for people (Weber, 2006), SLR might be easier to grasp given its visible legacy of increasing waterlines upon shores, dunes, docks, and other coastal infrastructure. Thus our research question:

RQ: Do county residents recognize SLR is occurring, and if so, how do they characterize its risk?

1.3. Cultural theory and Cultural Cognition

Cultural theories of risk perception hold that individuals identify threats according to views of the group culture with which they identify (Tansey and Rayner, 2009). Cross-culturally, groups at varying scales—from tribes to nations—can be characterized by certain belief traits, e.g., whether some individuals should have more power than others according to status (*hierarchy*) or whether individual preferences should take precedence over those of the collective (*individualism*) (Douglas, 1970; Hofstede, 1983; Kahan, 2012b). Anthropologist Mary Douglas' (1978, 1992) original conceptualization of cultural theory holds that risks are socially construed as perceived harm to the way of life of a group, including its moral values and functional integrity, and do not necessarily reflect objective characteristics of danger, such as probability and severity.

This study uses a psychometric operationalization of cultural theory, Cultural Cognition (Kahan, 2012b). Its thesis—and a related earlier theorization (Dake, 1991)—has been controversial in its conversion of an anthropological theory about groups to a psychological measure of worldviews with highly American political overtones (Sjoberg, 1998; van der Linden, 2016). Nonetheless, its scales of hierarchy and individualism have proven better than political ideology for predicting Americans' risk perceptions across an array of controversial policies, from gun control to climate change (Kahan et al., 2007).

The Cultural Cognition scales of hierarchy-egalitarianism and individualism-communitarianism function as predictive factors in risk perception models placing individuals within four "group and grid" quadrants, per Fig. 1 (Kahan, 2012b). The individualism scale captures views about government's role in balancing the rights of the individual versus the good of society. The hierarchy scale
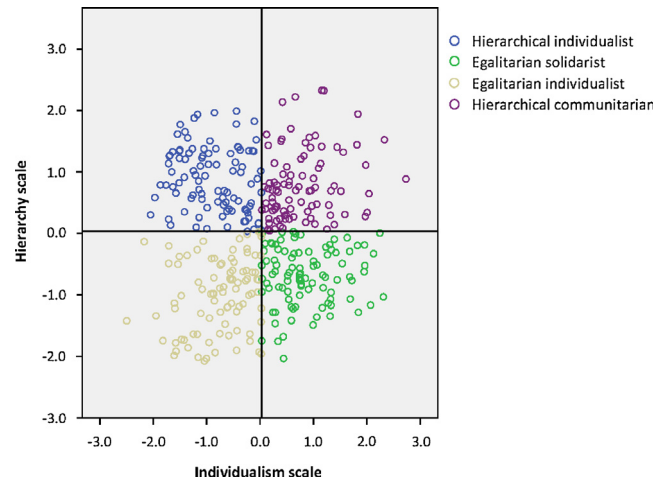

Fig. 1. Placing individuals within cultural worldviews based on Cultural Cognition's hierarchy and individualism scales.

measures views about whether greater equality should be promoted across income levels, racial groups, gender, and sexual preference groups.

Douglas and Wildavsky (1983) argued polarized societal perspectives on risks arise from the opposing worldviews of egalitarian solidarists and hierarchical individualists over the degree of regulation of commerce and industry required to maintain balance between individual freedoms and the collective good. However, identifying risks as a collective threat does not occur in all, or even most, public policy matters (Kahan, 2010). Public responses to low salience issues—e.g., nanotechnology and cell phone radio waves—are not explained by differing worldviews (Kahan, 2015).

Because of the association of SLR with climate change, we hypothesized:

H1. *(a) Respondents' worldviews will explain a significant amount of variance in risk perceptions of SLR and inundation; (b) hierarchy and individualism will inversely correlate with SLR risk perceptions.*

1.4. Detection of physical risks in the environment

We also geospatially assessed flood exposure to compare objective measures' to cultural worldviews' influence on perceptions of SLR threats. Notably, Brody et al. (2008) measured the influence of sea-level physical risk variables on perceived climate change risk to the respondents' health, finances, and physical environment. Vulnerability to SLR and coastal proximity were statistically significant in predicting these risk perceptions at the individual scale.

Still, cultural filters play a complex role in which threats are signified, and by whom. Recent work suggests the effects of proximity on risk perceptions can be mediated by other factors (e.g., nature of the hazard, cultural cognition, spatial scale). Goebbert et al. (2012) found political ideology and cultural worldviews predicted weather perceptions, but measures of actual weather change were only partially predictive (i.e., of flooding and drought, not of temperatures). The authors concluded that perceptions of local weather changes incorporate direct observation, ideology and cultural cognition. Moreover, Ruddell et al. (2012) found that scale was a factor in perceptions of neighborhood versus regional temperatures in Phoenix, Arizona. At the neighborhood level, perceptions of temperature changes were more strongly related to modeled temperature data, while at the