Article

Personally Relevant Climate Change: The Role of Place Attachment and Local Versus Global Message Framing in Engagement

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Abstract

To help mitigate the negative effects of climate change, citizens' attitudes and behaviors must be better understood. However, little is known about which factors predict engagement with climate change, and which messaging strategies are most effective. A community sample of 324 residents from three regions in British Columbia read information either about a climate change impact relevant to their local area, a more global one, or, in a control condition, no message. Participants indicated the extent of their climate change engagement, the strength of their attachment to their local area, and demographic information. Three significant unique predictors of climate change engagement emerged: place attachment, receiving the local message, and gender (female). These results provide empirical support for some previously proposed barriers to climate action and suggest guidelines for effective climate change communication.

Keywords

climate change engagement, message framing, place attachment, local and global climate impacts, climate change communication

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Social scientists, policy makers, businesses, and nongovernmental organizations are grappling with the question of how to increase citizen engagement in climate change issues. This is important because certain lifestyle choices or specific behaviors (particularly those of individuals living in developed countries) remain carbon intensive and unsustainable, and therefore must be altered if the climate crisis has to be successfully curbed (e.g., Gifford, 2008). Individual engagement in climate change issues can motivate some of these necessary behavior changes as well as foster the acceptance and longevity of climate-friendly policies. Engagement goes beyond simple awareness of the problem: it includes caring, motivation, willingness to act, and action itself (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007).

Fostering such engagement partly requires effective communication of the facts about, and impacts and solutions of, climate change (e.g., Moser & Dilling, 2007; Nisbet & Mooney, 2007). This is a growing area of literature, which is beginning to assemble the most effective strategies for climate change–related messaging (e.g., Feinberg & Willer, 2011; Leiserowitz, 2007; Moser & Dilling, 2007; O'Neill & Nicholson-Cole, 2009; Spence & Pidgeon, 2010; Whitmarsh, 2009). Thus, the current study aims to contribute to this relatively new body of literature by investigating two potentially important but understudied variables in climate change messaging: the local versus global frame of the message and place attachment, the sense of connectedness to one's local area.

Difficulties With Climate Change Communication

Engaging the public in climate change issues is a particularly challenging endeavor because the impacts are often perceived to be uncertain, in the distant future, and not personally relevant (Gifford, 2008; Lorenzoni et al., 2007; Vlek, 2000). Climate change often lacks the day-to-day relevance necessary to motivate information-seeking behaviors and, unlike ozone layer depletion, climate change has not been successfully communicated (Ungar, 2007). Public understanding of the hole in the ozone layer was facilitated by the use of metaphors (i.e., of UV rays penetrating the Earth's "shield") and by its direct relevance to health problems such as skin cancer, but much of the public has not perceived climate change to be as vivid, relevant, or alarming.

Another problem is that attentional resources are limited, and so individuals are not always able to notice or further process all information in their environment; thus, climate change impacts may unfold without much regard (Gifford, 2011); even when climate change is noticed and accepted as relevant, it must

compete with other issues for priority (Lorenzoni & Pidgeon, 2006). For instance, several British surveys found that the public views health, family, safety, finances, and terrorism to be of greater concern than climate change (Norton & Leaman, 2004; Poortinga & Pidgeon, 2003). Because competing issues attenuate the importance attached to climate change, engaging citizens in climate change issues remains difficult.

Part of the problem can be attributed to perceptions of psychological distance, the degree to which objects, people, places, and events are removed from an individual's immediate, direct experience (Liberman, Trope, & Stephan, 2007). This distance exists for temporal, spatial, social, and hypothetical (i.e., real vs. imaginary) dimensions. According to construal level theory (Liberman & Trope, 1998; Trope & Liberman, 2003), as distance increases, mental representations become less concrete and more abstract. Psychological distance may hinder climate change engagement—why bother to change one's habits and lifestyles for a cause that is outside one's daily sphere? Therefore, awareness of climate change is not sufficient for engagement because often it is perceived as a distant threat (Chess & Johnson, 2007; Leiserowitz, 2005).

The psychological distance associated with climate change also emerged in a study on elderly residents' perceptions of their vulnerability to heat waves (Wolf, Lorenzoni, Few, Abrahmson, & Raine, 2009). Although the elderly are among the most vulnerable to heat waves, those interviewed did not recognize their increased risk. This type of thinking is maladaptive when it reduces the frequency of precautionary actions such as buying fans or staying indoors on hot days. In sum, individuals readily distance climate change from their personal realm, which suggests that effective communication strategies should aim to reduce the gap between climate impacts and personal concerns. The current study contributes to the inquiry of how distance influences climate change engagement by focusing on spatial distance (i.e., local vs. global).

Effective Climate Change Messages

Some specific guidelines and strategies for effectively communicating the issues of climate change have begun to emerge (e.g., Futerra, 2005; Moser & Dilling, 2007). For example, climate change messages may be more effective when they incorporate an element of novelty, capture attention, demonstrate personal relevance, appeal to rational thought and emotion, and clearly state a course of action (National Endowment for Science and Technology Association [NESTA], 2008). Another effective tool is to use social normative information to convey that many people have begun to reduce their climate impact, and such action is socially valued (e.g., Bator & Cialdini, 2000; Schultz, Khazian,

& Zaleski, 2008). Climate change–related messages should also address citizens' prior beliefs, values, motivation, and shared cultural meanings (Chess & Johnson, 2007).

Others have found that gain frames (e.g., "by mitigating climate change, negative impacts can be prevented") increased positive attitudes toward climate change mitigation more so than loss frames (e.g., "without mitigating climate change, negative impacts will worsen"; Morton, Rabinovich, Marshall, & Bretschneider, 2011; Spence & Pidgeon, 2010). A related finding is that messages that frame the issues more optimistically, or focus on personal efficacy and the power of collective actions, may be more effective than negative message frames such as those that appeal to fear or portray the sacrifices involved in action (Feinberg & Willer, 2011; Futerra, 2005; Gifford & Comeau, 2011; NESTA, 2008; O'Neill & Nicholson-Cole, 2009).

Based on Americans' thoughts about climate change, Leiserowitz (2007) proposed five additional strategies to effectively communicate the issues. First, messages should illustrate the local and regional impacts of climate change because these may be more captivating than global impacts, and yet citizens do not often include them in their mental representations of climate change. Second, to reduce temporal distance from the issue, climate change should be framed as an immediate, current problem, rather than a remote threat. Third, because citizens rarely connect climate change to health threats or extreme weather, messages that incorporate these elements may increase concern. Fourth, existing uncertainties should be acknowledged so that the audience retains trust in the speaker. A fifth strategy is to target messages to specific groups and address the particular barriers to climate action that they face.

In sum, the guidelines that have begun to accumulate provide a logical starting point for climate change communications. However, additional message-framing research is important to identify new options for communication, establish the relative effectiveness of the various guidelines, and determine which guidelines are most effective for which audiences.

Personal Relevance and Locally Framed Messages

Given that psychological distance is a common hindrance to the reception of climate change information, effective communication campaigns might attempt to reduce such distance by demonstrating personal relevance. Indeed, social-psychological theories highlight the importance of personal relevance in effective attitude change. In their review of the principles of social judgment and persuasion, Kruglanski and Sleeth-Keppler (2007) argued that the

type of information or the content is not the main determinant of the impact of a message; rather, subjective relevance, task demands, and presentation sequence are more important. Others have similarly claimed that as personal relevance of a message increases one's interest and effort in processing the message also increase (e.g., Maio & Haddock, 2007).

How can climate change messages be made more personally relevant? One suggested but undertested proposition is that messages would be more effective if they captured the local materialization of climate change, including the regionally relevant activities that contribute to the problem, the felt and projected impacts, and the local opportunities for emissions reduction (Kates & Wilbanks, 2003; Leiserowitz, 2007; Nicholson-Cole, 2004). For instance, a survey of four U.S. areas found that although concern about global climate change was low, citizens had taken action against local environmental problems, such as a pollution cleanup effort at Lake Erie; if climate change problems acquired local status, perhaps similar collective action would be possible (Kates & Wilbanks, 2003). Furthermore, local initiatives could be encouraged by communication campaigns that convey the local economic and environmental benefits of emissions reduction. Because individuals tend to think about climate change in terms of global or future images (Leiserowitz, 2005), messages that focus on geographically local and current images might reduce perceived distance to the problem, and thereby increase engagement.

Local climate change visioning is one successful example of how projected global climate changes can be translated to local terms, and effectively communicated to citizens (Sheppard, 2005). Through an extensive process that combines spatial modeling and imagery, realistic scenarios of how local places would change under different climate trends are created. These scenarios range from severe climate impacts expected to occur in the absence of mitigative or adaptive actions, to moderate changes that would occur under minimal adaptation to key risks, and most optimistically, to scenarios of low-carbon communities that mitigate the impacts of climate change wherever possible, and adapt to the already inevitable impacts. After attending one of these visioning workshops, participants were more aware of local climate change impacts, believed that urgent action was more necessary, understood possible courses of action, and were more willing to support mitigation and adaptation policies (Sheppard, 2005). This supports the idea that locally framed messages might be effective. Nevertheless, this generalization remains to be confirmed, especially given that visioning is more complicated and more involved than simple message delivery, and that local and global impacts were not compared.

This local–global distinction was addressed as part of a multistage investigation of climate change "icons" and engagement in the United Kingdom

(O'Neill & Hulme, 2009). In the first stage, participants selected, and explained their choices of, important climate icons. These explanations related to the spatial scale of the icon (from local to distant) as well as pragmatic (e.g., logical) and intangible (e.g., affective) reasons. In Stage 2, projected impacts of climate change on these nonexpert icons along with a selection of expert-led icons, were modeled over a time scale of 50 years. In Stage 3, participants' engagement with the icons selected by experts (i.e., thermohaline circulation, ocean acidification, and the West Antarctic ice sheet) and nonexperts (i.e., the Norfolk Broads wetland, the Thames Estuary in London, and polar bears) was assessed. In general, participants better understood, were more drawn to, and were more interested in the nonexpert icons. Notably, two of the three nonexpert icons that situated climate change as less geographically distant, including the Norfolk Broads wetland (a local-level icon) and the Thames Estuary (a national-level icon) were perceived to be the most personally relevant. This supports the view that local climate change messages may be particularly effective in engagement.

The effectiveness of framing climate change impacts in local versus distant terms has also been tested experimentally (Spence & Pidgeon, 2010). In contrast to the proposition that local messages should be more engaging because they are more personally relevant (e.g., Leiserowitz, 2007), neither local (i.e., the United Kingdom and South Wales) nor distant (i.e., Rome) message frames appeared to alter people's attitudes toward climate change mitigation. The authors suggest that an optimism bias about local conditions reduces the perception that climate action is important, and the distant messages portray problems that are too far removed to effect action.

These contrasting findings point to the need for more research on the effects of local message frames. Consistent with Spence and Pidgeon's (2010) research, "local" impacts in the current study referred to regionally relevant impacts that posed threats to the local environment (i.e., occurring within a radius of approximately 50 km from participants' homes). We selected "global" rather than "distant" message frames because global impacts can have far-reaching effects that may be less easily discounted than distant impacts that could be thought of as someone else's responsibility. In addition, global frames are common to climate change–related media, and so it is important to know how such messages are received by individuals.

Place Attachment

Part of the study of climate change communication involves identifying the characteristics of the target audience, and determining their receptivity to different types of messages (Hovland, Janis, & Kelley, 1953). For example,

six profiles of Americans who differ in their attitudes toward climate change have been generated (Maibach, Roser-Renouf, & Leiserowitz, 2009).

One potentially important audience variable that has not yet been investigated with respect to climate change is *place attachment*, the formation of emotional and cognitive bonds with a particular place. Places become personally important through memories of them (Manzo, 2005; Twigger-Ross & Uzzell, 1996), their cultural or religious significance (Mazumdar & Mazumdar, 2004), their opportunities for belongingness and community (e.g., Fried, 1963; Woldoff, 2002), and their provision of physical comfort and goal support (Kyle, Graefe, Manning, & Bacon, 2004; Stokols & Shumaker, 1981). When place is incorporated into one's self-definition, it is referred to as place identity (e.g., Proshansky, 1978; Proshansky & Fabian, 1987; Proshansky, Fabian, & Kaminoff, 1983).

Recently, the diversity of person–place bonds has been organized into a tripartite framework, in which place attachment consists of person, process, and place dimensions (Scannell & Gifford, 2010a). The person dimension describes who is attached and whether the attachment is based on individually or collectively held meanings, the process dimension describes the affective, cognitive, and behavioral content of the person–place bonds, and the place dimension describes the qualities and specificity of the place to which one is attached.

We postulate that strong connectedness to place is important to climate change attitudes and behaviors because it can sometimes engender place-protective intentions (e.g., Nordenstam, 1994; Stedman, 2002). For example, residents who were more attached to their community expressed more opposition to a proposed freeway (Nordenstam, 1994). Place attachment is also associated with more self-reported proenvironmental behaviors (e.g., Clayton, 2003; Scannell & Gifford, 2010b; Vaske & Kobrin, 2001). One study demonstrated that youth working on local natural resource projects who were more emotionally attached to the area reported more proenvironmental behaviors than those who were less attached (Vaske & Kobrin, 2001). Thus, individuals may be more willing to exert effort to protect their meaningful places.

However, as Brown, Altman, and Werner (in press) and others (e.g., Devine-Wright & Howes, 2010; Edelstein, 1988; Kyle et al., 2004) have noted, place attachment does not unequivocally lead to place protection, and it may even underlie actions that are harmful to one's place. For example, users of the Appalachian Trail with high levels of place dependence were less opposed to problems along the trail such as crowding, litter, and noise (Kyle et al., 2004), possibly because these problems were by-products of their place use. That is, the physical aspects of the place may suffer as people cling to certain place meanings incompatible with place preservation. Similarly, place attachment

could reduce climate change engagement if climate actions appear to threaten the status quo of existing place meanings, as demonstrated in a sample of U.K. residents who opposed the proposals to plant wind farms in their local area (Devine-Wright & Howes, 2010).

Although the role of place attachment in citizens' receptivity to climate change communication efforts has not yet been tested, those who are more attached may be more engaged by messages that portray unwanted local impacts created by climate change.

Research Questions and Hypotheses

This study addresses two main questions:

> *Research Question 1*: How do messages that emphasize the local versus global impacts of climate change influence citizens' engagement in climate change issues?
>
> *Research Question 2*: Does this receptivity depend on the extent to which citizens feel attached to their local areas?

We expect that engagement with climate change issues depends on the local versus global frame of the message and the strength of one's place attachment. Therefore, the first hypothesis is that local messages will be the most effective message frame. The second hypothesis, based on the previous literature on place attachment and proenvironmental behavior, is that place attachment will be associated with increased climate change engagement. The third hypothesis is that place attachment and the message condition will interact: We expect that the greatest engagement will be observed among attached individuals who receive local messages.

Method

Measures

Climate change engagement was operationalized in two ways: engagement with the presented climate change message and engagement with climate change issues in general. First, participants completed a seven-item survey that assessed the extent to which they viewed the particular message to be effective. For instance, they assessed the message for its personal relevance, its ease of understanding, and its ability to elicit engagement. These items were adapted from O'Neill's (2008) study. The response options ranged from 1 (*very low*) to 7 (*very high*).

Second, participants completed a 16-item questionnaire that asked them to indicate their engagement with climate change issues. This measure was also adapted from O'Neill's survey, with some items added from O'Connor, Bord, and Fisher's (1999) survey. Following Lorenzoni et al.'s (2007) definition of climate change engagement, items should reflect the affective, cognitive, and behavioral components of climate change engagement. For example, one of the behavioral items asked "How likely are you to seek out information about climate change?" Because a greater range of response options is thought to improve reliability and validity (e.g., Reiss & Judd, 2000), we used a 7-point scale rather than the original 5-point scale. In addition, we reorganized these response options for ease of interpretation such that greater numbers represented higher agreement (i.e., 1 represented *strongly disagree* and 7 represented *strongly agree*).

To assess place attachment, items from two previously published measures were included (i.e., Billig, Kohn, & Levav, 2006; Jorgensen & Stedman, 2001). Both measures have demonstrated excellent reliability in past studies (both had Cronbach's α values of .89). Jorgensen and Stedman's (2001) 12-item sense-of-place scale was adapted from Williams and Roggenbuck's (1989) 27-item measure and from Williams, Anderson, McDonald, and Patterson's (1995) later version. Their scale is comprised of 4 items related to place identity (e.g., "This place is part of who I am"), 4 related to affective attachment (e.g., "I feel happiest when I'm in this place"), and 4 related to place dependence (e.g., "For doing the things that I enjoy most, no other place can compare to here"). Billig et al.'s (2006) scale initially was created to measure attachment to the Gaza region. Six items from this 13-item scale were added because they represent a broader definition of place attachment than that offered by Jorgensen and Stedman. These items encompass a spiritual connection (e.g., "The spiritual nature of the area ties me to this place"), a sense of "at homeness" (e.g., "I feel that this city is my home"), an intention to stay ("I intend to continue living here for the next 3 years"), and other relevant aspects of the person–place bond.

Two items that are typically part of place attachment operationalizations (e.g., Brown & Perkins, 1992) but were missing from the above scales were also included. These capture participants' feelings of pride and attachment toward place. All items were answered using 7-point Likert-type response scales that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). In total, the place attachment measure included 20 items.

Information Posters

Participants in the local and global conditions received a one-page information poster that consisted of text and photographs. To control fluency, length, and

message content, all messages were constructed based on a template. That is, the messages were written to be as similar as possible to each other, with necessary information about the local or global frame altered. For the global frame, impacts were described in terms of their broad effects expected to occur on a global scale. Specifically, individuals in the global message condition read posters about global sea levels rising due to melting ice sheets in the polar regions. To frame local messages, the climate impact described was one that was relevant to the participant's particular local area (i.e., the Kootenay, Okanagan, or Vancouver Island region of British Columbia), and specific place names were used. These local climate change impacts were selected based on consultation with provincial government climate change impact experts, who identified salient climate impacts in each of the study areas. Specifically, the poster for the Okanagan region was about forest fires, the poster for the Kootenay region was about the mountain pine beetle infestation, and the poster for the Vancouver Island region was about rising sea levels.

A focus group of 11 upper level university students provided feedback on the posters, and they were revised accordingly. Technical suggestions included enlarging the size of the photographs and darkening the photograph of the ocean so it looked less tranquil. Suggestions for revisions to the text included adding more information about the implications of the impacts to humans and portraying the impacts in a way that made them appear more extreme. This construction of information is comparable with that done in Spence and Pidgeon's (2010) study, but is unlike O'Neill and Hulme's (2009) study, which relied on accurate information from the Intergovernmental Panel on Climate Change. Participants were informed of this inaccuracy at the debriefing stage.

Two pilot studies (each consisting of approximately 30 university students) further informed the revision of the climate change messages. For example, the posters were revised to incorporate an element of self-efficacy, suggesting specific ways that individuals could take action against climate change. Moreover, given that frequency of exposure to a concept is important in effective priming (e.g., Förster & Liberman, 2007), the frequency of local or global words on the posters was increased, and more specific examples were added. Two of the final posters are presented in the online appendix.

A second change was to further enhance the local versus global priming. The more an individual processes the prime, the more effective it will be (Förster & Liberman, 2007). Thus, to further increase the priming of local versus global impacts, an added question asked participants to write an additional local or global climate change effect that they have noticed or could imagine happening. Finally, O'Neill's climate change scale was slightly revised. This scale assesses preexisting attitudes and beliefs about climate change,

which may not be easily altered after brief exposure to a message. Therefore, the scale was refined such that it measures *interest* in climate change actions as well as *willingness to act or attend to information*.

Recruitment

Individuals for the main study were recruited by delivering letters to residents along randomly selected postal routes in the three study areas (i.e., Vancouver Island, the Okanagan, and the Kootenays). Those interested in participating read the consent form and returned the survey in self-addressed stamped envelopes. The consent form outlined the steps of participation and very generally described the study as one that investigated attitudes and beliefs about one's local area, so that participants would not initially be aware of either the climate change or the place attachment aspects of the study. Of approximately 2,700 surveys that were mailed out, 332 were returned, for a response rate of 12.30%. Of these surveys, 5 were returned incomplete, 1 of which was sent back with no explanation. Another was returned by a 92-year-old woman who stated that her responses would not be helpful given that she would not be around long enough to see the impacts of climate change. Three blank surveys were sent back by individuals who do not believe in climate change. As one of them wrote, "There are many conflicting reports ad nauseam about climate change—and dishonesty in reporting—Mother Earth is just doing her thing."

Participants

Therefore, the participants were 327 adult residents from three regions of British Columbia, including the West Kootenays (*n* = 106), the Okanagan Valley (*n* = 116), and Vancouver Island (*n* = 105). These areas were of interest because they are culturally and geographically diverse, and experience different climate change impacts: pine beetle deforestation in the Kootenays, forest fires in the Okanagan, and rising sea levels on Vancouver Island. The selection of three local areas allowed us to operationalize "local impacts" in different ways, and thus, improve the construct validity of this variable as well as assess the generalizability of findings to individuals living in qualitatively different regions.

Participants varied in their annual income (ranging from C$2,000 to C$700,000, median = C$40,000), age (ranging from 18 to 95 years old, *M* = 54.30, *SD* = 16.07), and length of residence in the local area (ranging from 4 months to 67 years, *M* = 22.44, *SD* = 16.07). Occupation also varied widely, including diverse professions such as farmer, accountant, university

professor, occupational therapist, teacher, and laborer. The majority of participants reported owning their residence (72.5%), although some rented (24.9%) or lived with family and did not pay rent (2.4%). Participants' education was coded from 1 (*did not complete high school*) to 6 (*completed graduate school*) but on average it was above the midpoint of 3, which was *some college or trade school* ($M = 3.46$, $SD = 1.17$). In addition, slightly more participants were female ($n = 175$) than male ($n = 145$). Compared with provincial statistics from the 2006 census (British Columbia Stats, 2010), our sample was slightly more educated and possessed a higher median income. However, distributions of homeownership, gender, and age were comparable. Demographic information by region is presented in Table 1. As compensation for their time, participants were given the opportunity to enter their name into a lottery draw to win a prize of C$100.

Procedure

Participants were randomly assigned to one of three message conditions (i.e., local, global, and control). Those in the local condition read about a climate change impact relevant to their local area (e.g., Vancouver Island residents read about rising sea levels). Those in the global condition read about a global climate change impact. They then completed the Message Effectiveness Scale, the Climate Change Engagement Questionnaire, and the Place Attachment Questionnaire. Participants in the control group did not read any message but completed the latter two questionnaires. After completing the questionnaires, participants read the debriefing form, which outlined the purposes of the study in greater detail and thanked them for their time and participation.

Because participants completed the questionnaires from their homes, the order of task completion could not be monitored. However, to guide participants through the steps of participation, the instructions of participation were clearly listed and printed on a yellow sheet of paper, and all materials were stapled together in the intended order of completion.

Results

Data Cleaning and Scale Preparation

All quantitative variables were inspected for errors in data entry, the percentage of missing values, and the presence of outliers. In the rare instance that values outside of the range of response options were found, the original surveys were consulted for the correct value. The Z scores and boxplots of each item were examined to assess the presence of outliers. One participant

Table 1. Means and Standard Deviations of Continuous Demographic Variables, Place Attachment, Message Effectiveness Ratings, and Climate Change Engagement by Region

	Vancouver Island			Kootenays			Okanagan		
	n	M	SD	n	M	SD	n	M	SD
Length of residence	104	21.17	14.68	105	24.14	17.44	109	22.00	15.98
Income	81	C$60,825	C$53,515	81	C$47,504	C$45,290	85	C$47,883	C$28,157
Education level	101	3.89	1.01	105	3.32	1.12	112	3.20	1.25
Age	103	52.60	16.43	105	51.10	15.78	112	58.86	16.98
Place attachment	104	5.10	1.14	105	5.61	0.98	115	5.47	1.15
Climate change engagement	104	4.80	1.25	105	4.84	1.41	115	4.98	1.32
Message effectiveness	66	5.28	1.15	70	5.19	1.40	83	5.70	1.14

Note: Length of residence and age are in years. Education level was coded as follows: 1 = *did not complete high school*, 2 = *completed high school*, 3 = *some college or trade school*, 4 = *completed university*, 5 = *some graduate school*, and 6 = *completed graduate school*. Place attachment, climate change engagement, and message effectiveness ranged from 1 = *not at all* to 7 = *very much so*.

reported an income of C$700,000, which was 11 standard deviations above the mean. This value was winsorized such that one standard deviation was added to the second highest score (e.g., Field, 2005).

Of the 327 participants, 3 were missing more than 25% of their data, and so their data were removed. A missing-value analysis was then performed on the remaining data, with the exception of the demographic variables. This revealed that few values were missing; specifically, 83 data points were missing, which is less than 1% of the data.

A total of 18 participants who had completed the surveys actively denied the existence of climate change and the science behind it (as indicated by their comments). These participants were removed from further analyses, in part, because their extreme attitudes rendered them outliers. In addition, this decision was informed by Maibach et al.'s (2009) assertion that "dismissive" audiences actively deny climate change and possess rigid attitudes. The effectiveness of presenting climate change impacts as local or global would be irrelevant to an audience who does not believe in the science of climate change to begin with (Fahnestock, 1986). As such, results from this study will generalize only to those who accept that anthropogenic climate change is occurring.

Scale Reliabilities

The three scales fared very well on assessments of internal consistency. The 7-item Message Effectiveness Scale demonstrated high reliability ($\alpha = .89$), as did the 16-item Climate Change Engagement Scale ($\alpha = .93$). However, the corrected-item total correlation revealed that one item ("How complicated is climate change for you to understand?") did not correlate well with the scale's total score. Therefore, this item was not included in the climate change engagement index, and the reliability of the scale was improved ($\alpha = .94$). The 20-item Place Attachment Scale also presented excellent reliability ($\alpha = .94$).

Descriptives

The scale indices were then constructed. First, negatively worded items were reverse coded. Next, missing data from all scale items were replaced using mean replacement, a method considered appropriate given the low percentage of missing data (Field, 2005). Finally, items within each scale were summed and averaged so that scores would remain on a continuum ranging from 1 to 7, for ease of interpretation.

Means and standard deviations for each of the three scales showed that participants reported moderate levels of climate change engagement ($M = 4.88$,

SD = 1.33) and that this did not significantly differ by region, $F(2, 321)$ = .60, p = .55. Average message effectiveness ratings were also high (M = 5.41, SD = 1.25). However, these ratings did differ significantly by region, $F(2, 216)$ = 3.67, p = .03. Follow-up Games–Howell post hoc tests showed that message effectiveness ratings in the Okanagan region were significantly higher than message effectiveness ratings in the Kootenay region. Residents in all three regions reported fairly high levels of place attachment (M = 5.40, SD = 1.11), but place attachment was significantly greater among Kootenay and Okanagan residents than among Vancouver Island residents, $F(2, 321)$ = 6.02, p = .003. Means and standard deviations of the indices are presented in Table 1.

Significant correlations among the predictors ranged from r = −.13 (being female was associated with a shorter length of residence in the given local area) to r = .34 (being female was associated with being older). Intercorrelations were low enough that multicollinearity was not a concern. In support of this, both the average variance inflation factor (1.23) and the average tolerance value (.79) were within the acceptable limits (e.g., Menard, 1995; Myers, 1990).

Regression

The hypotheses were tested using multiple regression. Thus, the categorical variable "message condition" was dummy coded so that it could be included in the regression. Specifically, it was recoded into two dummy variables, using the control condition as the reference category. To test the third hypothesis that climate change engagement will be strongest among those with strong place attachment who receive a local message, interaction terms were created by centering the place attachment variable and then multiplying it by each of the message condition dummy variables (Aiken & West, 1991).

Message type, place attachment, and climate change engagement. A hierarchical linear regression analysis was conducted to explore the effects of message type, place attachment, and several demographic variables on climate change engagement. Using climate change engagement as the criterion variable, the predictors were entered into the regression in three steps. The demographic variables were entered as covariates in the first step and included gender, age, length of residence, and education level. Income was not included in the regression because it was missing approximately 25% of responses and thus, had not been mean replaced. The key predictors were entered on the second step and included the dummy-coded message condition variables and place attachment. The interaction terms (i.e., each dummy-coded message condition variable multiplied by centered place attachment) were both entered on the third step.

Table 2. Regression Coefficients for Predictors of Climate Change Engagement
(*N* = 291)

		Step 1	Step 2	Step 3
	r	β	β	β
Length of residence	−.13*	−.11	−.16**	−.13*
Education level	.04	.00	.02	.02
Age	−.16**	−.03	−.03	−.05
Gender	.24***	.18**	.16**	.17**
Place attachment	.28***	—	.28***	.30**
Dummy 1 (local message vs. control)	.10	—	.12*	.12*
Dummy 2 (global message vs. control)	.01	—	.07	.05
Place attachment × Dummy 1	—	—	—	.17*
Place attachment × Dummy 2	—	—	—	.12

Note: R^2 = .06 at Step 1, R^2 = .15 at Step 2, and R^2 = .16 at Step 3. Because R change was not significant at Step 3, the interaction effects cannot be further interpreted.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

The linear combination of the key predictors and demographic variables explained a significant 14.8% of variance in climate change engagement, $F(7, 295)$ = 7.14, $p < .001$. The effect size, represented by Cohen's f^2, was .17, indicating a medium effect (Cohen 1988). The coefficients are presented in Table 2. Further examination of the results revealed that the local message increased climate change engagement relative to that of the control group, β = .12, $t(288)$ = 1.94, p = .05, which supports the first hypothesis.

In support of the second hypothesis, place attachment significantly predicted climate change engagement, β = .29, $t(288)$ = 5.11, $p < .001$. In addition, gender (i.e., being female) was a significant unique predictor, β = .17, $t(291)$ = 3.65, $p < .001$. The omnibus test of the overall Place Attachment × Message Condition interaction was not significant, $F(2, 286)$ = 2.70, p = .07, indicating that the interaction effects could not be interpreted further. Because the design had the power to detect a medium effect size, if an effect of message condition interacting with place attachment exists, it is unlikely to be medium or larger in magnitude.[1]

Discussion

Fostering effective public engagement with climate change issues will require multiple approaches. Messaging is one approach, and the current study lends evidence to the notion that locally framed messages (but not globally framed

messages) are more engaging than receiving no message at all. Climate change engagement may also vary according to the characteristics of the message audience. In particular, this study is the first to our knowledge to show that residents who have stronger place attachment are more engaged with climate change issues. In an unhypothesized result, women tend to report higher levels of engagement than men.

Local Messages and Climate Change Engagement

In partial support of the first hypothesis, that local messages are more effective than global messages, climate change engagement was greater among those who had received a local message, as opposed to receiving no message at all. However, engagement did not differ among those who had read a global message and those in the control group. Not surprisingly, climate change–related attitudes are difficult to change with one simple message presentation. However, when climate change messages are employed, locality may improve individuals' receptiveness to the information.

This is consistent with Maio and Haddock's (2007) view that personally relevant messages are more persuasive. They propose that personal relevance heightens one's motivation and ability to process the message. Climate change conceptualized in local terms may be more tangible and more comprehensible. Our results therefore also support personal relevance as a guideline for effective climate change communication and offers local framing as one potential means to this end (e.g., Leiserowitz, 2007; NESTA, 2008). An interesting extension of this research would be to further investigate the effectiveness of local messages within varying media, such as through testimonials, video, or images with greater scope and meaning such as those used in climate change visioning research (i.e., Sheppard, 2005).

However, this finding is incongruent with a recent study which found that geographically local or distant message frames did not differentially alter attitudes toward climate change mitigation (Spence & Pidgeon, 2010). This difference may have occurred for a number of reasons, such as our use of a larger sample consisting of Canadian community members (rather than university students in the United Kingdom), or our use of different impacts (i.e., forest fires and mountain pine beetle), which could be more salient or certain than sea level rise. These differences suggest that more research is needed in this area.

Place Attachment and Climate Change Engagement

In support of the second hypothesis, climate change engagement was greater among those who were more attached to their local areas. Thus, it empirically

supports Gifford's (2011) proposition that lack of attachment with place is one of the key barriers to climate action. That connections to one's local area can indeed translate into concern for this broader issue is interesting. How might this relationship emerge? One possibility is that when individuals recognize that the impacts of global climate change have local implications, they may become more averse to its risks and then mobilize themselves to act. This is congruent with previous research which has shown that place attachment evokes opposition to place threats and motivates place-protective behavior (e.g., Scannell & Gifford, 2010b; Stedman, 2002; Vaske & Kobrin, 2001).

Another explanation is offered by interpersonal attachment theory. Given the overlap between place attachment and interpersonal attachment (see, for example, Giuliani, 2003), principles from the latter theory may inform the former. A key attachment theory principle is that individuals seek out and rely on their attachment figures for emotion regulation and support (Shaver & Mikulincer, 2007). Maintaining proximity to the attachment figure (through physical means or even by evoking a mental representation of them) is initiated when individuals experience threat. For example, exposing participants to death-related primes increases recall of positive experiences of their primary caregiver and decreases recall of negative experiences (Cox et al., 2008). Thus, perhaps climate change threats increase accessibility of place attachment constructs, and people obtain some solace from this threat by reaffirming their place bond. In other words, judgments of climate change as an important and worrisome issue may heighten perceived place bonds. In sum, the directionality of the effect between place attachment and climate change engagement remains unclear but would be an interesting avenue for future research.

Gender and Climate Change Engagement

The issue of gender and climate change engagement has received very little research attention thus far (APA Task Force, 2009; Terry, 2009). We found that women reported higher levels of climate change engagement than men. Indeed, women often report more environmental concern than men (e.g., Gifford, Hay, & Boros, 1982), but present results indicate that this trend also applies to climate change. Despite higher levels of engagement, Terry (2009) asserted that women experience additional barriers in mitigating and adapting to the effects of climate change, particularly when they lack access to financial capital, cannot implement low-carbon options, or are excluded from climate change–relevant decision making. Thus, women could potentially be targeted as early adopters and social models of mitigation and adaptation strategies, but this must occur in concert with the provision of aid, and the explicit inclusion of women in policy making (Terry, 2009). A broader

research issue that will require additional attention is how to empower and educate women of lower socioeconomic statuses in climate change issues.

Limitations

Several limitations should be noted. The first is that although local message framing appeared to influence climate change engagement, the simplicity of the messages may have attenuated its influence. Ideally, local messages would be even more idiosyncratic to the particular region, and would be presented in more captivating media such as art and video. Nevertheless, results show that incorporating an element of "localness" into a climate change message appears to be a worthwhile strategy.

A second potential problem is that we could not ensure that participants read the information and completed the questionnaires in the predetermined order. If some participants did not follow instructions and completed the questionnaires before reading the messages, this would have increased error rather than bias (i.e., the framing effects would be lessened, and engagement would appear similar to those in the control condition). However, if participants had read the debriefing form first, social desirability effects may have emerged. Nevertheless, the clarity of instructions and the arrangement of materials may have prevented this possibility. Participants were provided with clear instructions for the sequence of steps in participation, and all materials were stapled together in the intended order of completion.

A third problem is that the number of deniers in our sample (approximately 6%) was too few to evaluate their responses to the messages in comparison with the rest of the sample. Furthermore, this small percentage is less than the Canadian national average of about 14% (Borick, Lachapelle, & Rabe, 2011).[2] Ultimately, the primary goal of the present study was to examine how to engage individuals in climate change issues. How to reform the beliefs of deniers remains an important topic for future research (see, for example, Dunlap & McCright, 2011; Norgaard, 2011).

Conclusion

This study investigated predictors of climate change engagement in a community sample of residents in three regions of British Columbia. It provides improvements to the measurement of climate change engagement and advances understanding of climate change mitigation by considering the role of place attachment and local message framing. A sense of connectedness to place has broad implications; local ties are relevant to engagement with climate change issues, and thus, individuals with strong place attachment may serve as a

promising group to whom adaptation and mitigation strategies could be promoted. Based on the results, another target audience is women, who showed greater receptivity to climate change issues than men. Beyond that, local message frames appear to improve communication of negative climate impacts. These results provide empirical evidence for several untested propositions about climate change communication and barriers to climate action.

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Notes

1. We also conducted a hierarchical linear regression to explore the influence of the same predictors on message effectiveness, the results of which very closely mirrored the ones conducted for climate change engagement, $R^2 = 23.7\%$, $F(8, 189) = 7.34$, $p < .001$. This was not surprising given that climate change engagement and message effectiveness were highly correlated, $r = .86$, $p < .001$.
2. This poll also reported that a greater percentage of Americans (i.e., 26%) believe that there is "not solid evidence of global warming."

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