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Metropolitan Planning Organizations and Climate Change Action

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1. Introduction

The institutional responses to environmental change are coming into view after three decades of contemplating the challenges of climate change. Governance networks could be a key consideration for both urban affairs and communities dealing with climate change. Most research in the U.S. has not looked at regions and regional institutions to better understand their roles, strengths, and weaknesses for dealing with climate change. There are some examples of international research that suggest investigating regions and regional institutions may be a productive venue for advancing climate change action. Aylett's (2015) findings from his survey of over fifty municipalities across five continents reveals that some regions are more engaged in their efforts than others and that the most effective regions dealing with climate change adaptation are the ones that are building collaborative networks among municipal agencies. Another example is the work of Moloney and Fünfgeld (2015) that details examples of climate change alliances in Australia that are both formal and informal and having facilitated multi-level governance interactions for adaptive climate change responses.

In the U.S., most of the research has been on a city-level engagement in climate change. Cities are certainly at the forefront of tackling these challenges, but regional efforts may also exist and either complement or support city efforts. One exception is a study performed at the regional metropolitan level by Zahran et al. (2008) that looked at regional capacity as well as the stress and the risks regions face regarding climate change outcomes. Their study made use of Census, GIS, and consumer research survey data to define the characteristics of the regions. Using existing data is certainly an excellent place to start but can be limited in terms of what we

can learn *about* regional capacity and *involvement* in climate change policy. Climate change is regional and global in nature, presenting both regional and local city impacts and governance challenges (Ruth et al., 2006; Cutter et al. 2014; Bulkeley, 2010).

As such, it is plausible that metropolitan regions could play a role in climate change mitigation and adaptation. For example, in California, the Council of Governments for the 18 metropolitan regions in that state are actively implementing regional climate planning as required by law Senate Bill (SB) 375. The goal of SB 375 is to reduce greenhouse gas emissions by coordinating land use and transportation at the regional level through a Sustainable Communities Strategy or SCS. Additionally, according to the Center for Climate Change, 23 states have emission targets and goals to reduce Greenhouse Gas (GHG) emissions statewide (Center for Climate and Energy Solutions, 2011). Given that we know state and regional climate change planning is already taking place, it is worthwhile to find out which factors (beyond laws) are promoting engagement in regional climate change policy by metropolitan planning organizations (MPOs).

Regional level actors have the potential to overcome collective action problems through regional institutions with support in terms of funding but also disseminate information on successful and unsuccessful practices. The higher-level support of regional level actors can provide the foundation or opportunity to gain cooperative governance. Yet, the political landscape of regions may foster or detract from an MPO's ability to collectively engage in climate change action. Some regions such as those found in states with laws or targets to address GHG emission may be better positioned to work regionally than others. Even partisan politics could have an impact. For example, a region with a more liberal central city surrounded by more conservative cities may find it more challenging to obtain collaboration on climate change action

than one surrounded by equally liberal communities. Knowing which factors driver involvement in climate change action could lead to best practices that other regions could adopt. The importance of knowing the drivers has been underscored by previous research. For example, a study in the Florida Keys reveals experts and decision makers express a strong belief that there are serious impacts stemming from climate change, yet they are less certain about how to find solutions (Mozumder et al., 2011). The regional nature of climate change issues may mean MPOs are one type of institution well situated to be part of the answer or at least help address some of the challenges climate change presents communities. We know of no research to date that has systematically studied the role that MPOs play in this important topic in the US.

To explore the potential role of MPOs as part of the solution, this manuscript begins with a description of MPOs and our conceptual framework. We then review the literature on institutional responses to environmental change and literature from public policy, planning and local politics. Thereafter, the methods used to collect and analyze the data are discussed before turning to the analysis of the results. The manuscript concludes with policy implications and promising practices for encouraging more involvement by MPOs in climate change policy as well as ideas for future research on the topic.

2. Metropolitan Planning Organizations and our Conceptual Framework

2.1 Metropolitan Planning Organizations

Metropolitan regions are the primary drivers in economic growth and national economic activity (Redacted for Review, 2016). The economic outcomes observed in cities rely, to a large extent, on the efficient movement of goods and people – and the exchange of ideas across space. As such, metropolitan agglomerations provide the fundamental infrastructure that allows for

urban economic growth but, at the same time, the decisions metropolitan regions make on the types, form and function of that infrastructure defines the bidirectional impacts between each region and the environment (Cutter et al. 2014). So, for example, while each metropolitan region is affected by climate change differentially, regions also have differing capacities and resources to engage in climate change mitigation and adaptation (Hughes 2015). It is important to realize though that both of these effects are ultimately connected by decisions regarding urban infrastructure. MPOs are one of the institutional structures that exist and contribute the work and infrastructure that can enable in metropolitan regional capacity.

MPOs maintain a unique nexus of government arrangements and missions that could be used effectively to deal with climate change. MPOs are regional organizations that coordinate transportation investments of local, state and federal agencies. In 1962 the Federal Aid Highway Act required urbanized areas to coordinate "continuing, comprehensive and cooperative planning process[es]" when using federal dollars. In 1965 there were 224 urbanized areas and today there are 405 (including the urbanized area in Puerto Rico) (Association of Metropolitan Planning Organizations, 2016; U.S. Department of Transportation, 2016). Nearly half of all MPOs also serve as the Regional Council or Council of Governments (COG) for their specific geography. The MPOs that do not serve as Regional Councils focus on their federal mandate for elected officials to assist in the planning and implementation of the use of federal transportation funds within their region, often referred to as Regional Transportation Plans (RTPs). Regional Councils have a broader focus where local governments work together on social and environmental issues (National Association of Regional Councils, 2016; Association of Metropolitan Planning Organizations, 2016). Given that nearly half of MPOs are also Regional Councils and the other half deal directly with regional transportation planning, which has implications for energy, air

quality, and infrastructure, suggests MPOs may have both the institutional capacity and technical knowledge to work, if not directly, indirectly on issues that could have an impact on climate change.

Yet, the MPOs that serve various regional areas are not equal in size or capacity. There is great variation in the geography they cover ranging from 34 square miles to 38,649 square miles and populations ranging from 50,000 to one million or more people. Some MPOs have a staff of two employees while others have more than 100 employees. The median size staff for all MPOs is six while the median size of staff ranges between three and 37 employees varying in large part with the size of the area's population. The specializations of the employees include GIS, Travel Demand Modeling, Transit, Bicycle and Pedestrian, Public Involvement, Traffic Operations, Intergovernmental Relations, Air Quality, Safety, Transportation Disadvantaged, Freight, and Socio Cultural Impacts (Council of State Governments, 2015; Federal Highway Administration, 2010). The largest source of operating funds for MPOs is the federal government but state and local governments also supply a substantial amount of funding that MPOs may use (Federal Highway Administration, 2010). Yet, MPOs are constrained by federal guidance as to what they can and cannot do so as not to duplicate state and local efforts. Their mission is one of coordination through federal mandate and the pass through of the use of federal dollars. States such as California which have emboldened the expectations of their MPOs to address climate change are the exception and not the rule. Nonetheless, an MPO's unique nexus of state and local actors and federal funding may provide the most appropriate actors and institutional framework to engage in climate change action. Considering this and a broader framework of factors, MPOs rooted in transportation planning and policy may be well positioned to play a distinctive role to assist regions and cities dealing with climate change.

2.2. Conceptual Framework

The broader framework for this research centers on how *properties* of social-ecological systems (SESs) (i.e., adaptation and vulnerability) and institutions (i.e., their robustness, mental models and capacities) play a role in the governance choices MPOs make regarding climate change. SESs are "the integrated concept of humans-in-nature" that moves away from two popular views of social and ecological systems as subsets of each other (Berkes et al. 2002, p. 3), towards their conceptualization as interacting complex adaptive systems. SESs focus primarily on linkages between social and the ecological processes and efforts for delineation between each subsystem viewed as "artificial and arbitrary" (ibid. 2002, p. 3). Note that this view also influences our emphasis in the study of MPOs. MPOs have no mandate to work on climate change as their policy authority focuses on developing regional transportation plans and the allocations of funds for transportation projects. But, at the same time, they are not disconnected from interlinked social and ecological processes that surround transportation policy and planning. In fact, we argue that the linkages and causal effects are bidirectional. For example, effects of climate change (e.g. sea level rise, storm surges, and extreme weather events) are expected to alter the ways that MPOs explore metropolitan infrastructure choices in the future – in particular, the creation, maintenance and operation of transportation networks. Matthews (2012), for example, discusses climate change as a "transformative stressor". Furthermore, MPOs possess governing boards from a variety of jurisdictions (county, city, highway districts etc.), garnering community support from distinct sectors of local economies, and thus providing MPOs with a unique body that could, as regional institutions, potentially affect climate change.

We explore factors that affect MPO's likelihood to engage in climate change activity, recognizing that MPOs are not independent from the systems within which they operate. MPOs

may be affected by cross-cutting scale effects. Scale is an important aspect of complex systems and there can be a hierarchy or sub-systems lodged within the complex system (Berkes et al., 2002). There is not a one-to-one relationship between the concepts and the scales. Some concepts cross scales while others are lodged in the system or organization. As seen in Figure 1, we hypothesize the concepts of robustness, adaptability, capacity, vulnerability and mental models (at the organization or the system level) could play a formidable role in explaining whether MPOs engage in climate change action. We also control for the variables of geographic location in the U.S., state climate politics, partisan politics represented by voting, perceived local political climate and organizational position of the respondent. What follows is more detail about the nature and value of the conceptual framework and the variables that represent the depicted framework for understanding MPO involvement in climate change action.

Another component of the framework is that some of the variables are system variables while others are organizational and others straddle both dimensions in the model. System variables reflect factors that represent external forces such as the geographic location of an MPO or the context of specific state policies. Organizational variables represent internal processes and reflect characteristics of the institution such as the number of staff or age of the institution. Additionally, the framework acknowledges that some variables are a function of both system and organizational factors i.e., cross-scale such as politics which can be derived and have effects both internally and externally. Below we discuss the independent factors we hypothesize that have an impact on MPO climate change action.

Considering the *properties* of social-ecological systems (SESs) of Adaptation, Robustness and Vulnerability, let us examine Adaptation first. Adaptation is the process of structural change in response to external circumstances. Related terms include adaptedness - the

effectiveness of a dynamic structure in dealing with its environment - and adaptability - the capacity to adapt to future changes in the system concerned (Young et al., 2006). In the case of MPOs there may be factors such as whether the state in which the MPO resides is a state that requires the MPO to reduce GHGs as is the case in the states of California and Oregon (which we will explore later). Another factor may be the political context (conservative or liberal dominance in the region) that interacts or enables the adaptedness of an institution to ancillary needs and solutions to their primary mission.

As *properties* of SESs, the concepts of Adaptedness, Robustness and Vulnerability are heavily interlinked (Young et al., 2006). For MPOs, being robust means the agency can endure changes without having to overhaul its structure. How robust an institution is depends crucially on past adaptation activity to changes and shocks. The more robust, the greater the institution's capacity to deal with changes and persist without changing its structure (Young et al., 2006, p.305).

Vulnerability is a state where robustness does not help the system survive without structural change (Young et al., 2006). Disturbances affecting a vulnerable state will lead to a structural system adaptation or collapse. All three terms express a temporary condition of the interaction between a system and its context (Young et al., 2006). The more robust an institution, one that can withstand vulnerabilities or needs for adaptation, the greater likelihood it will be engaged in climate change.

As previously noted, the context of the MPO is likely to influence the level of engagement, but perhaps conceptually there are other factors that make MPOs more likely to engage directly or indirectly with climate change. Mental Models might be one element. Mental Models refer to frameworks of how we see the world. For example, do we see the causes of

climate change as due to our own behavior, a natural occurrence, or not happening at all? If Mental Models refer to how we see the world and robustness is the belief of efficacy of an institution (Weber and Stern. 2011; North, (2005)), then one might surmise that Mental Models are more important when it comes to adaptation policies while robustness would be more salient when many levels would need to be effective such as implementing mitigation policies. Yet, before we get ahead of ourselves, we must first ask, do either an institution's Robustness or Mental Models play a role in their engagement in climate change. In this study, our framework for understanding self – reported MPOs engagement in climate change policy considers the institution's Robustness, Adaptability and Vulnerability, as well as its capacity and Mental Models and the previously stated control factors such as politics.

[Insert Figure 1 about Here]

3. LITERATURE REVIEW

Below we review two interdisciplinary streams of literature that inform our model: (i) the literature on institutional responses to global environmental change and (ii) the literatures from public policy, planning and local politics. Although not completely nested within it, our model shares elements with the institutional analysis and development (IAD) framework (Ostrom et al., 1993), which has been utilized in the context of global commons (Ostrom, 2005, 2011). Specifically, we performed an extensive review of the research reported in peer-reviewed journals on the topic of climate change. That led us to other articles and books. We then looked at the articles and books that had relevance to the factors in our conceptual framework. We also looked at the literatures on public policy, planning and local politics for more general information and the control factors that might affect climate change action.

3.1 Institutional responses to environmental change / social-ecological systems (SES) literature

Common indicators on the institutional responses to environmental change include robustness, adaptive capacity, and vulnerability. Robust and adaptable institutions or organizations can sustain a high level of performance in a dynamic environment. Jen (2003, p. 14) finds that "…robustness…reflects the system's ability to perform multiple functionalities as needed *without* change in structures…. In so doing robust institutions can maintain acceptable performance without changing their structures in a changing environment." This is accomplished by building in redundancies in task or resource allocation (Levchuk, et al., 2004). An organization could also be robust by having already re-organized and built in redundancies to address climate change specifically. Given this definition one would expect robust organizations to be better able or ready to deal with climate change and therefore be more involved than agencies that do not see themselves as robust.

Furthermore, if as Adger et al. suggest, the success for an adaptation strategy relies on a) the way it meets the needs to adapt and b) how it affects others to be successful with their adaptation goals (2005), then the ability of an organization to re-configure itself to meet needs is a measure of its flexibility or adaptability in situations when facing new challenges. Adaptive organizations would lose efficiency if built like robust institutions with redundancies. Adaptive organizations are important for relatively stable environments, while robust institutions are important for unstable environments (Levchuk et al., 2004).

Finally, there are several ways to consider social vulnerability to climate change risks. For the purposes of this study we used the socioeconomic approach Kelly and Adger (2000) take.

They view vulnerability as the ability or not to respond, cope, recover, or adapt to an external impact on an individual's or group's livelihood or well-being.

We also considered perceptions about risk that have an impact on the decision to act in the face of threats (Adger et al., 2005). For example, Niles et al. (2013, p. 1757) find, as have others, "that the perceived risks and impacts of climate change are very important for understanding how people may change their behaviors or support policies to address climate change" (Grothmann and Patt, 2005, Lieserowitz, 2005; O'Conner et al., 1999). Niles' et al's. study further contends that risk perceptions, not climate change beliefs, are more important than we may have thought. Research by McCright et al. (2013) note that "belief and concerns about global warming are positively related to support for proposed climate policies" as do others (Bord et al., 2000; Bostrom et al., 2011; Dietz et al., 2007; Krosnick et al., 2006; McCright 2013; O'Conner et al., 1999; 2002; Zaharan et al., 2008).

3.2 Public policy, regional planning and local politics literature

The operationalization of climate actions through institutions and organizations has been examined within and across public policy, planning and local politics literature (Matthews, 2013). Authors identify the influence of internal and external pathways and barriers to change. Jeong and Feiock (2006) find more effective policy implementation is demonstrated by agencies with greater administrative capacity that command more resources, both financially as well as in terms of number of staff. Jepson (2004) finds that more motivated and educated planners provide the capacity to create research analysis and education, which enhances the likelihood of sustainable activities. Saha and Paterson (2008) survey research findings further reinforce the value of funding, elected official's support, and knowledgeable staff play a role in sustainability initiatives. As such, factors such as an MPO also being a COG, which is an agency with both a

broader mission and presumably more resources in terms of staff, leadership and financial means, could also contribute to the likelihood of sustainable outcomes. Kwon et al., (2014) find that financial independence, education, homeownership, form of government, ICLEI membership, and the intergovernmental impacts of entrepreneurial state legislators are factors that influence the use of policy actions at the local level – albeit differentially for alternative causes such as conservation or energy efficiency.

It can be challenging for city governments to find funding sources for planning and implementation strategies for climate change (Hansen et al., 2013). Hughes (2015) notes funds primarily come from state and federal agencies and NGOs. Clearly, having more access to resources would give an MPO greater ability and flexibility to deal with climate change issues and as such this could be another measure of capacity. The size of MPO population could also be a factor much like Bedsworth and Hanak (2013) suggest, so we also considered population size since larger areas typically have more administrative capacity.

Political factors, local elite power and urban regimes are important and can play a key role in local decisions (Basolo, 2000; Stone, 1989; Wildavsky, 1964). These factors may be at work regardless of political persuasion, as evidenced by the heavily Republican community of San Diego County being the first region in California to comply with new greenhouse gas emission targets set under SB 375 along with local governments agreeing to denser development to meet this goal (Bedsworth, 2011) Yet, in this case, it appears conservatives in the San Diego area wanted to shape the implementation more than meet the outcomes of the mandate and used their political persuasion to do so. Their strategy was challenged in the courts by local climate organizations. Research by Lockwood (2013) also describes the way politics may even reverse the goals of implementation established by law pointing to the dominate effect politics can have

on climate change implementation and engagement practices. He describes the importance of political identities on outcomes and finds that without a shift or transformation in preferences from groups that oppose an idea, or specifically in his study the Climate Change Act in UK, politics as an element of identity will continue to be averse to change that does not align with its values. Politics can rear its head in several ways. Outcomes could be a function of political leanings or dominance as well as political action such as a state having instituted ghg reduction measures from a more liberal persuasion or the way a more conservative community's governance goes about implementing ghg reduction strategy to align with a conservative community vision.

When considering social climate we also consider a positional factor, in terms of regional outlook on the topic, when considering regional context where the MPO resides. Geographic location is also a factor of importance in and of itself, yet there has been considerable debate and ambiguity surrounding the value of region as an explanatory variable in research. We know there is variation in factors that contribute to differences and similarities across regions. Patterson (1968) notes that regions are distinctive but their difference can be difficult to explain. (Redacted for Review, 2013) found place or city of residence has an important effect on U.S. and Canadian citizens demonstrating the continued importance of region in North America and calling attention to the need to model and capture the subtle and often ambiguous differences that are hard to explain in terms of the region on outcomes.

Regional geography could also have correlations with vulnerability. Zaharan et al. (2008) looked at risks in terms of precipitation, extreme weather history, coastal proximity, and ecosystem sensitive and measured stress as the local stressors a community faces in terms of effects of climate change. Regional location may possess benefits as well as risks (Hess et al.,

2008) providing another rationale for the importance of region in our study. Hess et al. (2008) find that by looking at place it is possible to examine risk and how it is distributed regionally. There are often regional networks to deal with adverse events, unlocking the importance of local, state and regional processes in terms of preparation or response activities either explicitly or by virtue of the networks that enhance that area's resiliency (Innes and Rongerude, 2013).

Finally, we recognize that a person's position in the organization may color the way they assess the realities of their organization. It may simply be the staff's function or position alters their view of the organization's work or provides a bigger picture view about the MPO's work. Jepson's (2004) research found a significant statistical relationship between the activity levels of communities and the character of the leadership in the local planning offices. As such we also controlled for position in the organization.

4. DATA AND METHODS

We developed a survey for the MPOs in the U.S. to investigate the structural impact of mental models and robustness of MPOs for involvement in climate change policy. The survey asked of MPO directors or their designee, in a series of questions, about which agencies they work with and how, as well as a series of attitudinal questions and organizational questions (a copy of the survey is available upon request; see Table 3 for the wording of questions used in this study). A complete mailing list was obtained from the U.S. Department of Transportation, which provided contact information for each of the 405 United States MPOs in February of 2015 (we excluded Puerto Rico from the analysis). In March of 2015, we sent an online survey to every MPO for each state in the U.S. The email included an option to complete a fillable PDF version of the survey by the respondent, if preferred. Those who did not wish to complete the

survey online could send the survey in PDF format back to researchers via email. The following month, April 2015, a follow-up email encouraged survey completion and reminded organizations of their options for survey submission. Following these returns, in order to encourage MPOs participation, a hard copy of the survey was mailed to the physical address of each of the organizations that did not complete the survey online or though the PDF format email option. Ultimately, 137 surveys were returned providing a 34% response rate with a 90% confidence interval and margin of error of plus or minus 6%. A comparison of MPOs that responded to the survey with those that did not using the Kruskal-Wallis test for the null hypothesis of probability of equality of population of responding MPOs and non-responding MPOs reveals no statistical difference between the MPOs based on the largest urbanized area's 2010 population within the MPO boundary (prob. = .12) but there was a difference in terms of the MPO region's population (prob = .04) level of significance. Given that cities with more population, regardless of density, have a greater carbon footprint than less populated cities or rural areas (redacted for review, 2013), we believe the MPOs response based on the largest urbanized areas is more relevant to this research and supports the idea that the sample is at least representative, although somewhat small. Table 1 illustrates the regional distribution of the MPOs that responded to our request for information alongside the percent of the US population that resides in each region. This clarifies issues of over/under-representation at different scales. For example, we can infer that the West is slightly underrepresented in our MPO sample compared to the size of the region in terms of population; but within the West, the Mountain division is overrepresented while the Pacific is underrepresented. We do not provide a more detailed breakdown so that we ensure the anonymity of organizations that responded to the survey.

To guard against common source bias, where respondents answered questions in terms of their position, we did an analysis of response by position and there was no statistically significant difference in any of the models. Additionally, we explicitly stated in the instructions that the respondents should answer from the perspective of their organization. Most questions used in the analysis are about specific behavior that does not have a positive or negative preference, such as has "your organization or employees within your organization re-organized their work to address climate change issues?" as climate change is not officially a specific purview of MPO, working on climate change or not would not necessarily be a positive or negative attribute. Specifically, the dependent variable, asks if their organization is involved in climate change work and a full 64% indicated no. There are four independent variables derived from questions dealing with opinions on being worried about climate change, causes of climate change, how informed employees are about mitigation and adaptation. Although one could judge that there are socially desirable responses to these questions the general response rate to each item reveals an answer that in no instance is more frequently reported than 46% of the time. Additionally, we asked the respondents to indicate how confident they are about their responses resulting in 74% of participants indicating somewhat or very confident, which suggests they feel they had a reasonable idea of the opinions/work of their co-workers.

We analyzed the collected survey and secondary source data using a binomial logit regression approach. This method allowed us to model the drivers of a binary dependent variable (a response or lack of response to climate change). Although the method deviates from the standard ordinary least squares approach, it is more appropriate for cases of limited dependent variables (Maddala, 1986). Note that our tables report the effect of independent variables on the dependent variables in the odds-ratio but the standard errors for the logs-ratio coefficients are

also reported in parentheses. Our dataset is formed by culling a subset of the questions in our survey and collecting a variety of secondary source data (Tables 2-3).

4.1 Dependent measure

The dependent variable in our models - and main variable of interest in this paper - is the MPOs current involvement in climate change policy. We extract this measure from our survey by asking the question of whether the MPO is currently involved in a climate change policy. Out of 124 responses, 30.6% responded 'Yes' while 64.5% responded 'No', and 4.8% of the responders did not know.

4.2 Independent variables

We use several independent variables for testing our hypotheses*: Robust* explores the organization's robustness: the capacity of the organization to cope with shocks without having to change in structure (categorical). This is an organizational-level concept. Only 12% of the respondents strongly agreed with the statement that the organization has been designed with redundancies in task-resource allocations. The *Reorganized* variable (another binary variable from our survey) captures the flexibility of the MPO for an explicit reorganization of work of employees within an organization to address climate change issues that gets to the adaptive capacity of the organization. The variable captures an organizational change process that is distinct from the dependent variable which asks if the organization is currently involved in climate change policy; the correlation coefficient between Reorganized and our dependent variable is 0.49. *Age* is measured as the number of years that have passed since the founding of the MPO (continuous).

Adaptable captures the degree to which the organization can be reconfigured to cope with unexpected organizational change (this is a categorical variable, extracted from our survey,

following a five point Likert-type scale). This is an organizational level variable in the conceptual framework. Approximately 18% of our respondents strongly agreed with the statement that the organization allows for structural reconfiguration. *Resources* measures the level of the organization's resources (e.g., human-power, financial, grants) allocated to climate change, as compared to 5 years ago; this is a categorical variable that shows that the majority of respondents (54%) indicated that compared to 5 years ago that about the same amount of resources are allocated to climate change issues.

Capacity variables were used in our study: *MPO Population in 2010* is a variable we derived from secondary (Census) data and measures the total population of the MPO region in thousands for 2010. Conceptually, this is a system capacity measure. The data are from the U.S. Department of Transportation, Federal Highway Administration. *Staff* measures the number of staff in the MPO in the year 2015 and was derived primarily from the MPO websites or by calling the MPOs. Conceptually, this is an organization level measure of capacity. Less than five percent of the data came from Associations of Metropolitan Planning Organizations' (AMPO) 2013 MPO Salary Survey Report. Additionally, we included the variable that the institution is a Council of Government (COG) or not (binary). We captured this data by reviewing the website of each MPO. Only if the MPO is both a COG and MPO is it noted as COG for our research. Finally, *Board* is a variable the captures the size of the board of an MPO which was determined by reviewing each of the MPO websites. In a handful of instances, we called or emailed the MPOs for this information. Additionally, both COG and Board are cross-scale measures of capacity.

We also employ a group of variables describing the mental models of the MPOs and in our conceptual framework all of these variables are at the organizational level. *Worried* is a

categorical variable from our survey that captures the degree of worry about global warming in the organization. It ranges across 5 categories, from “very worried” to “not worried at all”. *Causes Warming* describes the degree of belief in anthropogenic causes of global warming for employees who think that global warming is happening (categorical). It ranges from a belief of mostly anthropogenic causes (“Caused mostly by human activity”) to a belief of mostly natural causes (“Caused mostly by natural changes in the environment”), and even to a belief that climate change is not happening (“None of the above because global warming isn’t happening”) with an added option of “don’t know / not sure”. *Informed Mitigation* describes how informed employees are in the organization about options for reducing global warming (categorical). *Informed Adaptation* describes how informed employees are in the organization about options for adapting to the effect of global warming (categorical). Both of the above variables range from “very well informed” to “not at all informed” with an option of “don’t know / not sure”.

We captured a measure of social vulnerability across the U.S. using the Social vulnerability index, 2006-2010 as defined by the Hazards and Vulnerability Research Institute. This is a system level variable in the conceptual framework. According to the University of South Carolina’s Hazards and Vulnerability Research Institute Social Vulnerability Index 2006-2010 measures the social vulnerability of U.S. counties to environmental hazards. The index allows researchers to compare social vulnerabilities across U.S. counties. The components of the index include race and class; wealth; elderly residents; Hispanic ethnicity; special needs individuals; Native American ethnicity; and service industry employment so that the index can take into account the constraints of family structure, language barriers, vehicle availability, medical disabilities, and healthcare access in the preparation for and response to disasters. We use this index in the same manner as Kelly and Adger (2000) who consider social vulnerability

influence's in terms of individuals or groups of people's capacity to adapt to changes that might affect their well-being or livelihood.

4.3 Controls

Our control variables include *Politics*, which measures the helpfulness of the political climate in the region in terms of advancing the MPO's efforts to address climate change issues (categorical). We also included *percrepvote,* the percentage of vote for the Trump/Pence ticket in the 2016 General Election for the largest county in the MPOs region. Both the voting and survey question are cross-scale concepts. We also include a binary variable, *CCESEmis*, produced by the Center for Climate and Energy Solutions (CCES, 2011) that accounts for the 23 states with GHG emissions targets and goals: Arizona, California, Colorado, Connecticut, Delaware, Florida, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New Mexico, New York, Rhode Island, Utah, Virginia, Vermont, Washington, and Wisconsin[1]. Additionally, we used a group of geographically defined dummy variables (*Midwest, Northeast, West* and *South* as the baseline variable) denoting the broad region of the U.S. that the MPO resides[2] (see Table1). This is system level variable. Finally, a set of respondent's position in the agency dummy variables (*Planner/Engineer, Head of Organization, and Other Position*), denoting the survey respondent's position in the organization was also included. Conceptually, this is an organization level variable.

[1] We also explored a similar binary variable, *GHGred*, indicating if the state had mandated greenhouse gas emission reductions - a system level concept. The states with greenhouse gas emission budget trading programs include California, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont and additional states that have greenhouse gas performance standards or incentives include Illinois, Montana, Oregon and Washington (U.S. Environmental Protection Agency, 2014). The results were nearly identical to the *CCESEmis* variable

[2] Additionally, we ran all our models using regional district dummies (*East North Central, Mountain, New England, Pacific, South Atlantic, West North Central, West South Central* and *Mid-Atlantic* as the baseline variable). We originally hypothesized that we could capture a geographical effect that would be distinct and statistically significant across several climate sensitive zones of the U.S. (e.g. South Atlantic). Our hypothesis was rejected in all cases other than the Pacific region. Furthermore, due to the mismatch of responses in our survey, more comprehensive models are necessarily based on fewer observations. The sparseness of some observations across geography caused a problem with a geography dummy variable.

[Insert Tables 1, 2 and 3 about Here]

We also run Spearman's correlation analysis for all variables included in the models and we do not find many significantly correlated sets (most correlations are well below 0.3). Exceptions include the correlation between MPO staff size with the MPO population (0.77) and Robust with Adaptable (0.46).

5. FINDINGS

Our findings from the logistic regression analysis are reported below (Tables 4-6). We find strong support for the importance of scale and mental models on climate, and partial support for robustness as drivers of MPO responses to climate change. We do not find evidence that the adaptability and vulnerability variables are connected to MPO responses to climate change issues. In what follows, we report the results of the logistic regressions in the odds-ratio format.

In our research, we ran a variety of model specifications, including and excluding variables of interest, testing our hypothesis stated in an earlier section. Each variable that relates to our hypotheses on robustness, adaptability, mental models, capacity and social vulnerability is entered individually in parsimonious specifications but also in specifications that control for a multiplicity of variables. So, Table 4 presents models with a focus on variables *Robust, Adaptable, Worried* and *Causes Warming*, and *Staff*. Table 5 reports models utilizing variables *Reorganized, Resources*, *Informed Mitigation/Adaptation*, and *MPOpop2010*. Models reported in Table 6 utilize *Age*, *COG*, *Board*, but also one specification that adds *Robust*, *Reorganized*, *Adaptable*, *Resources*, *Worried*, and *Causes Warming*. All logistic models employed include our *Vulnerability* variable, the *Geography* and *Position* dummies as well as our *Politics, percvoterep* and *CCESEmis* variables. We interpret the coefficients emerging from the model as the factor of

change in the odds-ratio of the dependent variable (where the odds ratio is the probability of the event divided by the probability of the nonevent). All interpretations should be viewed as ceteris paribus - all else held constant. In Tables 4-6 we report the standard errors from the logit regressions; note that these are not in the same units as the odds-ratio coefficients and thus not directly comparable; we include them for purposes of completeness of presentation.

Regarding our robustness group of variables, the *Robust* variable is statistically insignificant across all model specifications (Table 4, 6) but the *Reorganized* variable is positive and significant in most specifications run (Table 5-6). A unit increase of the *Reorganized* variable, increases the odds ratio of an MPO's response to climate change by a factor between 5 and 6.

Our group of adaptability variables (*Adaptable, Resources, Age*) is never statistically significant in any specification we ran.

Our group of capacity variables reveals that the effects of *Staff and COG* are more important than *MPO Population in 2010* and *Board* considering their statistical significance; in particular, an increase in the size of the *Staff* by one person increases the odds ratio of an MPOs responsiveness to climate change issues by a factor of 1.04-1.13, meaning the odds of involvement increases by 4%-13%. Being a COG (a change in the COG variable from zero to one) increases the odds ratio of an MPO's responsiveness to climate change by a factor of approximately 3 in one model (Table 6).

The set of organization-level mental model variables also reveals differences between variables capturing distinct dimensions of mental models. *Worried* and *Causes Warming* are introduced in the specifications jointly and are statistically significant in almost all models run. *Worried* is not statistically significant, but *Causes Warming* is. A unit increase in *Causes*

Warming (a reduction in the belief of an anthropogenic cause of climate change) is associated with a 0.09-0.20 unit reduction in the odds-ratio of an MPO's involvement with climate change (Table 4). The hypothesized *Causes Warming* effect is statistically significant (Table 3) in the more parsimonious specification. Being informed about mitigation and adaptation actions (*Informed Mitigation*, *Informed Adaptation*) does not have a statistically significant effect on current involvement.

Out of our three political climate control variables, only one (*Politics*) was statistically significant across all specifications employed in our paper. A unit increase in the *Politics* variable, increases the odds ratio of an MPO's response to climate change by a factor of 2 in most models but potentially up to 5 in the most comprehensive specifications. The county-level conservative vote (*percrepvote*) and the State-level climate policy (*CCESEmis*) variables are not statistically significant. We interpret this result as evidence of a complex effect of local politics on the level of involvement of an MPO in climate change issues.

The set of geographical dummies reveals interesting effects on the odds of an MPO being involved with climate change policy. The *West* dummy is of a sizable magnitude and statistically significant; being located in the West region (as compared to the South region, our baseline) increases the odds of a response by a factor of 5 in most of our model runs.

Finally, the set of organization position dummies is always statistically insignificant across all models. Furthermore, our social vulnerability variable has a statistically significant effect on one of our specifications; the odds-ratio changes by a factor of 0.55.

[Insert Tables 4, 5, and 6 about Here]

Finally, it's worthwhile to point out the relationship of our key predictors to scale; that is, whether our statistically significant variables operate at single scale (either system or

organization) or are cross-scale variables. *Reorganization*, *Staff*, *Causes Warming*, *Politics*, and *West* are statistically significant explanatory variables. *West* (external) and *Politics* (cross-scale) are system variables and have a very strong effect in our models. *Causes Warming*, *Reorganization*, and *Staff* are organization (internal) variables concerned with capacity in general and while statistically significant, have smaller effect in the MPO's current involvement in climate change.

6. DISCUSSION AND CONCLUSIONS

Our paper examines factors that affect the involvement of MPOs in climate change activity. We contribute to the existing literature by adding evidence at the level of regional metropolitan governance and bridging two types of literatures in a quantitative modeling framework: the institutional responses to environmental change, driven by conceptualization of urban systems as social-ecological systems, and the public policy, regional planning and local politics literature.

Overall, our results support only a subset of our hypotheses. While the evidence on the importance of the robustness variables is mixed, our findings clearly point to a lack of statistical significance of the Adaptability variables. Yet, this is perhaps not surprising as Levchuck notes that adaptive organizations are valuable for relatively stable environments and robust institutions are important for unstable environments (Levchuk et al., 2004) such as the climate change policy arena. We also find that the number of staff working in an MPO is a more important factor than the MPO region's population size, in terms of the capacity of an MPO to address climate change issues. This suggests that the capacity of the institution is an endogenous variable and not a reflection on MPO's jurisdictional size. Furthermore, the positive effect of the number of and

MPO board members points to the importance of the multiplicity of jurisdiction, leading to a governance structure faced with a larger array of climate change actors and issues. The social vulnerability score of the central county of the MPO does not affect the MPO's current involvement in climate change policy, after controlling for geographical regions. The logistic regressions without the geographic dummies do not make the social vulnerability variables statistically significant either (results not presented in the tables).

Mental Models on climate change play a role in involvement in climate change policy – in particular, the perceived degree of concern about climate change issues within an organization and the belief in the anthropogenic nature of climate change. This finding supports other findings by Niles et al., (2013) and McCright et al., (2013), noted previously, regarding concern about climate change being a driver in behavior to engage in climate change action. This seems to hold true for MPOs as well. Yet, being informed about mitigation and adaptation options does not appear to be connected to organizational involvement with climate change policy.

Politics was also significant as expected. Where the political climate was viewed as favorable to working on climate change, MPOs were more likely to be involved in climate change action policy. It is also the case that county-level voting patterns (Republican or Democrat) as well as the State-level climate action mandates did not influence MPO involvement in climate projects. Once again, this finding is pointing to the more endogenous motivations for engaging in climate change. Furthermore, geography matters for specific regions such as the Pacific. This is interesting as coastal cities in the Mid-Atlantic region which face imminent threat due to climate change (not unlike the coastal cities in the West) are not overtly manifesting regional action. As Patterson and other research previously noted, this highlights an intangible difference between regions and we find this difference applicable to climate change

action. We also find that the position of the survey responder in the MPO hierarchy does not affect the stated involvement in climate change policy. The political climate in terms of being favorable for the MPO to deal with climate change and belief that human behavior is causing warming of the earth were both significant. This supports Lockwood's finding on values aligning with an issue matter for action. It suggests that both structure and individual capacity have an effect and may underpin action. Overall, system variables appear to have a stronger effect on current involvement in climate change, compared to our organizational variables. This finding can help guide action across scales in regional governance of climate change.

New research should explore what specifically it is about "Region" that matters, in particular in the Pacific and but not the South Atlantic, for example. Does it have to do with the alliances and networks that exist in these locations as Hess et al. (2008) suggest, or is it something less tangible as (Redacted for Review) and Patterson found to be true in their research? We might also want to know more about the way Mental Models, specifically the degree of concern people working in MPOs have, plays out. Is the effect of region the result of an aggregation of individual concerns or is it derived from the local political climate or citizen concerns? Additional research on why some MPO institutions reorganized themselves to contribute to work on climate change could be fruitful. Specifically, more research exploring how or why politics, as a cross-cutting system variable, is having an effect may be worthwhile. As the make-up of the COG includes elected officials, there should be no doubt their politics have an influence on the work of the MPOs, hence politics was a control variable. However, the broader political environment from which the elected officials hail and the regional identity of where the MPO is located could perhaps be better captured in a more sophisticated way than the MPO's perceptions of the helpfulness of political climate on climate change issues. Another

measure of the influence of politics on the work of MPOs, such as environmental scorecard results from the League of Conservation Voters for congressional representatives, could provide more nuanced insights. Finally, determining more internal factors that assist with building institutional capacity beyond the number of staff might also open avenues to help MPOs take a greater role in the policy area of climate change.

In the end, MPOs may have a unique structure and mission that could handily help regions and communities deal with climate change. MPOs often possess both the needed involvement of elected officials for leadership on the matter and in some cases the technical capacity to directly address issues related to climate change. In a little more than half of the cases of MPOs overall, they at least have the connection to the elected officials to deal with issues around transportation planning that have an effect on energy, infrastructure and air quality that could make a difference in dealing with climate change.

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1. Survey responses by region and division; The US Census' grouping of states and the District of Columbia that are subdivided into four regions and then further into nine divisions.

Region	Regional Response Rate	Population (%)	Population*
Division			
Northeast	17.5%	17.54%	56,296,628
New England	*5.8%*	*4.59%*	*14,726,156*
Middle Atlantic	*11.7%*	*12.95%*	*41,570,472*
Midwest	23.4%	21.13%	67,839,187
East North Central	*14.6%*	*14.56%*	*46,756,588*
West North Central	*8.8%*	*6.57%*	*21,082,599*
South	39.4%	37.72%	121,081,238
South Atlantic	*24.1%*	*19.69%*	*63,226,230*
East South Central	*7.3%*	*5.87%*	*18,848,938*
West South Central	*8.0%*	*12.15%*	*39,006,070*
West	19.7%	23.62%	75,822,786
Mountain	*10.9%*	*7.31%*	*23,456,688*
Pacific	*8.8%*	*16.31%*	*52,366,098*

* Source: U.S. Census: Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2017, Release Date: December 2017

Northeast Region- US Census Bureau Region 1. Composed of two divisions; *Division 1: New England* which contains Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont and *Division 2: Middle Atlantic* which contains New Jersey, New York, and Pennsylvania

Midwest Region-US Census Bureau Region 2. Composed of two divisions; *Division 3: East North Central* which contains Indiana, Illinois, Michigan, Ohio, and Wisconsin and *Division 4: West North Central* which contains Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.

South Region- US Census Bureau Region 3. Composed of three divisions; *Division 5: South Atlantic* which contains Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia, *Division 6: East South Central* which contains Alabama, Kentucky, Mississippi, and Tennessee, and *Division 7: West South Central* which contains Arkansas, Louisiana, Oklahoma, and Texas.

West Region- US Census Bureau Region 4. Composed of two divisions; *Division 8: Mountain* which contains Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada, and Wyoming and *Division 9: Pacific* which contains Alaska, California, Hawaii, Oregon, and Washington.

TABLE 2. Means and Standard Deviations of Variables in the Analysis

Variable	Mean	Standard Deviation	N	Min	Max
Dependent Variable					
Currently Involved	0.32	0.47	118	0	1
Independent Variables					
Reorganized	0.37	0.48	120	0	1
Adaptable	3.51	1.12	129	1	5
MPO population in 2010	423,577.2	712,182.2	137	20,761	4,703,593
Staff	11.67	14.19	125	1	97
Resources	2.15	0.59	107	1	3
Worried	3.26	1.08	110	1	5
Causes Warming	1.73	0.64	96	1	4
Informed Mitigation	3.54	1.05	111	1	5
Informed Adaptation	3.24	1.07	105	1	5
Robust	3.25	1.2	121	1	5
Age	32.5	13.62	137	1	55
Social Vulnerability	-1.41	1.64	137	-7.3	4.29
Control Variables					
Politics	2.92	1.3	114	1	5
County Voting Politics	52.08	13.27	137	20.2	85.7

State GHG Emission Goal	0.51	0.50	137	0	1
Midwest	0.234	0.425	137	0	1
Northeast	0.175	0.382	137	0	1
South	0.394	0.490	137	0	1
West	0.197	0.399	137	0	1
Planner/Engineer	0.38	0.49	137	0	1
Head of Organization	0.31	0.46	137	0	1
Other Administrative	0.18	0.39	137		
Other Position	0.02	0.17	137	0	1

TABLE 3. Definitions of Variables in the Analysis

Variable	Definition
Dependent Variable	
Currently Involved*	Is your organization currently involved in a climate change policy? (Binary)
Independent Variables	
Reorganized*	In the last five years, has your organization or employees within your organization re-organized their work to address climate change issues? (Binary)
Adaptable*	Degree to which the organization can be reconfigured to cope with unexpected organizational change (categorical).
MPO population 2010 (in thousands)	Population of MPO region in 2010 (in thousands).
Staff	Number of staff in MPO (2015).
Resources*	Compared to 5 years ago, my organization's resources (e.g., human-power, financial, grants) allocated to climate change are..... (categorical).
Worried*	In your opinion, how worried are people in your organization about global warming? (categorical).
Causes Warming*	In your opinon, of those employees that think global warming is happening, do most think it is ..... (categorical).
Informed Mitigation*	In your opinion, how informed are employees in your

	organization about options for reducing global warming? (categorical).
Informed Adaptation*	How informed are employees in the organization about options for adapting to the effect of global warming (categorical).
Robust*	My organization is 'finely-tuned' for a specific mission, but allows structural reconfiguration and/or strategy adaptation to cope with unforeseen changes in the mission and/or organization. (categorical).
Age	Age of Organization (continuous).
Social Vulnerability	Social vulnerability index, 2006-2010 (continuous).
Control Variables	
Politics*	How helpful is the political climate in your region in terms of advancing your organization's efforts to address climate change issues? (categorical).
County Voting Politics	Percentage of people in the largest county in the MSA that voted for the Trump/Pence ticket in 2016
State GHG Emission Goal	States with a target or goal of reducing GHG emissions
Midwest	MPO is in the Midwest region
Northeast	MPO is in the Northeast region
South	MPO is in the South region

West	MPO is in the West region
Planner/Engineer*	The position of the survey respondent is planner or engineer
Head of Organization*	The position of the respondent is head of organization
Other Administration	The position of the respondent is in administration (but not the head)
Other Position*	The position of the respondent is 'Other'

***Indicates variable derived from survey question**

TABLE 4. Binomial logit model results on Current Involvement in Climate Change with emphasis on variables *Robust, Adaptable, Worried, Causes Warming* and *Staff*; coefficients are reported in odds ratio format with standard errors in parens

	Robust	Adaptable	Mental Model	Vulnerable	Capacity	Full Model
Robust	1.68					1.16
	(0.46)					(0.44)
Adaptable		1.23				1.04
		(0.28)				(0.47)
Worried			0.70			0.40
			(0.27)			(0.24)
Causes Warming			0.20*			0.09**
			(0.11)			(0.07)
Vulnerability				1.00		0.99
				(0.01)		(0.02)
Staff					1.04	1.13**
					(0.02)	(0.04)
Politics	1.97**	2.06***	2.74***	2.15***	2.37***	4.94**
	(0.43)	(0.43)	(0.78)	(0.46)	(0.59)	(2.40)
Conservative Vote	0.98	0.98	0.97	0.99	1.00	0.99
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
State Climate Politics	0.45	0.51	0.47	0.54	0.38	0.21
	(0.27)	(0.27)	(0.32)	(0.28)	(0.22)	(0.20)
Midwest	1.43	1.64	3.25	1.69	1.13	2.03

	(1.03)	(1.10)	(2.79)	(1.08)	(0.78)	(2.05)
Northeast	2.82	2.97	5.96*	3.05	2.62	4.84
	(2.08)	(1.94)	(5.34)	(1.89)	(1.71)	(5.09)
West	4.51*	4.80*	24.61**	4.71*	4.88*	39.38**
	(3.40)	(3.49)	(24.23)	(3.49)	(3.71)	(54.33)
Planner / Engineer	1.56	1.43	2.21	1.73	2.01	2.95
	(1.09)	(0.90)	(1.66)	(1.10)	(1.37)	(2.36)
Head of Organization	0.70	0.74	0.68	0.89	1.31	1.33
	(0.49)	(0.50)	(0.56)	(0.59)	(0.97)	(1.28)
Other Position	1.27	1.26	0.55	1.96	2.28	1.69
	(1.96)	(2.49)	(1.04)	(3.96)	(5.38)	(3.92)
Constant	0.02	0.04	1.18	0.06	0.02*	0.59
	(0.04)	(0.06)	(3.01)	(0.10)	(0.03)	(2.70)
Pseudo-R^2	0.22	0.18	0.31	0.18	0.21	0.41
N	100	106	87	109	99	73
BIC	151.65	161.73	131.48	163.87	150.63	126.43
Log-likelihood	-50.50	-55.21	-38.94	-56.13	-50.04	-28.89
Model d.f.	10	10	11	10	10	15
Chi^2	17.06	19.55	29.38	19.26	22.26	35.15

TABLE 5. Binomial logit model results on Current Involvement in Climate Change with emphasis on variables *Reorganized, Resources, Informed Mitigation/Adaptation*, and *MPO population*; coefficients are reported in odds ratio format with standard errors in parens

	Robust	Adaptable	Mental Models	Vulnerable	Capacity	Full Model
Reorganized	6.07*					4.92*
	(3.58)					(4.00)
Resources		2.47				1.19
		(1.38)				(0.72)
Informed Mitigation			1.47			1.31
			(0.48)			(0.46)
Informed Adaptation			1.39			1.56
			(0.42)			(0.57)
Vulnerability				0.96		1.33
				(0.14)		(0.27)
MPO Pop 2010 (in 1,000s)					1.00	1.00
					(0.00)	(0.00)
Politics	1.92**	2.08***	2.10**	2.15***	2.14***	1.99**
	(0.43)	(0.42)	(0.48)	(0.46)	(0.45)	(0.45)
Conservative Vote	0.99	0.99	0.99	0.99	0.99	0.99
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
State Climate Politics	0.38	0.45	0.35	0.54	0.55	0.33
	(0.26)	(0.29)	(0.21)	(0.28)	(0.29)	(0.27)
Midwest	0.83	1.87	1.76	1.69	1.77	0.71

	(0.64)	(1.41)	(1.28)	(1.10)	(1.16)	(0.67)
Northeast	2.04	2.50	2.29	3.07	3.19	0.91
	(1.55)	(1.83)	(1.52)	(1.92)	(2.00)	(0.95)
West	4.78	5.11	4.73*	4.67*	4.78*	4.33
	(3.88)	(4.44)	(3.64)	(3.48)	(3.53)	(4.00)
Planner / Engineer	2.24	0.99	2.27	1.71	1.76	2.17
	(1.68)	(0.71)	(1.62)	(1.10)	(1.12)	(2.18)
Head of Organization	1.29	0.54	1.14	0.89	0.89	0.91
	(1.00)	(0.42)	(0.81)	(0.59)	(0.60)	(0.91)
Other Position	1.78	0.83	2.05	1.94	1.84	0.60
	(2.44)	(1.43)	(3.89)	(3.99)	(3.84)	(0.93)
Constant	0.03	0.01*	0.01*	0.05	0.05	0.01
	(0.06)	(0.02)	(0.01)	(0.08)	(0.08)	(0.02)
Pseudo-R^2	0.28	0.21	0.24	0.19	0.19	0.33
N	105	100	96	109	109	84
BIC	148.06	151.68	149.38	163.91	163.91	145.66
Log-likelihood	-48.43	-50.51	-47.31	-56.15	-56.19	-37.38
Model d.f.	10	10	11	10	10	15
Chi^2	24.49	18.10	21.17	19.29	19.78	31.12

TABLE 6. Binomial logit model results on Current Involvement in Climate Change with emphasis on variables *Age, COG, Board*; coefficients are reported in odds ratio format with standard errors in parens

	Robust	Capacity	Scale	Full Model
Age	1.02			0.99
	(0.02)			(0.03)
COG		3.01*		13.69
		(1.62)		(24.36)
Board			1.01	1.08
			(0.02)	(0.04)
Robust				1.68
				(0.94)
Reorganized				16.28*
				(20.73)
Adaptable				1.37
				(1.13)
Resources				0.68
				(0.47)
Worried				0.40
				(0.24)
Causes Warming				0.10
				(0.14)
Vulnerability				0.55*
				(0.14)
Politics	2.16***	2.17***	2.21***	5.17*

	(0.47)	(0.47)	(0.47)	(3.38)
Conservative Vote	0.99	0.99	0.99	0.99
	(0.02)	(0.02)	(0.02)	(0.03)
State Climate Politics	0.60	0.53	0.52	0.03*
	(0.31)	(0.28)	(0.27)	(0.04)
Midwest	1.60	0.96	1.47	0.34
	(1.07)	(0.71)	(0.99)	(0.44)
Northeast	2.93	2.39	2.95	3.63
	(1.87)	(1.58)	(1.85)	(5.73)
West	5.53*	3.33	4.87*	131.09*
	(4.13)	(2.55)	(3.61)	(290.58)
Planner / Engineer	2.02	1.96	1.61	10.03
	(1.38)	(1.37)	(1.02)	(19.90)
Head of Organization	0.97	0.94	0.87	6.90
	(0.68)	(0.68)	(0.58)	(10.57)
Other Position	1.85	2.94	1.82	20.31
	(3.73)	(6.59)	(3.90)	(40.56)
Constant	0.02*	0.03*	0.04*	0.00
	(0.03)	(0.05)	(0.06)	(0.01)
Pseudo-R^2	0.19	0.22	0.19	0.53
N	109	109	108	71
BIC	162.96	160.09	162.29	130.16
Log-likelihood	-55.68	-54.24	-55.39	-22.45
Model d.f.	10	10	10	19

Chi^2	18.63	26.90	21.97	19.40