

COMMUNICATING HOPE ABOUT SOCIETAL ISSUES:
THE CASE OF CLIMATE CHANGE

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DEDICATION

This is dedicated to the current and future generations of this planet, who are and will be living with the effects of climate change that we are bequeathing to them.

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ABSTRACT

COMMUNICATING HOPE ABOUT SOCIETAL ISSUES: THE CASE OF CLIMATE CHANGE

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Research indicates that news media coverage of climate change in the United States has emphasized the harms of warming more so than potential solutions (Hart & Feldman, 2014; O'Neill, Williams, Kurz, Wiersma, & Boykoff, 2015), or what is known as “the hope gap” (Upton, 2015). It is thus not surprising that many express a feeling of fatalism or helplessness in the face of climate change (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). This dissertation develops a theory of hope as it pertains to social issues and applies it to climate change, based on appraisal theories of emotion (Lazarus, 1991b; Ortony, Clore, & Collins, 1988; Roseman, 1984), positing cognitive summative evaluations of a situation (appraisals) as precursors for emotion. I develop a more in-depth set of measures of the emotion of hope in response to climate change than previous researchers, based on how hope has been measured in contexts other than climate change. Two survey studies were employed to analyze hypotheses related to the antecedents,

internal structure, and consequents of societal issue hope, including an embedded experiment in one survey employed to investigate hypotheses about message processing. Results support the validity of the measurement and conceptual approach, and provide support for some of the core theoretical claims, while challenging several other predictions and offering novel insights, such as identifying a sub-population of apparent stoic optimists who persist in feeling hopeful about climate change despite their intense skepticism that humanity will succeed in rising to the challenge.

CHAPTER ONE: INTRODUCTION

“All is not lost. Human beings, while capable of the worst, are also capable of rising above themselves, choosing again what is good, and making a new start.”

—Pope Francis, encyclical *Laudato si'*, On care for our common home

From theology (e.g., Tillich, 1965) to neurology (Sharot et al., 2012), hope has received extensive scholarly treatment and occupies a central place in the colloquial lexicon and many aspects of culture. The classic early psychological conception of hope is that of a general positive expectancy for goal attainment in life (Stotland, 1969). Research has found that possessing hope about positive outcomes in one's personal life (either generally or related to a specific topic such as the course of illness) is associated with well-being (Magaletta & Oliver, 1999) and success in goal-directed activities as a result of greater motivation and persistence in the face of barriers or initial failure (Snyder, Harris, et al., 1991). Conversely, lack of hope (hopelessness) produces fatalistic inaction (Farran, Herth, & Popovich, 1995; Stotland, 1969).

Yet, for societal issues, only a small body of research has investigated what impact hope may (or may not) have on efforts by individuals to contribute to solving collective problems (cf. Snyder & Feldman, 2000). No broadly-accepted definition or

measures exist for hope generally, and certainly not pertaining to societal issues, nor any established theory linking hope to attitudes, beliefs, and behaviors beyond the personal realm.

Little research in either the personal or societal issue contexts has investigated the concomitant question of how communication may impact hope. The importance of these questions is perhaps nowhere more apparent than on the topic of society's response to climate change. The predominant discourse of climate change appears toxic to hope—full of apocalyptic imagery and pessimistic predictions—yet the issue stands as one of the greatest and most urgent challenges of our time.

This dissertation seeks to offer insight into the nature of hope about societal issues and the role of communication, with a specific focus on climate change. It proposes a theory of hope as it operates in the realm of societal issues, covering hypothesized causes and consequences of hope and the role of hopeful messages. It then tests these theories using survey and experiment data related to the topic of climate change.

CHAPTER TWO: LITERATURE REVIEW AND THEORY

What is Hope?

General usage. Hope has several uses in everyday language which are quite distinct. Hope in its verb form may refer to a preference for a certain outcome, as in expressions such as “I really hope the new iPhone offers teleportation.” Alternatively, it is used in its noun form to denote confidence that an outcome is likely, as in “I have a great deal of hope that teleportation will be included in the new iPhone.” This latter usage also carries the connotation that the outcome is not only likely but highly desired. For many, hope stands for the highest and most sublime aspirations of individuals and groups. As opposed to these judgments and evaluations of external events, hope may also express intention, as in “it is my hope to complete my book this month.” In some usage the word hope takes on a metonymic function, as a signifier for that which offers hope, as in “he is our only hope for salvation.” The Oxford American Dictionary describes the first meaning of the noun hope as “a feeling of expectation and desire for a certain thing to happen.” It is this sense of the word that has received the bulk of scholarly attention, and the one that I will employ in this dissertation.

Perhaps as old as concept itself is the debate over whether hope represents a foolish or a realistically optimistic perspective. Or perhaps both: “Hope is easy for the foolish, but hard for the wise. Everybody can lose himself into foolish hope, but genuine

hope is something rare and great" (Tillich, 1965, p. 17). Some see hope as a likelihood evaluation for some desired event (e.g., Stotland, 1969), and thus deriving from a calculation weighing available evidence. For others (see review in Snyder, 2000b), hope involves less the systematic consideration of available evidence but rather what an individual chooses to believe in the absence of or in lieu of available information, and in fact may be displayed as a willful maintenance of belief in the face of countervailing evidence (and to this extent it is "blind hope"). In the arena of climate change, foolish hope in the form of undue optimism has been implicated in the failure to morally engage with the issue (Markowitz & Shariff, 2012). Yet a long tradition of research on the psychological role of hope in goal oriented behavior indicates that even "foolish" hope may have a beneficial placebo effect in encouraging striving (Snyder, 2000b, p. 4).

Past literature. Hope is such a fundamental notion and can refer to such a range of human experience that it would be impossible to trace a comprehensive picture of its many meanings and applications in scholarship. To suggest such breadth, however, I will mention one application of hope in the field of religion before focusing my review on those conceptualizations more akin to my intended use of the term.

Hope features prominently in many theologies, and especially Christianity. The concept of courage is central to the work of Christian existential theologian Paul Tillich, with hope in the face of hopelessness as the courageous exercise of faith in the face of an otherwise meaningless world (Tillich, 2000). Along with faith and love, it stands for him as one of the signature Christian virtues. For Tillich, hope thus exhibits a transcendent quality above calculations of specific probabilities and instead stands for a foundational

belief in possibility. Meanwhile, social scientists have debated the role of religiosity and spiritual wellbeing in hope. Some have seen religiosity and spirituality as antecedents to hope (Herth, 1989), others have seen them as consequences of hope (Fehring, Miller, & Shaw, 1997), and yet others have conceived of them as a component part of hope itself (Scioli, Ricci, Nyugen, & Scioli, 2011). The richness of the concept of hope has led to such varied results for many other scholars beyond the study of religion as well.

The oldest tradition of the study of hope within the social sciences dates from research principally in the 1960's that conceptualized hope as belief in the probability (or positive expectation) of personal goal attainment (e.g., Stotland, 1969). It is thus unidimensional, a stable personality trait, and not associated with any particular object, but rather a broad characterization of an individual's outlook. This hope does not carry with it any additional elements related to more detailed beliefs, reasoning or emotion attached to those likelihood estimates. Research in this tradition has broadly specified general physical and mental health benefits from high levels of hope (Stotland, 1969).

This version of hope can be seen as similar to but distinct from what another tradition of scholarship has termed "dispositional optimism," a general expectation in positive outcomes (Scheier & Carver, 1985). Whereas both of these constructs are defined in terms of the baseline likelihood level that an individual anticipates for desired outcomes, hope pertains to personal goals whereas optimism reflects expectations about the functioning of the world more broadly.

In the field of nursing, hope has been studied in the palliative contexts of elderly patients and those with potentially terminal illnesses such as HIV/AIDS (Kylmä,

Vehviläinen-Julkunen, & Lähdevirta, 2001), hospice (Dufault & Martocchio, 1985), and cancer (Fehring et al., 1997; Nowotny, 1989), among many others (see Farran et al., 1995 for a thorough but dated review). This palliative notion of hope has been positioned as central to nursing practice (Miller, 2007), and is described as a transient mood state (rather than a stable trait) that patients evince in relation to a specific object, usually their prognosis or end of life circumstances. Researchers have developed several operationalizations for palliative hope, such as the Miller Hope Scale (Dufault & Martocchio, 1985), Herth Hope Scale (Herth, 1989), and the Nowotny Hope Scale (Nowotny, 1989). These tend to be multidimensional measures, with the Nowotny scale comprising six subscales identified through principle components analysis: confidence in the outcome, possibility of a future, relations with others, spirituality, interiority, and active involvement. Thus, in addition to expectations about outcomes, these conceptualizations of hope include other, more phenomenological components, relating hope to many areas of belief and behavior beyond a calculation of probability.

Scholars in the positive psychology tradition have produced perhaps the largest body of work on hope, with the work of Charles R. Snyder and colleagues developing a consistent theorization and operationalization of the construct (Snyder, 2000b, 2002; Snyder, Harris, et al., 1991; Snyder, Irving, & Anderson, 1991; Snyder et al., 1996). Hope here is a cognitive set of beliefs, principally a trait (though it may also manifest as a state [Snyder et al., 1996]), that exists across context and outcomes as a general orientation to personal goals. It consists of two mutually interacting sets of beliefs about “agency” and “pathways.” Agency encapsulates an individual’s expectation that they

possess the ability and determination to carry out plans to accomplish his or her goals, and could be considered a global assessment of self-efficacy beliefs (cf. Bandura, 1997). Pathway beliefs relate to expectations that plans to achieve goals can be successful, and thus may be seen as the global analog to response efficacy. Taken together, agency and pathways beliefs interrelate to produce hope as the estimation of abilities, opportunities, and barriers. Individuals estimate the likelihood of navigating pathways contingent upon their agency perceptions and derive their perceptions in part from their assessment of whether they will be motivated by viable pathways to achieve their goals.

Snyder et al. developed the so-called Hope Scale to measure this conceptualization of hope (Snyder, Harris, et al., 1991; Snyder, Irving, et al., 1991). Scores predicted goal setting behaviors, positive affect, likelihood evaluations, robustness against impediments to goal achievement, as well as overall well-being. In a demonstration of the scale's discriminant validity, hope items loaded in factor analysis apart from self-efficacy and optimism items and uniquely contributed to predicting well-being (Magaletta & Oliver, 1999).

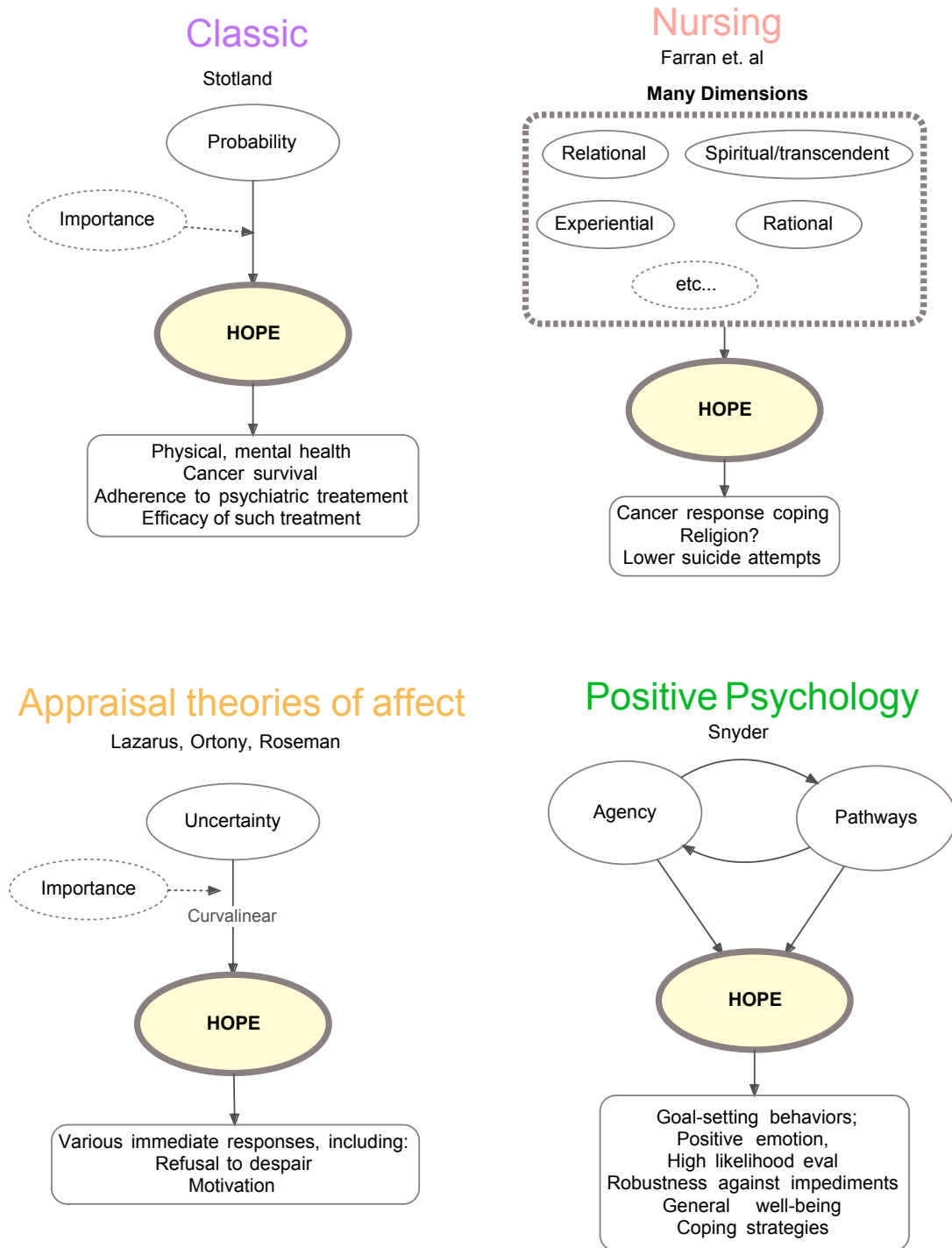


Figure 1 The four main models of hope in the social science literature

Hope and societal issues. Hope has principally received attention within either the realms of clinical psychology or as one among several emotions in studies of affect. Little research has examined the broader question of the role that hopefulness may play in individuals' response to societal issues, which extend beyond the immediate context of their own lives. There are, however, several exceptions to this pattern, in which researchers have examined the role of hope in social and political topics.

The Stoner Hope Scale attempted to capture an individual's global sense of positive expectation at a range of levels, from individual goals up through issues such as environmental pollution, poverty, and world peace (Stoner, 1988). Several scholars have also considered hope at the level of society rather than the individual. Snyder et al. have suggested that what they term variously as *collective hope* or *communal hope* (Snyder & Feldman, 2000; Snyder & Lopez, 2007, p. 194) characterizes the combined degree of hope exhibited among group members around shared goals (these authors also speculate that those more hopeful in their personal lives will exhibit greater prosocial attitudes and behavior). One also sees the glimmer of hope as a construct animating the "euphoric enthusiasm" theorized at the early stages of the environmental issue-attention cycle (Downs, 1972).

Just and colleagues have conducted one of the few studies on the role of hope in electoral politics (Just, Crigler, & Belt, 2007). They employed survey data from the 1996 US presidential election, including questions asking respondents to report whether each of the candidates had ever made them feel hopeful (along with the emotions enthusiasm, worry, fear, and anger). They found that among these emotions, hope was the most

important predictor of support for Bill Clinton, producing stronger effects in their model of candidate preferences than many of the traditional predictor variables (such as party identification and perceptions of the economy). Hope in a candidate also predicted greater information seeking behavior (watching a candidate's convention, following the nightly news) in general, though Just and colleagues found that hopeful feelings about Bob Dole were not linked to news viewing. They theorized that this finding supported a motivated selective attention theory of affect and information seeking in which individuals make decisions in an attempt to maintain positive affective states. The dominant story line about the Dole campaign during the period of the surveys depicted him with slim odds of winning the presidency, and those who placed the most hope in him may have chosen to avoid exposing themselves to such news in order to maintain their level of hope¹. Their analysis also indicated the stability of hope, with hopeful evaluations provided in July of 1996 serving as a principle predictor of hope when the same individuals were re-interviewed in October.

Hope and climate change. In the realm of research on climate change, hope has also received little specific attention. Perhaps the only published study to specifically address hope by name in the context of climate change (Myers, Nisbet, Maibach, & Leiserowitz, 2012) conceptualizes hope as a positive affective state brought about by considerations of response and self-efficacy. Myers and colleagues found that for several

¹ Though note that this explanation implies that hopeful evaluations of candidates stem both from a hope in what the candidate could accomplish were he to be elected, as well as a sense of hope *that* he would be elected (which are potentially two different evaluations that voters might make). Just et al. (2007) did not address which (or both) of these conceptions characterized their construct of hope.

American climate change issue publics, emphasizing the health implications of climate change (as opposed to the environmental or national security ramifications) in a written message led participants to rate more sentences of the message as hopeful.

A dissertation by Chadwick (2010) also investigated the role of hope in persuasive appeals, using climate change communication as a test case. Chadwick developed persuasive hope theory (PHT) to explain the nature of hope in this context, along with its antecedents and consequents. In PHT, a “subjective feeling of hope” is seen as a discrete emotion² (i.e., as opposed to being merely an expression of positive affect), and the theory predicts that hope arises directly out of cognitive situational appraisals that regard a potential event (such as reducing climate change) as (a) producing a better future, (b) personally important, (c) aligned with personal goals, and (d) possible. Chadwick’s data analysis supported a mediated, rather than direct, relationship among these four appraisals and a feeling of hope induced from reading manipulated stimulus messages³. In Chadwick’s post-hoc model, message condition (low vs. high hope) predicted the personal importance of climate change, which in turn predicted goal alignment and possibility appraisals, both of which in turn predicted the appraisal of a better future (if climate change were reduced). This appraisal of a better future then directly predicted a feeling of hope in the message. This feeling of hope

² See below for a discussion of the various theories of the structure of affect.

³ While Chadwick did assess pre-exposure hope (using the stem “When I think about climate change, I feel...”), the measure of hope used for analyses was post-message (using the stem “When I read this message, I felt...”). That this measures hope specifically in response to the message potentially renders it less applicable as a general measure of hopefulness.

increased the intention to perform mitigation behaviors suggested in the message.

Hopeful messages also increased response efficacy.

Other climate change research has touched on the topic of hope tangentially. Survey results among U.K. residents analyzed by Lorenzoni, Nicholson-Cole, and Whitmarsh (2007) suggest that hope is not high, with a widespread belief that society is not on course to successfully address climate change. Thaker (2012) has found that collective efficacy beliefs are linked to greater engagement in and support for steps to adapt to climate change impacts on water scarcity in India. To the extent that collective efficacy may be a precursor to hope (see more on this below), this finding indicates the powerful motivational and suasive role that hope may play.

The role of affect and cognition. There is disagreement in the literature about whether hope is an affective, cognitive, or hybrid construct. The scholarly work that takes hope as its central focus of study has occasionally characterized hope as an affective construct, or having dual affective and cognitive components (e.g., Farran et al., 1995), but the majority of treatments have construed hope along cognitive lines (e.g., Miller & Powers, 1988; Nowotny, 1989; Snyder, Harris, et al., 1991; Stotland, 1969). At the same time, studies of affect per se have frequently included hope among the various varieties of affect under investigation (alongside fear, anger, etc.).

Cognitive perspectives on hope. The argument for the cognitive nature of hope stems from the observation that hope bears centrally on consideration of evidence and a calculation of probability for a desired future outcome, and thus requires effortful cognitive processing of evaluation, planning, expectation, and deliberation. This point

has been recognized by thinkers across a wide range of disciplines, and since antiquity (e.g., Aharon Ben-Ze'ev, 2000; Averill, Catlin, & Chon, 1990; Cicero, 2002; Nussbaum, 2001). The first (and highly influential) psychological theorization of hope (Stotland, 1969) described it as the perceived probability of obtaining a goal, thus aligning hope much more with phenomena of judgment under uncertainty in cognitive psychology (e.g., Tversky & Kahneman, 1974) and subjective probability elicitation in risk analysis (e.g., Hampton, Moore, & Thomas, 1973) than with affective phenomena. Other scholars studying hope in various fields, including nursing (e.g., Miller & Powers, 1988; Nowotny, 1989) and positive psychology (Snyder, Harris, et al., 1991), have also concluded that cognitions about the future are central to the concept of hope. Arriving at a similar conclusion, some affect theorists have contended that hope, along with other would-be expressions of affect that entail significant consideration of possible future scenarios, ought not to be properly considered as forms of affect at all (Clore & Ortony, 2000; Lazarus, 1991c; Lazarus, Kanner, & Folkman, 1980).

Affective perspectives on hope. The tradition of scholarship studying affect⁴ offers another view on the meaning of hope. The characterization of hope in these approaches overlaps with those from the cognitive perspectives in noting the positive connotations of hope, its future-orientation, and its capacity to motivate action. Affect

⁴ Terminology is vexing in this area. Some authors (e.g., Neuman, Marcus, Crigler, & Mackuen, 2007) explicitly use the terms *emotion* and *affect* interchangeably, while others, distinguish the complexity of emotion, transience of *feelings*, and longer-lasting *moods* all as varieties of affect (e.g., Monahan, 1995). Yet others use affect as a subcomponent of emotion (Groopman, 2004). Still others see emotion as distinct from affect, which they use generically to refer to "a feeling that something is good or bad" (Slovic, Finucane, Peters, & MacGregor, 2004, p. 311) and a "faint whisper of emotion" (p. 312). This study does not seek to adjudicate these debates and retains the term affect when referring to the non-cognitive experience of hope. Usage at other points follows that of the authors under discussion.

researchers, however, identify hope as one among many other affective responses in humans, rather than a cognitive phenomenon. In theories of discrete emotion, hope exists alongside others such as happiness, anger, fear, joy, depression, pity, shame, sadness etc. While transcultural research on facial expression has substantiated the claim that certain emotions are widely shared across cultures, hope is not one of these emotions, perhaps because it does not possess a readily recognizable facial representation. In one typical approach, a typology of emotions positions hope in categories positively related to the future and the self (Ortony et al., 1988). Other traditions within affect research structure emotions by placing them along one or more dimensions, such as valence (positive to negative) and/or intensity, often in a complicated circumplex conceptual space (e.g., Russell, 1980). Researchers tend to place hope on the positive⁵ end of valence dimensions, but the multidimensional approaches have generally not explicitly included the position of hope, though one analysis has placed the affect *hopeless* in a region near *depressed*, and *disappointed* and opposite *eager*, *elated*, and *enthusiastic* (Plutchik, 1997).

Hope as jointly affective and cognitive. Contrary to the view that hope is either an entirely affective or cognitive phenomena, a diverse array of scholars have concluded that hope is unusual in the degree of affective and cognitive interplay that it entails. This perspective includes several positions. Some see hope as a construct comprising both affective and cognitive dimensions:

⁵ Traditionally, positive affect has been conceived in hedonic terms, with pleasurable feelings of joy and happiness prototypical positive emotions.

"I understand hope as an emotion made up of two parts: a cognitive part and an affective part. When we hope for something, we employ, to some degree, our cognition, marshaling information and data relevant to a desired future event...But hope also involves what I would call affective forecasting—that is, the comforting, energizing, elevating feeling that you experience when you project in your mind a positive future"

(Richard Davidson, quoted in Groopman 2004, p. 193)

Similarly, though not labeling it as explicitly affective, Farran, Herth, and Popovich (1995) argue for the need to include an “experiential” dimension in the study of hope, alongside the rational dimension that is tapped by most measurement instruments of hope (p. 72).

Other scholars have not gone so far as to see hope as dually affective and cognitive, but have highlighted differences among the types of affect, noting that some appear to originate out of spontaneous, instinctive responses (such as fear or anger), while others are dependent on cognitive processing before the emotional state is experienced, and that those forms of affect having a future component (such as hope) are particularly of this variety (Averill et al., 1990; Groopman, 2004; Lazarus, 1991c; Roseman & Smith, 2001; Snyder, 1994; Snyder, Cheavens, & Michael, 1999). Some scholars thus identify hope as “clearly one of the most cognitively integrated emotions” (Just, Crigler, & Belt, 2007, p. 324; see also Damasio, 1994).

If affect and cognition are interrelated in hope, what might be the structure of that relationship? A diverse body of theories in the affect literature and other fields support a

conceptualization of mutually influential cognitive and affective constructs, “the dance of affect and reason” (Finucane, Peters, & Slovic, 2003, p. 327). Appraisal theory (Lazarus, 1991c, 1991a, 1991b) positions affective responses as the result of initial cognitive functions involving perception, processing, and evaluation of stimuli. The mind first determines the nature and significance of stimuli before being able to formulate an emotional reaction to them. Yet even this theory of *cognitive primacy* (Lazarus, 1984) admits of the important feedback processes that occur as affective state in turn influences the cognitive appraisal process, biasing processing by causing the mind to lend increased weight to certain stimuli (Roseman & Smith, 2001). The proponents of *affective primacy* (Zajonc, 1980) would agree with this last observation, arguing that affect is the initial human reaction to stimuli, and that affect then colors “hot” cognitive processing (Abelson, 1963) and decision making: “first we feel, then we think” (Monahan, 1995, p. 84). Though traditionally understood as rival positions, the cognitive and affective primacy positions may in fact offer complimentary perspectives that present a picture of affect and cognition as intimately interrelated and mutually constituted.

Research finds that this relationship between cognition and affect is moderated by the personal relevance or importance of the cognitions under consideration; that is, their implications for the goals and motivations of the individual (Breznitz, 1986; Lazarus, 1991a; Roseman, 1991; C. A. Smith & Lazarus, 1990). Lacking this *personal importance*, cognitive responses to stimuli will not be significant enough to generate an emotional reaction. This moderating role of personal importance in fact lies at the heart of one definition of affect offered by leading scholars on the topic, that affect “is the

evolved cognitive and physiological response to the detection of personal significance" (Neuman, Marcus, George, Crigler, & Mackuen, Michael, 2007, p. 9)⁶. At the same time, theories of discrete emotions (e.g., Lazarus, 1991a; Ortony et al., 1988; Roseman, 1984) argue that affect is not an undifferentiated response that only varies in magnitude, but rather possesses a distinct character for each affect (e.g., hope, sadness, anger). It may thus be best to consider that the *strength* of the affect is moderated by importance, while its discrete *character* remains determined by the nature of the cognitive stimulus.

Conceptual definition of *societal issue hope*. I define *societal issue hope* as *the feelings experienced by an individual when she or he considers the potential resolution to a perceived challenge facing society*.

This definition has several parts. First, societal issue hope only pertains to topics beyond the realm of the individual or his or her immediate others (e.g., friends, family, neighbors). As discussed below, the nature of societal topics introduces important differences compared to hope in the realm of personal issues. Societal challenges are those that cannot be resolved by the individual acting alone, and because they involve so many others, individuals' knowledge about societal issues is inherently less intimate than it is for personal issues.

Second, societal issue hope pertains to perceived challenges, and not all possible future events. Hope can only be present when the individual desires the outcome object. One does not hope for something that one does not want to see come to pass. This added

⁶ That definition may in fact even suggest that importance is the mediator, not moderator of the cognition-to-affect process.

component of desire thus sets hope apart from mere impartial speculation or belief. My conception of hope implies both that one wishes to see an outcome occur, and that one believes it to be relatively likely to occur.

Thus, hope about public issues (especially controversial ones such as climate change) is not isometric across the spectrum of beliefs that characterize an individual's basic orientation to the issue. Rather, hope is intrinsically bound up in one's understanding and definition of the societal reality. In the case of climate change, belief in or (at the opposite extreme) denial of its reality and the perception that it poses a risk both serve to determine the intrinsic orientation and meaning of hope for an individual. For the skeptic, hope does not obtain for the solution to a problem one does not believe to exist; if anything, hope for a skeptic would entail the hope that (potentially undesirable) mitigation efforts *not* take place. For this reason, examination in the theorizing and analysis in this dissertation will deal exclusively with those who entertain a minimal level of belief in and concern about the reality of climate change.

Third, the definition of societal issue hope (hereafter often referred to as *hope*) presented here is of an affective phenomena: *the feeling, mood, or emotional response that occurs when individuals consider the probability they assign to a given outcome, with the intensity of the affective response determined by the level of importance the outcome of the societal issue holds for them.*

Thus, the key antecedent to hope is cognitive, an individual's subjective probability of some future state of affairs (*probability appraisal*). Probability appraisal is a global belief about the likelihood of resolving a given societal problem. Such a belief,

though perhaps little more than a vague general impression, thus represents the mental synthesis of several other beliefs into an overall evaluation of the probability that the problems posed by a societal issue will be successfully addressed. Whether individuals experience a positive or negative affect when contemplating a given level of probability appraisal should vary between individuals and across issues. A 50% likelihood of a desired outcome may fill one individual with happiness and another with disappointment. Probability appraisal and hope influence one another and interact in relating to the constructs that may arise.

Several final observations about this definition warrant mention. The unit of analysis is the individual, as I conceive hope as a psychological attribute evinced in the thoughts, feelings, and behavior of a single human being⁷. I thus choose to use the term *societal issue hope* rather than *collective* or *communal hope* so as to avoid confusion over the unit definition. Whereas Snyder and Feldman's (2000) communal hope characterizes the level of hope across a group of individuals about a shared goal, my understanding of hope remains the property of an individual.

Societal issue hope also requires an object. Just as attitudes are evaluations of some attitude object (Allport, 1935), societal issue hope refers to some social or policy outcome that could occur, such as hope that racial equality will be achieved, polio eradicated, or climate change reduced to a safe level. Thus, an individual will possess levels of hope for a range of objects, and hope can be compared across individuals who

⁷ This thus precludes hope as an attribute of other entities such as messages, discourses, circumstances, organizations, or as an emergent property of aggregations of individuals.

share hope evaluations for the same object. It is a variable concept; an individual can have more or less hope than another (cross sectional variance), and an individual's level of hope may vary over time (within individual variance), as described next.

State and trait. Psychologists use the terms *state* and *trait* to describe differences in the over-time within-individual variance of a construct (e.g., Spielberger, 1985). Traits are enduring facets of personality that tend to be stable across time. States are transitory experiences, often triggered by stimuli, that lack a stable basis in personality.

Previous scholarship disagrees on the character of hope, depicting (personal) hope variously as a trait (Snyder, Harris, et al., 1991; Stotland, 1969), a state (Dufault & Martocchio, 1985; Fehring et al., 1997; Miller & Powers, 1988; Nowotny, 1989), or a hybrid (Gottschalk, 1974, 1985; Grimm, 1984; Scioli et al., 2011). The hybrid approaches suffer from a lack of clarity. Gottschalk contends that assessment of hope at a single point in time constitutes a measure of hope as a state, while averaging across multiple assessments at several points in time constitutes a measure of hope as a trait. This instrumental literalism substitutes characteristics of operationalization for a conceptual argument about the nature of the construct. Grimm's State-Trait Hope Inventory (1984) assesses hope about specific situations, suggesting hope's state character, but also finds correlations with enduring between-individuals variance on stable traits such as depression and long-term conditions such as cancer diagnosis.

My conception of hope offers a way to understand this disagreement and ambiguity in the literature and provides an explanation for state as well as trait characteristics. Hope tends towards expression as temporary emotional states.

Probability appraisal should express itself variably as more trait-like or state-like, depending on several factors.

Probability appraisal depends upon information from the environment and individuals' mental processing to arrive at likelihood judgments. These cannot be seen as purely the product of the moment; formulating a sense of probability appraisal for an issue relies too much on an enduring (though evolving) set of prior issue-relevant beliefs (discussed below). These beliefs should permit the observation of reliable within-individual continuity in probability appraisal. These influences suggest that a given level of probability appraisal could persist within an individual across circumstances and remain generally stable over intervals of days, weeks, or beyond so long as the antecedents of probability appraisal—beliefs and probability calculations—remain relatively stable and support that level of hope. On the other hand, exposure to significant new information (for example, the results of an election) may lead to substantial changes in probability appraisal over short periods of time. Yet, as I argue below, individuals' prior levels of probability appraisal will exert an important influence on how new information is incorporated into their assessments, suggesting that cognitive is not as mercurial as states of affect.

Thus, probability appraisal can be understood as midway between the state and trait dipoles. This positions societal issue hope on ground also occupied by other classes of psychological variables such as beliefs (e.g., self-efficacy) or attitudes (e.g., as policy support). These variables do not appear and vanish over short periods of time as do true

state phenomena. But nor are they entrenched dispositions or central components of personality like true traits.

A comparison between societal issue hope and hope in personal affairs is useful here. I posit that societal issue hope lacks the stability of trait hope about one's own personal life chances (Snyder, 2000a). The self represents a domain of paramount concern, knowledge, and attention for most individuals (Markus, 1977), and Snyder et al. (1991) find that individuals hold rich and stable beliefs about their own agency and available means to achieve their goals, comprising the cognitions associated with hope about events in their own lives (Snyder, 2000a). Societal, political, and scientific issues are less immediate and generally lower in their salience, and importance for individuals, who tend also to be less knowledgeable about them. This suggests that the hope an individual holds for successful resolution of a societal issue is likely to turn on much more limited information and thereby experience greater instability due to shifting patterns of salience and new information. It is this dynamic interplay of factors, driven by salient information and often under conditions of low motivation and heuristic processing that sets societal issue hope apart from the personal hope described in the clinical psychologist and palliative nursing fields.

This should be especially true for individuals with low levels of issue involvement. Lacking the strong motivation and highly integrated knowledge to maintain a consistent probability appraisal belief over time, low-involvement individuals' probability appraisal is more likely to be the idiosyncratic result of new stimuli combined with latent prior issue attitudes and beliefs that are made salient when such individuals

are provoked to think about the issue at a particular point in time (such as during a survey). It seems plausible, for instance, that a single newspaper story may have a large impact on an individual's hopefulness for a low-involvement topic societal issue in a way unlikely when the individual rates hope in his or her own life.

It is also important to note the role of what I will refer to as *object orientation* in discussing state and trait. Some conceptions of hope (e.g., Snyder, Harris, et al., 1991) see hope not oriented toward any specific object (such as a certain goal or event), but rather a general orientation to life events. This lack of object orientation implies a more trait-like character for hope, as it is rooted in chronically available dispositions of the individual and can be assumed to persist over time and across situations. On the other hand, versions of hope that see hope as oriented towards specific objects (e.g., hope in a certain outcome) open the window more fully to state expressions of hope. Hope about a specific object ought to be rooted less in deep-seated dispositions and more contingent upon environmental information and the availability and salience of mental representations of the object, and thus subject to greater vicissitudes as those factors vary over time. My conception of societal issue hope is object oriented in that it pertains to specific issues rather than the future of society in general. Societal issue hope is thus expected to be less stable than traditional traits.

Theory of the Structure and Causes of Societal Issue Hope

Based on my conceptualization of societal issue hope, two spheres—cognitive and affective—are involved. Hope and probability appraisal can be understood as parallel means for individuals to construct a summary prognosis regarding climate

change: either by sampling from their salient beliefs (cf. Zaller, 1992) or extrapolating from their feelings. In reality, each process is likely interconnected with the other, as rational consideration of evidence (probability appraisal) evokes affective responses (hope) that then color the further interpretation and weighing of information (back to probability appraisal), thereby potentially producing a stable, reinforcing feedback between affect response and cognitive appraisals.

The following subsections lay out my theory of the antecedents to societal issue hope. These relationships are diagramed in Figure 2.

Fig 2a

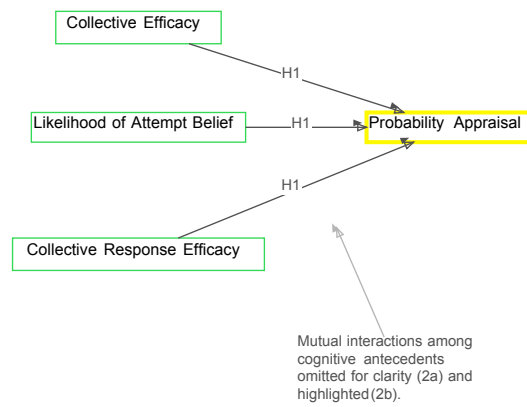


Fig 2b

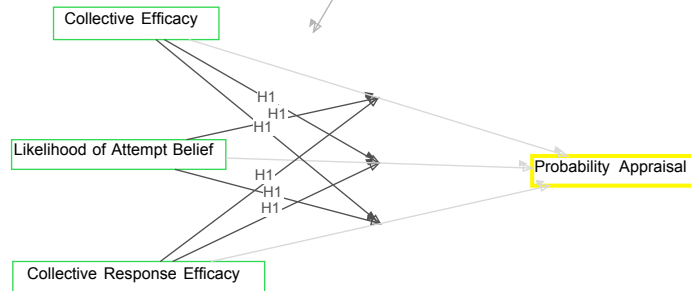


Fig 2c

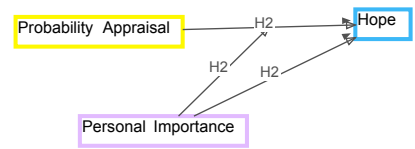


Fig 2d



Figure 2 Proposed Structure of Hope and its Antecedents

Probability appraisal. Probability appraisal is the result of the processing that occurs when an individual evaluates available information to answer the question, “How likely is it that the societal problem will be satisfactorily resolved?”⁸ Underscoring the significance of probability appraisal for lower-salience social issues such as climate change is the finding that probabilistic information (such as that represented by one’s level of probability appraisal) plays a larger role in judgment and decision making when the topic is more emotionally distant (Slovic, Finucane, Peters, & MacGregor, 2002).

Antecedents of probability appraisal.

Under full rationality. Attempting to rigorously predict the course of events for an issue could lead an individual to utilize a range of beliefs such about collective efficacy and the actions and intentions of multiple societal actors⁹. Specifically, a fully rational individual should calculate probability appraisal (i.e., the perceived likelihood of successfully addressing the issue) as the multiplicative function of three other judgments:

- (a) the probability that an attempt will be initiated to mitigate climate change, *attempt likelihood*;
- (b) perceived capability of the group to execute a successful action, perceived *collective efficacy* (Bandura, 1997); and

⁸ Note both the passive voice and the lack of specificity attached to “satisfactorily resolved.” Beliefs about which societal actors would address climate change, and what a satisfactory resolution would entail are subject to variation among individuals and in part constitute an individual’s degree of hopefulness.

⁹ Of course, questions of timing (e.g., will action be taken in time to mitigate emissions before warming reaches a certain point; when will warming impacts be felt) and an individual’s subjective judgment of what constitutes a ‘satisfactory’ solution state to climate change should ultimately play a role in the calculation.

(c) the probability that the attempt will succeed in adequately addressing climate change, perceived *collective response efficacy*.

These are subjective probabilities (Hampton et al., 1973), an individual's perceived likelihood of these outcomes. Estimation of each these probabilities would in turn require a consideration of the various solution pathways (policies, collective actions, individual behaviors) that could contribute to resolving the issue. The relationship among them is multiplicative because each is conditional upon the others in determining a successful resolution of the issue. For instance, the collective response efficacy of an attempt relates to issue resolution only to the extent that an attempt is successfully carried out (as determined by collective efficacy).

Under bounded rationality. Rationality, of course, cannot be assumed in all (or even most) cases, and the mental capacity, motivation, and information necessary to carry out a comprehensive probability assessment fully weighing all relevant factors are beyond the means of any single individual. Rather, individuals will seek to rely on a simpler general impression about the feasibility and likelihood of their desired outcome using an abbreviated process. But the factors present in the foregoing discussion of full rationality serve as a starting point in describing the formation of hopeful cognitions regarding climate change. I propose an illustrative model of such rationality-bounded processing to depict the variables and relationships actual individuals may consider as they cope to make sense of a complex societal issue. The model still presents a dauntingly elaborate set of calculations, and I do not propose that individuals engage the

full details of the models in a thorough, or even conscious way¹⁰. Rather, individuals are likely to render the various judgments in an instantaneous, impressionistic manner, liberally employing heuristic mechanisms. The principle value of the model is to identify the variables and relationships that may come into play, with the potential for future theorizing about the mechanisms and contextual and individual variables—such as construal level (Trope & Liberman, 2003)—that may moderate and mediate the full process.

Individuals will first seek to sample working and long-term memory for possible solution pathways that offer the means to imagine how the issue might be resolved. The set of such sampled pathways P will likely not contain all those that an individual could produce, but merely those that individuals are able to make available during periods of processing. The set will thus also likely not resemble the actual full distribution of pathways that exist at large. Rather, mechanisms such as the availability heuristic (Tversky & Kahneman, 1974) and current salience (top-of-the-head phenomenon) (Taylor & Fiske, 1978) are likely to drive selection.

Formalization of bounded rationality model. For each pathway p_i of set P , individuals will seek to judge the pathway's potential contribution to issue resolution. The product of the three factors identified above (attempt likelihood, perceived collective efficacy, collective response efficacy) contribute to this judgment.

¹⁰ Though theories of expectancy value assume a similarly complex model of cognition (involving summing of probability products across relevant attitude objects) to that proposed here (e.g., Ajzen, 1985, p. 13), suggesting that individuals may in fact facilely and routinely perform cognitive processes that require intricate formalization.

While logic indicates that each factor should play an equal mathematical role in determining the overall likelihood that a pathway will contribute to resolving the issue, individuals may express bias in their own judgments. Research suggests, for example, that an especially attractive outcome (in this case, a high response efficacy) can lead to insensitivity to probability (attempt likelihood and perceived collective efficacy) (Rottenstreich & Hsee, 2001). An individually subjective weight coefficient W_{factor} may thus be associated with each of the factors for each pathway by each individual. An overall weight W_i for each pathway represents further heuristics and biases that may influence the relative importance individuals associate with different pathways above and beyond that accounted for by the foregoing factors. Recency bias and use of the representativeness and availability heuristics (Tversky & Kahneman, 1974), for example, may lead individuals to privilege (respectively) those pathways considered last in the process; those most resembling what the individual expects of solutions; or those most familiar.

Finally, an individual will perform a summation over the set of pathways under consideration, combining the judgments about the likely effectiveness of each pathway to arrive at a total prognosis for addressing the issue. This sum should bear a quasi-proportional relationship¹¹ to probability appraisal, the overall subjective probability of resolving the issue. This description may be formally represented by Equation 1:

¹¹ Although of course the ‘conversion function’ of the proportion must be asymptotic (e.g., logistic) to transform values of the sum (with a theoretical range of 0 to infinity) into cognitive hope values (with a 0% to 100% range).

Equation 1 Model of probability appraisal formation

$$\propto \sum_{i=1}^P \left[W_i (W_{CE_i} \times CE_i) \times (W_{CRE_i} \times CRE_i) \times (W_{L_i} \times L)_i \right] \quad (1)$$

where probability appraisal varies quasi-proportionally as the sum of the products of an individual's judgments of perceived collective efficacy CE , collective response efficacy CRE , and likelihood of attempt L and their associated subjective weights W for each possible solution pathway i in the set P of all considered policies or behaviors. In other words, when formulating an estimate of the probability that an issue will be successfully resolved, an individual will attempt to compile an assemblage of the possible routes to addressing the issue, estimate the realistic contribution of each to the solution, and combine the total amelioration offered by the likely mitigation routes¹².

Comprehensive empirical validation of this model is beyond the scope of this dissertation. Rather, I seek a more limited aim of evaluating if the core variables involved serve as predictors of probability appraisal.

H1: Probability appraisal will vary as a multiplicative function of an individual's issue-relevant collective efficacy, collective response efficacy, attempt likelihood beliefs.

Hope about social issues. Hope about social issues is a positive feeling, emotion, or mood associated with the future resolution of a problem facing the larger community. As discussed above, affect theories vary in whether they conceive of affect as comprising

¹² Equation 1 represents the amount of the harm associated with the issue that individuals expect to see resolved. For parsimony, this model omits considering the possibility that to determine their hopefulness, individuals will compare such harm reduction estimates against their preference level for what constitutes a sufficient 'resolution' to the problem.

discrete types, or as arrayed along one, two, or more dimensions. The dimensional concept of affect proposes that the various apparent forms of affect can be understood in terms of one or more dimension, such as *valence* (positive to negative emotions). In contrast to the dimensional model, appraisal theories posit discrete emotions that cannot necessarily be compared with one another along dimensions such as valence (for an overview of the differing schools of thought on the structure of affect, see Neuman, Marcus, George, et al., 2007).

Researchers nonetheless agree on the general phenomenological characteristics of hope, whether it is described as a discrete emotion associated with goal congruence, future expectations, and motivation (Lazarus, 1991c; Ortony et al., 1988), positioned along the higher end of the positive valence dimension, or located in the vicinity of eager, elated, and enthusiastic states on a multidimensional circumplex (as is suggested by a reading of Plutchik, 1997). With this in mind, I propose that hope about social issues can be understood as a discrete form of affect in so far as the circumstances leading to its expression are highly specific and not shared by all generically positive forms of affect. At the same time, it is important not to take this disarticulation too far. There is a need to appreciate hope's positive valence and proximity to other members of the positive affect family. Doing so provides a basis for theorizing hope's effects by drawing upon the broader positive affect literature, which has found, for instance, broad similarities in how positive (versus negative) affect influences message reception (Monahan, 1995).

Probability appraisal as precursor to hope. While theories of affective primacy (e.g., Zajonc, 1980) and cognitive primacy (e.g., Lazarus, 1991a) contest whether affect

or cognition comes first, the literature on hope in particular suggests that the affective experience of hope is dependent on a contemplation of goals and future possibilities. This suggests that the cognitions involved in these appraisals are a necessary antecedent to hope. Research also finds that cognition and affective response are interrelated, and that the impact of cognition on affect is moderated by personal importance. I therefore incorporate this process into my model.

H2: The beliefs that an individual holds about the likelihood of some desired societal outcome (probability appraisal) will produce the affective response of hope as a joint function of that likelihood and the personal importance that the individual places in the outcome. In other words, both probability appraisal and personal importance will have main effects on hope, as will their interaction. (Note that boundary conditions are set on this relationship by Hypothesis 6)

Hope as precursor to probability appraisal. Individuals may infer their probability appraisal from their hope on the basis of the affect heuristic or via affect-biased processing. The *affect heuristic* (Slovic et al., 2002; Slovic, Finucane, Peters, & MacGregor, 2004) describes the mental “shortcut” employed when individuals substitute answering a subjectively difficult question (e.g., how risky is nuclear power?) with reliance on their feelings of the goodness or badness associated with the object under consideration. Individuals may thus infer probability judgments from their affective response to a topic. The affect heuristic could be one means to answer the question, “How likely is it that global warming will be satisfactorily resolved?”, occurring when an

individual does not have the information, cognitive resources, or motivation to engage in the taxing processing required to fully think through all the considerations pertinent to answering that question. One interprets one's immediate emotional reaction to considering climate change as an indication of the likelihood of success, such that a more negative affective state (e.g., fear, frustration, anger) will produce more pessimistic probabilities than a more positive affective state (e.g. happiness, pleasure, love).

A similar result may obtain via a slightly different pathway—affect-biased processing—when individuals' general affective state predisposes them to consider certain information during the cognitive processing they employ to arrive at probability judgments. Research has found that people in happy moods are more optimistic, and those in sad moods more pessimistic in their probability judgments (Fedorikhin & Cole, 2004; Wright & Bower, 1992). Though no definitive mechanism for this effect was established, Wright and Bower, and Fedorikhin and Cole speculated that selective attention and recall of mood-consonant information (Blaney, 1986) could explain their observations among individuals employing an availability heuristic (Tversky & Kahneman, 1974). As reviewed above, scholarship generally depicts hope as a positive affect in proximity to happiness. Contemplation of a topic about which one feels hopeful should thus induce a general affective state that will bias cognitive processing of probability information towards a more optimistic assessment of probability appraisal.

Thus, an affect-biased processing pathway as well as an affect heuristic pathway both suggest that hope may influence probability appraisal.

H3: Hope will positively predict probability appraisal.

Comparison with Chadwick (2010). My theory of hope is congruent with the persuasive hope theory and empirical findings of Chadwick (2010) in several ways, though my theory also has some notable differences. First, the fundamental cognitive variables are similar. In PHT, one of the four cognitive appraisals that lead to a feeling of hope is an individual's perception of the possibility that a desired outcome will occur. This aligns with what I term probability appraisal. I contend that the other three cognitive appraisals in PHT (that mitigation is important, goal congruent, and that it will produce a better future) are sufficiently similar in conceptualization¹³, operationalization, and empirical observation¹⁴ that they may warrant consideration as a single construct for the sake of parsimony. This would then render a construct that is similar to the personal importance of the issue in my theorization of societal issue hope¹⁵. Both PHT and my theory thus consider importance and probability as the cognitive cornerstones of generating hope.

¹³ Lazarus' (1991c) notion of goal congruence would also cover Chadwick's better future appraisal. Some scholars (Just et al., 2007; Zaichkowsky, 1994) also (Zaichkowsky, 1994) use relevance, goal congruence, and/or importance synonymously.

¹⁴ Across Chadwick's two experiments, intercorrelations among the indices for these constructs ranged from .45 to .65, indicating that they were strongly related, though not necessarily identical. No factor analysis was conducted that compared the items from across the scales, however.

¹⁵ Seen another way, the "better future" and "goal congruent" appraisals necessary for hope in Chadwick's theory are the equivalent to my specification that hope can only exist when individuals see a potential future outcome as desirable. Whereas her two constructs are linear predictors of hope, I conceive of desire for the outcome as a purely binary (present/not present) gateway condition for hope. While Chadwick's model may offer more sophistication, I argue that our approaches are conceptually analogous. In fact, the use of desire (or "better future" and "goal congruent" appraisals) as linear predictors of hope (rather than merely as a gateway precondition for hope) may beg conceptual and analytic questions: as these appraisals also characterize an individual's general level of involvement in the issue (a well-established and centrally important construct on its own, which independently predicts a range of outcomes, including behavior), does a theory of hope based around them risk conflating hope with simple involvement?

Secondly, both PHT and the theory I develop here appreciate that cognitive as well as affective constructs are relevant to understanding hope. Differences emerge in the structure between affect and cognition. For Chadwick (2010), the relationship between the two was structured sequentially: cognitive appraisals (of possibility, a better future, goal congruence, and importance) result in feelings of hope. My model treats the affective and cognitive components of hope as co-equal and interactive (not sequential).

Third, I theorize that personal importance, rather than serving as one among several appraisals prior to the formulation of hope, instead moderates the influence of probability appraisal on hope. While Chadwick's (2010) post-hoc analysis (i.e., analysis investigating relationships above and beyond original hypotheses) found that importance mediated the effect of hopeful messages on the other cognitive appraisals, she did not provide a theorization of this result¹⁶. She appears not to have considered adding moderating relationships in formulating her post-hoc model, and given the intercorrelations between many of the variables, it is conceivable that the data could also support a model in which importance functions as a moderator, as I propose.

Notably, Chadwick (2010) found appraisal of the possibility of mitigating climate change was the only one of her theorized four cognitive precursors to hope that was consistently¹⁷ amenable to manipulation via experimental messages. This was the case

¹⁶ Other aspects of the post-hoc model do not yield to obvious explanation. For instance, appraisal of the possibility of climate mitigation is shown to predict belief that mitigation would yield a positive future, which in turn predicts a feeling of hope.

¹⁷ In one of her two experiments, Chadwick did also find that appraisal of the importance of climate change *did* appear to be influenced by message condition, with a strong (vs. weak) hope message increasing importance appraisal. But this relationship only emerged in SEM analysis, and not more targeted

both when comparing between a generally strong (vs. weak) hope message, as well as when specific components were modified to specifically target the various cognitive appraisals. This suggests that involvement with climate change (i.e., importance, goal congruency, and better future belief) is relatively stable and insensitive to superficial communication. Possibility judgments, on the other hand, did respond to shifts in the information provided about the likelihood of reducing climate change. It is likely that most individuals (and even more likely for the college students in Chadwick's studies) have limited mental representations of the likely course of climate change, thereby leaving them more impressionable to a message containing new information.

Theory of the Consequences of Societal Issue Hope for Engagement

Engagement. Lorenzoni et al. (2007) define *engagement* in climate change as “a personal state of connection with the issue of climate change... concurrently comprising cognitive, affective and behavioral aspects” (p. 446). The construct presents conceptual challenges in attempting to encompass the diverse antecedents and internal dynamics of cognition, affect, and behavior as a unified entity. While it is difficult to understand engagement as a coherent psychosocial construct, it may be more useful as an umbrella term to represent the diverse ways that individuals respond (or not) to a societal issue such as climate change that entails complex political, scientific, risk, and emotional aspects. I use engagement in this dissertation as a way to refer to the array of outcomes that flow from an individual's level of climate change societal issue hope. I discuss two

regression analysis of the appraisal. Her other experiment failed to find any such relationship between message effects and appraisal of importance.

aspects of engagement below, behavioral engagement and attitudinal engagement. The theorized relationships between societal issue hope and behavioral engagement are illustrated in Figure 3.

Behavioral engagement. I define behavioral engagement as any action taken by an individual with the intention to address a perceived problem or achieve a goal. In the context of climate change, behavioral engagement can include both personal conservation actions as well as political and consumer activism aimed at changing policy.

Understanding the precursors to behavior remains a notoriously challenging subject in the social sciences. Even one of the more well-developed theories tailored to predict movement supportive behaviors—the Value Belief Norm model—succeeds in one study in explaining less than 23% of behavioral variance, and this performance was superior to other theories and constructs commonly employed to explain behavior (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). One barrier to apprehending the full scope of factors and relationships involved in behavior is the mere diversity and complexity of the variables. Whereas many theories of behavior put great emphasis on individual psychological constructs such as behavioral intentions (e.g., Ajzen, 1985), social context and place-based affordances may often exert far more influence on actual behavioral performance (E. Maibach, Abrams, & Marosits, 2007).

It is with these limitations in mind that I seek to nonetheless theorize a role for societal issue hope in promoting behavioral engagement. My thinking here seeks to expand upon Chadwick's (2010) finding that feelings of hope predicted intentions to engage in personal climate change mitigation behaviors espoused in experimental

messages. I move to considering actual behaviors while theorizing hope as a general psychosocial influence outside of the context of specific stimulus events. Several bodies of theory and research support this proposed link between hope and behavior.

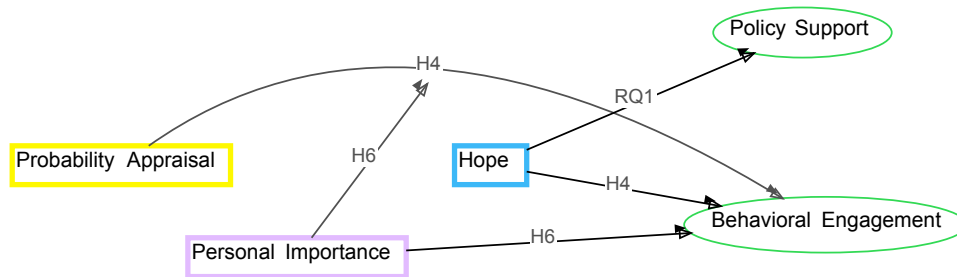


Figure 3 Hope and Consequents

Theories of hope and behavioral engagement.

The logic of collective action. Individual behavior intended to address societal issues is plagued by the classic challenges attending collective action problems. These include incentives for individuals to act as free-riders, benefiting from the actions of others that improve conditions faced by all. Collective action also poses the challenge of aligning expectations and intentions across a wide number of actors. When the utility of one individual's contribution to resolving a problem is contingent upon similar actions undertaken by others (including individuals, policymakers, and/or institutions), the individual's perception of the likelihood of such concerted action and overall probability for success of the collective action effort may loom large in personal calculations of whether the individual's involvement is worthwhile. After all, even vigorous and

successful personal action by one individual will not succeed in addressing a collective challenge if others do not likewise join in or other barriers prevent collective success. Research has indeed found that belief in the likelihood of group success—what I term probability appraisal—is an important predictor of individual involvement in collective social action (Finkel, Muller, & Opp, 1989).

Results from personal hope. The voluminous findings on personal hope indicate that hope spurs goal-oriented activity, resilience, fortitude, and persistence (e.g., Gottschalk, 1974; Herth, 1989; Snyder, Irving, et al., 1991). Conversely, lack of hope is associated with despondency, inaction, and a lack of motivation to pursue goals, leading in the extreme case to a lack of will to survive, a phenomena observed in both humans and other species (Stotland, 1969). The belief in success embodied by high levels of societal issue hope should thus increase behavior while low levels of hope may be corrosive to engagement even of individuals highly concerned about the issue.

Self-regulation theory. The self-regulation literature on goal reorientation associated with low outcome expectancies (Carver & Scheier, 1981, 1998) and the discrepancy management component of goal setting and achievement in social cognitive theory (Bandura, 1991) both speak to responses to low hope. They suggest that although a discrepancy between one's current state and a desired state may spur motivation to act to achieve the desired state, when no resolution seems probable (i.e., low hope), the discrepancy may be resolved in favor of rejecting (reorienting away from) the goal (see also cognitive dissonance, Festinger, 1957). Thus, lack of hope may not simply discourage action, but actively cause individuals to disavow interest in doing so.

Cognition and affect. Hope may encourage engagement via both cognitive and affective routes. Cognitively, one's level of hope provides a guide to the likelihood of success, thus facilitating goal-oriented planning. As noted above, probabilistic information such as that represented by one's level of probability appraisal plays a larger role in judgment and decision making when a topic is more emotionally distant (Slovic et al., 2002), such as for lower-salience societal issues.

Via the affective route, positive affect has been found to encourage favorable appraisals (Isen, 1987; Slovic et al., 2002), an approach response, and issue engagement and been found to increase attention to and recall of messages high in positive affect (Monahan, 1995; Slovic et al., 2002)¹⁸.

H4: Hope and probability appraisals will increase issue-relevant behavioral engagement.

The general proposition presented in H4 is subject to the following qualifications.

Extreme probability appraisal. The spectrum of values of probability appraisal—while conceptually continuous—may have two points of psychologically significant disjuncture. One separates more or less complete lack of hope (an individual's belief that an event has approximately no chance, or 0%, of coming to pass) from other slightly less extreme values of hope at the low end of the spectrum. The other point separates high values of hope from extreme hope, where the expectation approaches complete certainty,

¹⁸ Yet, the relationship between engagement and affect is complex. Negative affect towards climate change (seeing it as a “bad thing”) is strongly associated with increased risk perceptions (N. Smith & Leiserowitz, 2012). High levels of engagement are thus likely when there is a negative affect response towards the risk associated with an issue, but positive affect is elicited when contemplating potential solutions. This highlights the need for an appropriate balance between concern and hope.

or 100%. Research has found that such objectively quantitative differences have qualitatively different impacts for individuals' judgments (Loewenstein, Weber, Hsee, & Welch, 2001). The certainty conveyed by the extreme values carries cognitive and affective significance, whereas the other values in between are much less interpretable. Changes among middle values (from 20% to 30%, say) are thus less meaningful than change to or from an extreme (from 0% to 1%, for instance. As Slovic et al. (2004) put it, "responses to uncertain situations appear to have an all or none characteristic that is sensitive to the *possibility* rather than the *probability*" of significant events (p. 318, emphasis added).

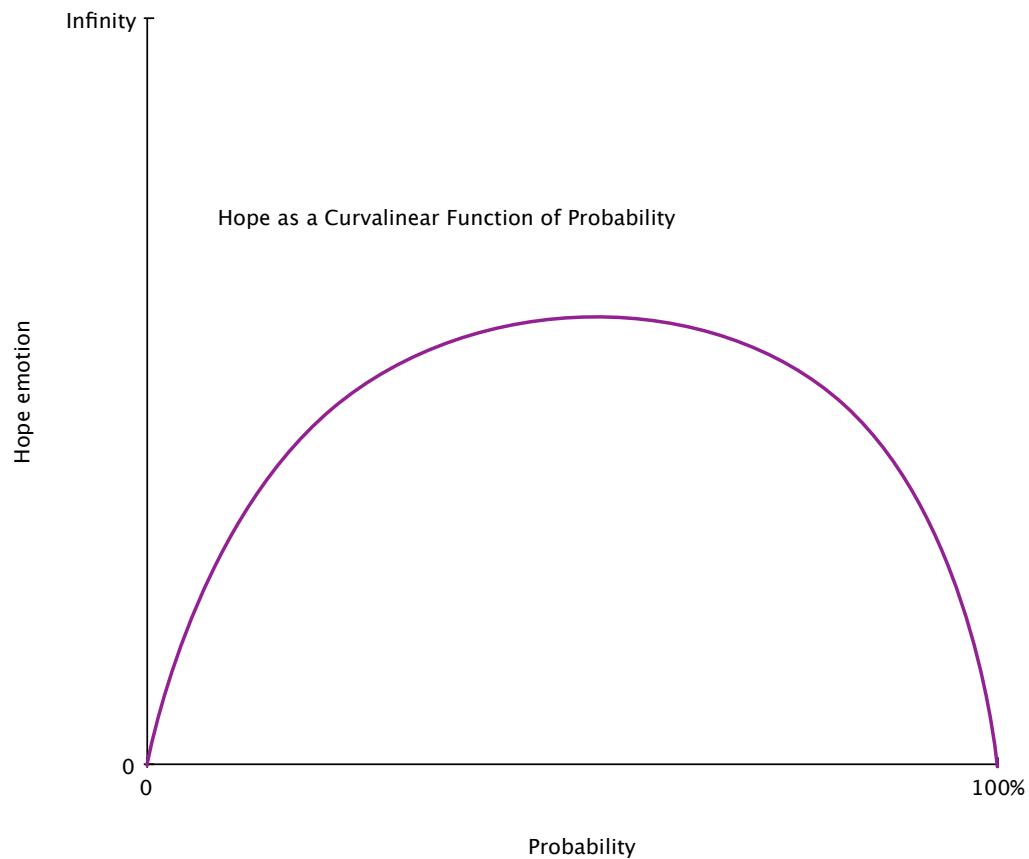


Figure 4 Proposed curvilinear relationship between probability appraisal and hope

It is for this reason that the perspectives of some theorists point towards the need for a modification of the view that relationship between probability appraisal and hope is linear (Day, 1970; Lazarus, 1991b, 1999). This flows from the phenomenological insight that hope (perhaps paradoxically) exists only when there is some degree of *uncertainty* in the desired outcome. When we are certain that the desired outcome is impossible, we despair and do not hope (Day, 1970). Conversely, when the desired outcome is certain, we are happy, confident, and optimistic, but no longer need to hope (Day, 1970; Lazarus, 1999). Thus, whereas Stotland and others have seen the relationship between probability

beliefs and hope as more or less linear, the relationship may in fact be curvilinear, with the feeling of hope being most pronounced when probability beliefs indicate the most uncertainty regarding the outcome, and hope least present when the probability is believed to be either vanishingly small or a sure thing. Lazarus therefore defines hope as "*fearing the worst but yearning for better*" (1991b, p. 282, italics in original). Doubt is key ingredient of hope, and anxiety about the future should coexist with hope in individuals' emotional states.

Thus, the generally positive relationship between probability appraisal and hope proposed above should be in fact curvilinear when examined across the full range of probability (Figure 4). Extremely low probability appraisal (at or approaching a 0% assessment of issue resolution) will lead individuals to assume that collective action is destined to fail and thus fatalistically conclude that personal behavior is not worthwhile (Finkel et al., 1989; Schwartz, 1977). Low (but not extremely low) levels of probability appraisal should produce low hope and higher levels of probability appraisal should result in higher levels of hope. At some point of extremely high probability appraisal (approaching 100% certainty that the issue will be resolved), further increases in probability appraisal should be associated with *lower* levels of hope. Individuals extremely sanguine about the possibility of successful mitigation should consider it a "done deal" not requiring an additional contribution from them, what might be termed a Pollyanna effect.

H5: At extremely low and extremely high levels of probability appraisal, individuals will exhibit virtually no hope.

Role of personal importance. In probability appraisal's theorized relationship with behavioral engagement, personal issue importance should play a moderating role. The predicted nature of this relationship is presented in Table 1. The dynamics include:

A general effect of personal importance. Higher importance leads to higher behavioral engagement, as suggested by research linking issue involvement with behavior (Brickner, Harkins, & Ostrom, 1986; Chaffee & Roser, 1986; Stanley & Lasonde, 1996).

Moderation by extremes of probability appraisal. An exception to the above pattern occurs under extremely high or low probability appraisal, which see no increase in behavioral engagement when moving from low to high importance. The certainty that the issue will (or will not) be solved implies that personal action could not help, breaking the link between importance considerations and behavior (Schwartz, 1977).

Curvilinearity in the main effect of extreme probability appraisal. Extremely low (~0%) and extremely high (~100%) probability assessments decrease engagement across all importance levels (as discussed above).

Moderation by extreme importance. Extreme (but not high) personal importance mitigates the effect of extremely high probability appraisal and near zero probability appraisal. I theorize this given individuals' increased insensitivity to probability in judgments if the topic is personally significant (Rottenstreich & Hsee, 2001)¹⁹.

¹⁹ Conceived more broadly, an extreme level of personal importance may also produce a fervent dedication and moral compunction to act on an issue, akin to a fanaticism or existential stoicism. Such a response should lead an individual to engage despite an assessment that society is unlikely to resolve the overall issue.

Table 1 Interaction of probability appraisal and personal importance on behavioral engagement

		Personal Importance		
		<i>Low</i>	<i>High</i>	<i>Extreme</i>
Probability Appraisal	<i>~0%</i>	None	None	+
	<i>Low</i>	+	++	+++
	<i>High</i>	++	+++	++++
	<i>~100%</i>	None	None	+

Note. Cells represent relative level of behavioral engagement

H6: Personal issue importance will moderate the influence of probability appraisals on behavioral engagement in several ways, as described in Table 1.

Attitudinal engagement. Whereas existing theory and research support the expectation that societal issue hope will produce behavioral engagement outcomes, the picture is less coherent regarding attitudinal engagement. I define attitudinal engagement as the strength of support for policies intended to address an issue of concern. While a great deal of literature addresses the concept of attitude strength (see Petty & Krosnick, 1995) and the causes of attitudes generally (e.g., Allport, 1935; Alvarez & Brehm, 2002; McGuire, 1969; Zaller, 1992), it is not immediately clear what role hope may play.

An argument could be made that hope increases attitudinal engagement. High hope may lead to a generally positive affective response to an issue; employment of the affect heuristic would then generate judgments of high benefits and low risks (Finucane,

Alhakami, Slovic, & Johnson, 2000). Assessments of likely overall success in addressing an issue may motivate support for specific policies seen as ‘on the winning side of history’. The affective intensity and cognitive complexity entailed in high hope may serve to enhance the importance, durability, and structural integration dimensions of attitude strength (see Petty & Krosnick, 1995). While a case could be made for offering a hypothesis about the existence and directionality of a relationship between societal issue hope and attitudinal engagement, I believe that such an effort would be too speculative at the moment, and therefore advance a research question on this topic.

RQ1: Does hope influence attitudinal engagement?

Hopeful Messages—Catalyst of Action?

Developing a theory of hope about societal issues raises several points. I have already put forth conjectures for several of these: the immediate cognitive antecedents of hope; hope’s internal structure; and the consequences of hope. Of further theoretical and practical interest is the effect of exposure to hopeful communication in influencing individuals’ hope and subsequent attitudes and behaviors. Only a limited body of research has addressed the question of the impact of hopeful social issue messages. The final component of my dissertation seeks to answer these message reception questions. The proposed relationships among message processing variables are presented in Figure 5.

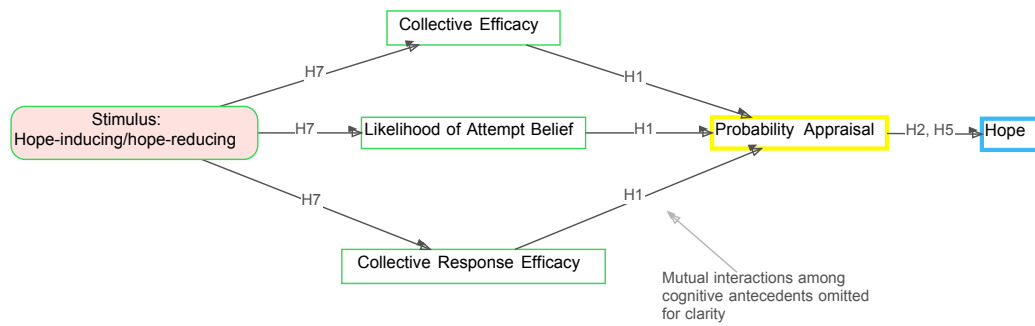


Figure 5 Hope and Message Processing

Hopeful messages. Furthering this analysis first requires a clear definition of hopefulness as an attribute of the communication context. This conceptual question—what is a hopeful message—has escaped sustained attention within the scholarly literature on hope. Two studies do address this topic within the field of climate change communication (Chadwick, 2010; Myers et al., 2012). While both proposed theories of what constitutes hopefulness in communication, they ultimately sought to validate these definitions in terms of recipient hopefulness ratings rather than conceive of hopefulness as an independent and intrinsic property of communication.

The work by Myers et al. (2012) found that less engaged viewers were more likely to find a message about the public health impacts hopeful compared against messages stressing the environmental or national security implications of climate change. Chadwick (2010) theorized that messages containing strong arguments in support of her four proposed antecedent appraisals of hopeful feelings should be effective in increasing hope. As mentioned above, she found that climate change messages designed according to these principles were successful in influencing two of the appraisals, personal issue

importance (in one of two experiments) and possibility of mitigation (in both experiments). Participants felt that a message with strong (vs. weak) arguments related to all appraisals was more hopeful. In the second experiment, which used a factorial design to independently vary message arguments for each of the four appraisals, only the manipulation of arguments related to the possibility of mitigation was rated as more hopeful. These empirical findings support the role of probability appraisal and personal importance in my theory of hope, and suggest that message content relevant to these constructs is a key ingredient in creating hopeful messages. These findings also indicate that message effects on hope are (at least partially) mediated by cognitions.

In this dissertation I offer a theory that addresses the question of what constitutes hopefulness as a message quality, and which variables are involved in the message reception process and mediate the relationship between hopeful messages and behavioral and attitudinal outcomes. Just as I theorized three cognitive beliefs as antecedents to probability appraisals, which in turn (along with personal importance) prompt the emotion of hope, so I now propose that hopeful messages are those that (as Chadwick also found) engender probability appraisals and a sense of importance. Specifically, to engender probability appraisals, the message will need to contain one or more elements that speak to my theorized cognitive antecedents: belief in likelihood of attempt, collective efficacy, and collective response efficacy.

Consequences of message exposure. The proposed model describes a pathway by which message perceptions interact with individual characteristics to update an

individual's probability appraisal. Subsequent 'downstream' effects of message processing should thus be the product of this post-exposure probability appraisal.

H7: Messages constructed to increase or decrease beliefs regarding the likelihood of solutions being attempted, collective efficacy, and collective response efficacy will have corresponding effects on those beliefs, and thereby on probability appraisals and thus on the emotion of hope.

Hypothesis 5 theorized that probability appraisal and hope about social issues should result in behavioral engagement. Research Question 1 asked if societal issue hope would influence attitudinal engagement. As corollaries to Hypothesis 5 and Research Question 1, post-exposure hope should therefore lead to behavioral engagement, and possibly attitudinal engagement.

H8: Exposure to hopeful(less) messages will increase (decrease) behavioral engagement, mediated via probability appraisals and hope.

RQ2: Will exposure to hopeful(less) messages increase (decrease) attitudinal engagement?

CHAPTER THREE: CCAM STUDY METHODS

A Study to Examine the Structure and Consequents of Societal Issue Hope

Overview of CCAM study. In this dissertation I first statistically model my hypotheses in a previously collected survey dataset. Data are drawn from several waves of Climate Change and the American Mind (CCAM), a survey series conducted by George Mason University and Yale University using nationally-representative adult US samples drawn from the online panel maintained by academic and market research firm Knowledge Networks. Knowledge Networks uses probability sampling via random digit dialing and address-based frames to recruit its panel, members of which are then sampled for individual surveys. The content of the surveys deals predominantly with climate change themes. Each wave includes approximately one thousand respondents.

The CCAM study seeks to provide generalizable findings by analyzing data from a representative samples of US residents. Because the available data for these samples do not contain the items measuring the cognitive antecedents of probability appraisal, this study only examines Hypotheses 2, 3, 5, 6, and 7, and Research Question 1, related to the internal structure of hope, and its engagement consequents, as illustrated in Figure 3. Analysis proceeded by fitting a structural equation model of the hypothesized relationships to the data.

Design. The dataset compiled results from several waves of the CCAM survey series:

- Wave 3: December, 2009–January, 2010, $N = 1,001$
- Wave 4: May, June, 2010, $N = 1,024$
- Wave 5: April–May, 2011, $N = 1,010$
- Wave 6: April–June, 2011, $N = 1,043$ ²⁰

Principle measures. Several measures relevant to my hypotheses were available across all these CCAM waves.

Measuring probability appraisal. The literature on the elicitation of subjective probabilities is extensive (e.g., Ayyub, 2001; Chesley, 1975; Ludke, Stauss, & Gustafson, 1977; O’Hagan et al., 2006; Seaver, von Winterfeldt, & Edwards, 1978; Van Lenthe, 1993). Most research has focused on elicitation among communities of subject area technical experts, with the goal of generating risk assessments and engineering guidelines for project planning and evaluation initiatives. Even among such populations of highly sophisticated, motivated, and (in many cases) numerate and statistically trained individuals, methods of probability elicitation are not straightforward. Methods range from those that tap the judgments of individuals using instruments with hypothetical gambles, analogies, and metaphorical devices such as probability wheels (e.g., Wang & Druzdzel, 2000), to those that involve experts in interactive settings such as focus groups (O’Hagan et al., 2006).

²⁰ NB: Wave 6 was a recontact of participants from a prior CCAM survey in 2008.

When attempting to assess subjective probabilities among non-experts, elicitation is likely to require an even simpler and more straightforward approach, geared to the level of sophistication of the mental models such individuals will possess for complex societal issues. Asking participants to select from among numerical probability estimates alone (e.g., 10%, 50%, etc.) is unlikely to be effective among those with low numeracy. Moreover, individuals are likely to see poor correspondence between a single number (such as a percentage) and their mental representations of likelihood when the issue is complex and multivariate. Individuals' conceptions of probability in such cases may not be amenable to distillation into a single numerical representation. It may be preferable to provide participants with choices from among various simple narrative scenarios, each of which would depict a certain value for each of the relevant factors that individuals find relevant to their thinking. I have theorized that for probability appraisal those factors are collective efficacy, collective response efficacy, and attempt likelihood. An instrument could thus allow participants to choose the most likely from among several scenarios that each offer descriptions of these factors combined at varying levels.

I measure probability appraisal—the subjective probability of successful mitigation—with an item asking participants to select from among several scenarios that one that best represents their beliefs about the likelihood that humans will reduce global warming. The question stem reads “Which of the following statements comes closest to your view?” and provides the following response options:

1. Global warming isn't happening
2. Humans can't reduce global warming, even if it is happening

3. Humans could reduce global warming, but people aren't willing to change their behavior, so we're not going to
4. Humans could reduce global warming, but it's unclear at this point whether we will do what's needed
5. Humans can reduce global warming, and we are going to do so successfully

Participants selecting the first option would be excluded from further analysis because they do not believe in the existence of climate change. My conceptual definition of societal issue hope requires that an individual perceive a challenge facing society. One cannot hope for something that one does not see as necessary.

The subsequent responses provide an ordinal set of increasingly hopeful outlooks. They tap beliefs about collective efficacy and response efficacy (e.g., "Humans can't/could/can reduce global warming..."), and attempt likelihood ("people aren't willing to change"/"it's unclear whether we will"/"we are going to"). As a survey item attempting to assess any one traditional construct on its own, this question poses difficulties in interpretation precisely because it interweaves these several variables. But as an assessment of probability appraisal—a belief that is premised on the combined consideration of these variables—this survey item serves to capture the complexity of cognitions that contribute to probability appraisal.

Measuring hope. Hope is measured as a self-reported expression of emotion, with an item asking participants how strongly they feel "hopeful" when thinking about climate change. This item is contained as part of a larger battery of "emotion" survey items. The question stem asked, "How strongly do you feel each of the following

emotions when you think about the issue of global warming?” (“climate change” was substituted for “global warming” in the Study 1 instrument). “Hopeful” was one item in the battery²¹, and response options ranged from 1=not at all, to 4=very.

Measuring personal importance. Personal importance was assessed as the mean of the standardized score of two items. One asked, “How worried are you about global warming?” (1=not at all to 4=very). The other asked, “How important is the issue of global warming to you personally?” (1=not at all to 5=extremely).

Measuring engagement. Personal behavioral engagement and attitudinal engagement with climate change was measured with a number of items (see Appendices A and B). Behavioral engagement was measured with four items such as, “Over the past 12 months, how many times have you done these things?...Rewarded companies that are taking steps to reduce global warming by buying their products” (0=Don’t Know; 1=never; 5=many times). Attitudinal engagement was measured with eight items such as, “How much do you support or oppose the following policies?...Regulate carbon dioxide (the primary greenhouse gas) as a pollutant” (1=strongly oppose; 4=strongly support).

²¹ The other emotions were: for the survey of the general population samples, “afraid”, “helpless”, “interested”, “angry”, “sad”, “depressed”, “guilty”, “disgusted”; for the Republican-only sample, “angry”, “sad”, “afraid”, “uncomfortable”, “confused”.

CHAPTER FOUR: CCAM STUDY RESULTS

The following results describe first study of the dissertation, on the dynamics and consequents of climate change societal issue hope. Data for this study came from CCAM waves 3–6. After cleaning, the final sample size was $N = 3,124$. I used structural equation modeling to compare the fit of the theorized relationships to the data.

Preliminary Investigation via Correlation and Regression

Prior to structural modeling, I undertook several exploratory analyses to estimate the possible relationships among the key variables in a subset of the dataset. To examine if hope was related to behavioral and attitudinal engagement (H4, RQ1), compared scores on the CCAM hope measure across the Six Americas of Climate Change (E. W. Maibach, Leiserowitz, & Roser-Renouf, 2009), a six-segment audience segmentation of US residents on their climate beliefs, attitudes, and behaviors. Hope was moderately negatively correlated with "rightward" status on the Six Americas (i.e., the “Dismissive” segment were the least hopeful; the “Alarmed” were the most), and inspection reveals that this is an essentially monotonic progression across segments and hope response categories.

To further probe the hope–attitude relationship (RQ1), I examined the correlation between hope and an index of policy support, finding it was moderately strong, $r = .38, p < .001$. In a multiple linear regression model, controlling for a range of other

factors including demographics, ideology, and basic climate beliefs, hope still uniquely positively predicted policy support, $\beta = 0.10, p < .001$. This was a larger effect size than the unique contributions of conservatism, party identification, individualism, self-efficacy, or perceived scientific consensus. At the same time, incremental added unique value of hope in predicting policy support in the model with these other predictors was small, with a $\Delta R^2 = .008, p < .001$. Though to be fair, this is a strong test of my theory, as I only posited a relationship between policy support and hope as a research question, and not a hypotheses informed directly by my theory.

These initial observations supported H4 and RQ1, and suggested sufficiently robust relationships in the data to justify structural modeling.

Theory Investigation via Structural Equation Modeling

My first goal in the study is to test the appropriateness of the theorized model laid out in Figure 6²².

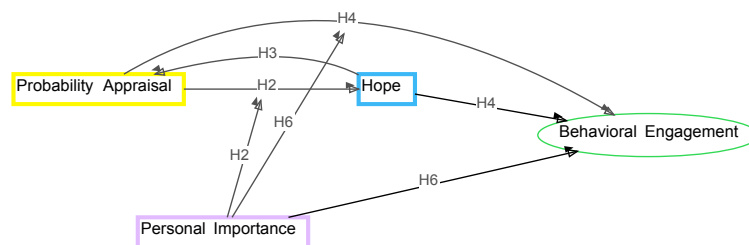


Figure 6 Original cross-sectional model of hope's influence on behavior

²² Note: the moderation by issue importance is depicted as a separate indicator (Iacobucci, 2010) which is different than the conceptual depiction in previous chapters.

Measures and Model Specification. I specified three path models in *Mplus* for each of the three forms of behavior that serve as ultimate variables (consumer activism, lobbying public officials, and organizational activism) based on the hypotheses in my proposal. Correlations for the variables in each model are provided in Table 2. Issue importance was computed as the mean of the standardized scores of two survey questions (personal importance and worry about climate change). Probability appraisal (4-point scale), hope (4-point scale), lobbying (5-point scale with skewed distribution), and organizational activism (5-point scale with skewed distribution) were specified as ordinal variables and pathways to them were modeled as probit regressions. Robust least squares estimation (WLSMV) was used for parameter estimation and model fitting rather than maximum likelihood estimation to account for the ordinal nature of the data (Finney & Distefano, 2006).

Table 2 Correlations among hope, probability, importance, and behavior variables

	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.
1. (CCAM) Hope	2.46	0.87	--						
2. (CCAM) Probability	3.54	0.79	.23 ***	--					
3. Importance	0.04	0.90	.28 ***	.36 ***	--				
4. Probability*Importance	0.35	1.09	-.10 ***	-.34 ***	-.21 ***	--			
5. Organizational Activism	1.28	0.72	.11 ***	.09 ***	.28 ***	-.02 <i>n.s.</i>	--		
6. Lobbying	1.18	0.62	.08 ***	.10 ***	.26 ***	.00 <i>n.s.</i>	.50 ***	--	
7. Consumer Activism	1.75	1.17	.16 ***	.17 ***	.36 ***	-.05 **	.42 ***	.39 ***	--

* $p < .05$, ** $p < .01$, *** $p < .001$.

$N = 2,922$

Correlation coefficients are Pearson's r

The consumer activism measure (computed as the mean of two survey questions) has nine levels. I would ordinarily be inclined to model an ordinal variable with this many levels as an interval or ratio variable in multiple regression. And in structural equation modeling, ordinal data of greater than five categories can be treated as normally distributed so long as it roughly resembles the normal distribution and the Satorra-Bentler robust maximum likelihood estimator is used to protect against some violations of the normality assumption (Raykov & Marcoulides, 2006). But the consumer activism measure is so highly skewed that I doubt it could be said to even resemble a normal distribution, and so I employed a WLSMV estimator appropriate for ordinal-level data.

Model Identification. Possessing a positive number of degrees of freedom is a first requirement for a structural equation model to be (over) identified and amenable to estimation. Degrees of freedom is computed as the difference between the number of known elements of the data and the number of unknown model parameters to be estimated. The calculations that follow refer to my proposed model (Figure 6).

Knowns. Numerous sources specify the knowns as the number of unique entries in the variance/covariance matrix of the observed data. This can be computed as equal to $v(v+1)/2$, where v is the number of indicators. With five indicators (including the interaction term), there are thus 15 known values for this model. However, a different approach (Dimitrov, 2010) to computing the number of knowns when determining the degrees of freedom for path analysis (i.e., path models with no latent constructs) looks to the number of *correlations* among the observed variables—not their variances and covariances—constitute the known values that can be used to estimate the model.

Because a variable's correlation with itself is always 1, correlations do not provide unique information for model estimation (unlike variable variances). Thus, the known correlations for a model with v observed variables is $v(v+1)/2 - v$. Using this formula with 5 observed variables yields a total of 10 known correlations (as of course can be quickly confirmed by an examination of a correlation table).

Unknowns. The unknown model parameters to be estimated in path analysis consist of a) all variances of exogenous variables and b) all paths between variables. My theorized model thus contains nine unknowns (seven paths and the variances of two exogenous variables). It is unclear, however, whether error term variances of endogenous variables count as unknown model parameters. In general they should be counted (Raykov & Marcoulides, 2006), but this appears not to be the case for path analysis (Dimitrov, 2010). Adding the three error variances of the endogenous variables in the model would then total 12 unknowns.

Degrees of freedom. Regardless of calculation method, my theorized model ought still to have positive degrees of freedom (suggesting it is over-identified) and therefore appropriate for analysis with structural equation modeling. Using the variance covariance matrix computation for knowns and including endogenous error variances as unknowns yields 3 degrees of freedom (15 knowns, 12 unknowns). The alternative approach yields 1 degree of freedom (10 knowns, 9 unknowns).

Moderation and identification. Based on a path diagram depiction involving moderation (Iacobucci, 2010, p. 93), I have specified the interaction term between probability appraisal and issue importance as a separate variable both pictorially (see

Figure 6) as well as conceptually for the purposes of model identification. The above degree of freedom calculations are based on that presumption.

I remain slightly concerned, however, that because the variance of an interaction term (and hence its covariances too) is a (multiplicative) function of other variables in the model, the interaction term therefore does not provide "unique information" (Ullman, 2007, p. 695) for degrees of freedom purposes. I explored this in *Mplus* by constructing an arbitrary path analysis model with my variables of interest (including the interaction term) designed to resemble a just-identified model ($DF = 0$) except substituting for a causal path between probability appraisal and issue importance instead an interaction between them on hope (see Figure 7). Though this model should have been over-identified, it produced in *Mplus* a model with near perfect fit ($\chi^2 = .587$ ($p = .44$), RMSEA 0.000 (90% CI 0.000–0.044), CFI = 1.000, TLI = 1.045). This suggests that computationally the interaction term made a negligible contribution of unique information (i.e., it didn't truly count as a new known) for the purposes of determining model degrees of freedom.

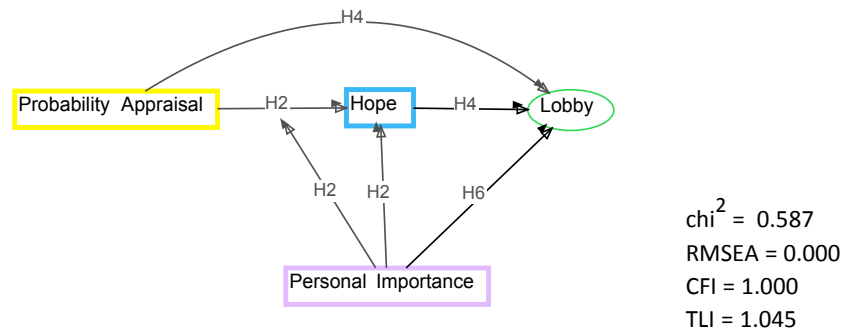


Figure 7 Near perfect fit of model with interaction term²³

Identification Issues. Even though the above calculations indicate that the models have positive degrees of freedom (suggesting that they may be identified), when I ran them in *Mplus*, *Mplus* indicated an inability to identify models with consumer activism and lobbying as the ultimate dependent variable. *Mplus* was able to estimate a model for organizational activism (albeit with poor fit [$\chi^2 = 546.60$, $p < .001$, RMSEA = 0.302, CFI = 0.557, TLI = -0.991]). An examination of the observed correlations among variables in each model does not seem to suggest why such a difference would exist in how *Mplus* treated them (see Table 2). The failure in identification suggests that the non-recursive nature of the models may be causing problems (see next).

Non-recursive modeling. The model I am proposing involves a reciprocal interaction (i.e., a ‘feedback’ loop) between probability appraisal and hope. Such a ‘non-recursive’ model presents challenges in a path analysis/structural equation modeling framework. At the very least, a non-recursive model goes beyond the standard

²³ NB: This model was constructed solely to probe identification and fit computations performed in *Mplus* and does *not* represent a theoretical formulation.

assumptions behind maximum likelihood-based model parameter estimation techniques (Dimitrov, 2010). Some seem to indicate that non-recursive models are not possible at all in SEM/path analysis (Garbin, 2012; Maddala, 1983, p. 117; Muthén, 2006). On the other hand, the experience of one user indicates it is possible to specify non-recursive models in Mplus (using alternatives to ML estimation) (Muthén, 2006). One source indicates that non-recursive SEM can be unproblematically estimated using maximum likelihood in *Stata* or *LISREL* (Williams, 2013), but that seems implausible given that the more fundamental problems in non-recursive modeling should transcend software package.

However, there are several alternative analytical strategies available.

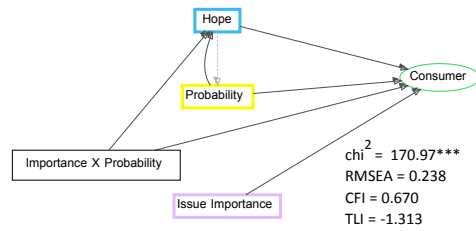
Modeling with a reciprocal path removed. The first alternative strategy would be to simply remove one of the offending reciprocal paths between the two forms of hope in the models. Results of this approach are discussed below. Removing a reciprocal path does allow *Mplus* to successfully estimate the models. An obvious problem with this approach, however, is that it does violence to the model of reciprocal causation that I had originally theorized and wish to test.

Results of modeling without the inclusion of one of the paths between probability appraisal and hope are presented in Figure 8 for models predicting each behavior variable. *All models achieved poor fit (assessed with RMSEA, CFI, TLI), so specific path coefficients have not been provided.*

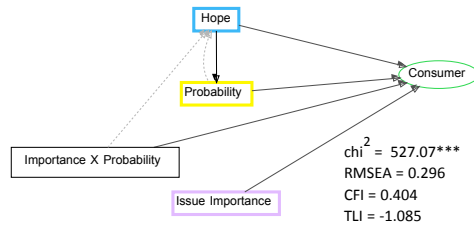
An issue that arises with this approach is the question of which path to remove (the one from probability appraisal to hope, or visa versa?). One way of answering that question (and an investigation that is of theoretic interest for me generally) would be to

compare the fit of each model. Superior fit would for a given model would be evidence supporting the relationship between the forms of hope in that model (as against the alternative direction of causation).

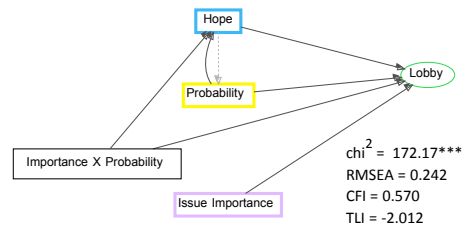
Unfortunately, the standard methods to compare models are either inappropriate or not available in this case: the χ^2 difference test only applies to comparisons between nested models (Ullman, 2007, p. 721), which these are not; and, the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) indices are only applicable to maximum-likelihood estimated models, and not the WLSMV estimation I used for these models of ordinal data.



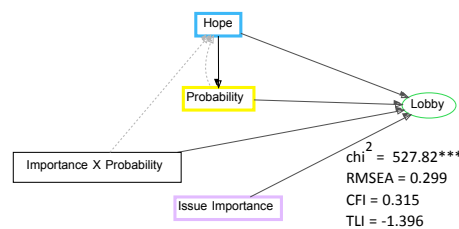
Pane 1. Consumer behavior model, removing the hope → probability path (indicated in grey dotted line).



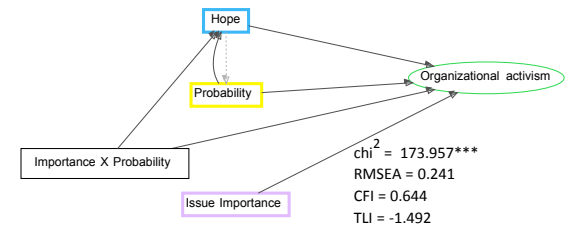
Pane 2. Consumer behavior model, removing the probability → hope path (indicated in grey dotted line).



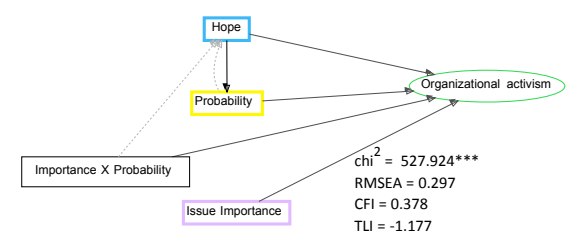
Pane 3. Lobbying behavior model, removing the hope → probability path (indicated in grey dotted line).



Pane 4. Lobbying behavior model, removing the probability → hope path (indicated in grey dotted line).



Pane 5. Organizational activism behavior model, removing the hope → probability path (indicated in grey dotted line).



Pane 6. Organizational activism behavior model, removing the probability → hope path (indicated in grey dotted line).

Figure 8 Modeling predictors of various outcome variables, alternating remove of path from hope to probability, and visa versa

Table 3 Comparative Fit Indices

	Consumer Activism Model		Lobbying Model		Organizational Activism Model	
	<i>Hope to Probability path only</i>	<i>Probability to Hope path only</i>	<i>Hope to Probability path only</i>	<i>Probability to Hope path only</i>	<i>Hope to Probability path only</i>	<i>Probability to Hope path only</i>
<i>AIC</i>	15,966.47	16,503.49	12,078.23	12,596.09	13,330.57	13,835.08
<i>BIC</i>	16,050.52	16,563.54	12,132.08	12,655.92	13,384.58	13,895.09
<i>Adj BIC</i>	16,021.92	16,531.77	12,103.48	12,624.15	13,355.99	13,863.32

Note: Adj BIC is the sample-sized adjusted BIC

In order to attempt an answer to the question of comparative fit, however, I re-ran the models in Mplus using ML estimation to obtain AIC and BIC scores. These are presented in

Table 3. Scores ranged from ~12,000 to ~16,000, and for each model and each index, scores were at least 500 points lower for the models with a path only from hope to probability appraisal. While lower scores on these indices imply better fit than a rival model, standard references do not offer guidelines on the magnitude of difference necessary to draw such conclusions (Raykov & Marcoulides, 2006; Ullman, 2007). That said, it appears that a path from hope to probability appraisal fits the data better (albeit still poorly in absolute terms) than a path from probability appraisal to hope²⁴. This observation should be viewed with special caution, however, because it is based on maximum likelihood model fitting procedures that assumed interval/ratio, normally distributed data for the dependent variables.

Other strategies for non-recursive model analysis. Because SEM techniques do not allow for the analysis of the non-recursive model I originally theorized, I explored several alternative approaches.

One approach would involve modeling the reciprocal relationship between hope and probability appraisal through longitudinal measures. A subset ($n \sim 1,000$) of the sample I am using for these analyses were also surveyed three years prior (Fall, 2008), at which time they were asked the same set of items *except* for the hope question. I could employ these earlier data in several ways, such as modeling probability appraisal at time

²⁴ This difference could be spurious, caused by the fact that in the models with the cognitive hope to hope path removed, I also removed the moderation of that path by importance (i.e., two paths were removed), producing models with one fewer path (and one more degree of freedom) than the models in which the hope to cognitive hope path had been removed. To examine the possibility of such a spurious difference, I re-specified the models without the path from hope to cognitive hope to remove the importance interaction, rendering them equivalent to the rival models in terms of number of paths and degrees of freedom. AIC, BIC, and adjusted BIC showed only single digit differences with the models with the importance interaction included, so we can conclude that there was no such spurious difference.

2 as a product of hope at time 2, which in turn would be modeled as the product of probability appraisal at time 1. But the absence of the hope data from the time 1 survey makes this a suboptimal approach.

Moving outside of the SEM framework entirely permits other possibilities. Two-stage least squares (2SLS) regression mitigates the issue of correlated error terms from reciprocal causation modeling by first modeling values for one variable in the reciprocal relationship by regressing it on other model variables (Williams, 2013). In a second stage, the estimated values for the variable are employed instead of the actual variable values in order to model the path to the other variable in the reciprocal relationship (indirect least squares is a similar method that offers another potential avenue). But this process can require an ‘instrumental variable’ that is highly correlated with one of the variables in the reciprocal relationship (but not the other). Because such a variable is not available on CCAM dataset nor can one be readily imagined for a future data collection opportunity, this approach is also not practical.

CHAPTER FIVE: RATIONALE FOR MEASUREMENT STUDY

Motivation for a Measurement Study

My analyses of CCAM data in the preceding study has shown a general pattern so far that fails to support the central hypotheses in this dissertation. This includes a failure to find expected relationships between the constituent elements of hope with one another (hope, probability appraisal, and the role of issue importance in moderating between them). I also have not found strong effects between hope and climate change engagement. It has been unclear whether these are valid null findings, or whether they result from a lack of adequate measurement or explication.

In other words, is there truly a “there there” regarding my notional construct of hope in climate change? If so, how is it best measured? And are the putative measures of hope in existing CCAM datasets valid indicators of the constructs?

Such a study conceived as a response to the initial CCAM analyses has several principal aims and pursues questions in the realms of theory testing, measurement method, and validity assessment.

Aims:

1. Continue to evaluate my theorized constructs of hope, probability appraisal, and importance, and their relationship to one another and dependent variables of interest.

2. Expand knowledge about the role of hope in communication and processing, and the role these variables play in shaping behavioral and attitudinal responses and address hypotheses related to hope's role in message processing. These are described in Hypotheses 8 and 9; and Research Question 2 regarding effects for attitudinal engagement. These are illustrated in Figure 9.

Questions:

1. Do measures of hope demonstrate construct validity via responsiveness to a hope inducing (reducing) stimulus, in accordance with my theory?
2. Does my model of the antecedents to hope explain the observed data?
3. Examine a range of measurement approaches for hope, based on my own theorizing as well as existing literature. Do they exhibit convergent validity and appear to represent the same construct? Criterion validity with regards to climate change engagement?
4. How do the items I have identified in past CCAM waves as potential measures of hope and probability appraisal serve in that capacity, compared to other options I have developed for this study? Are the CCAM items sufficient to conduct analyses of hope on their own?

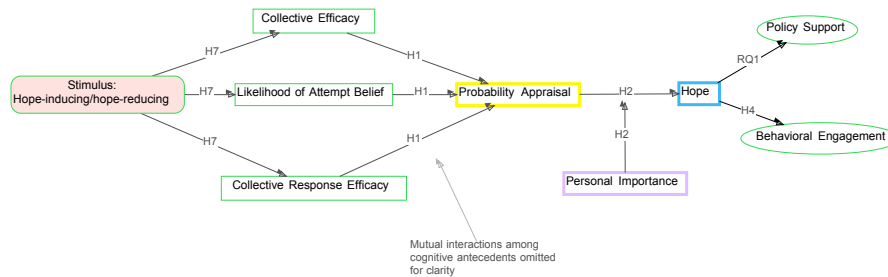


Figure 9 Full theorized model of message effects²⁵

Reflecting on the Role of Hope Stimuli with State and Trait Constructs

A construct valid measure of state hope should show that scores go up in response to exposure to hopeful information. If I am conceptualizing hope related to climate change as a stable trait, to the extent that a person higher on the trait may tend to be predisposed to be hopeful about climate change; i.e., when the topic of climate change is made salient (by internal mental processes or environmental stimuli triggering thinking about it), the person's response includes feeling hope (potentially along with other emotions, of course). Thus, the 'feeling of hope' itself is necessarily a more or less temporary state, dictated by the duration and frequency with which the person thinks about climate change.

The emotion of hope is the response to stimuli that invoke fearing for the worst paired with a longing and realistic imagining that it will be better. Thus, in situations where the stimuli is simply the salience of climate change per se (e.g., when it spontaneously comes to mind for someone, or when someone encounters words or images that evoke the topic), then a person will draw on available pre-existing

²⁵ Note: Not all aspects of this diagram are examined in the analysis contained in this dissertation.

considerations/appraisals (of importance and probability) to determine the emotional valence of climate change and how hopeful s/he will feel in response (which can be thought of as 'baseline' or trait hopefulness in climate change). If the stimuli entail more than a mere salience prime, and contain information bearing on the appraisals (of probability and importance) that generate hope, then the experience of hope in that situation may correspondingly differ from baseline in the direction dictated by that information. So, for instance, someone who has a level of trait hopefulness in climate change that would lead them to respond with a level of experienced hope of X amount when simply thinking about climate change in the absence of other stimuli, would experience an amount of hope less than X when reading a news story indicating the unlikelihood that humans will successfully tackle climate change. Over time, as an individual is exposed to further information, this information can alter the content and salience of considerations that inform the appraisals that generate hope, thus altering the individual's (baseline) level of trait hope.

CHAPTER SIX: MEASUREMENT STUDY METHODS

Design of Measurement Study

Stimulus and control conditions. Participants were randomly assigned to one of three conditions: a) to read a ‘hope-inducing’ message, b) to read a ‘hope-reducing’ message, or c) see no message, but instead take a battery of additional questions (see ‘contextual hopefulness’ items, below). All other aspects of the survey experience were the same, and included questions on climate change beliefs attitudes, and behaviors, including the measure of hope and probability appraisal.

Instrument order. The stimulus (or contextual hopefulness battery, for the control condition) was displayed early in the survey, so that most of the other items could measure its effect. The only items to come prior were the CCAM measure of importance (to allow for examination of how importance moderates message reception, and to provide a cleaner measure of CCAM importance, for measurement validation purposes), dispositional optimism (not analyzed in this dissertation), and the climate change belief items used as screener questions.

Stimulus design. The hope-inducing message and hope-reducing stimulus messages were each structured as a headline, preamble paragraph, series of bullet points, and a call-out box sentence, approximately 600 words in length (see Appendix C). The tone was intended to mimic that of journalism or other informative texts. The messages

each had components corresponding to my theorized antecedents to hope: perceived necessary effort (to tackle climate change); collective efficacy; collective response efficacy; and likelihood of attempt (by society to tackle climate change). These components were each discussed in one of the bullet points and touched on in the preamble paragraph and call-out box. The hope-inducing message contained language designed to increase each of these variables; the hope-reducing message had language intended to decrease each of them. For example, the sentence “The smart money is now on the world taking action.” in the hope-inducing condition, intended to increase likelihood of attempt belief, and “The smart money remains on the world not taking action.” in the hope-reducing condition.

Rationale for a control condition. Because one important purpose of this study is to compare different measurement approaches to studying hope and related constructs, there would be a concern in only being able to assess them after a hope stimulus exposure, as this may differentially affect how respondents react to the measures, preventing a ‘clean’ comparison of them. Specifically, having the Chadwick antecedent items come after the stimulus could be problematic. I am including the Chadwick items to compare them against my own in terms of how they perform at predicting hope. If I could only compare them against my antecedent measures among participants post-stimulus, that would be after exposure to a stimulus specifically designed to move *my* constructs, not Chadwick’s, increasing the possibility that the stimulus might change participants’ reactions to my stimulus measures, but not the Chadwick ones, and thereby erroneously lead me to conclude that there is less of a relationship between Chadwick’s

measures and mine²⁶, and between Chadwick's measures and hope (compared to mine), than there in fact is in general. Including a no-stimulus control condition provides a venue to obtain a 'clean' read on relationships among all the measures (i.e., without the stimulus introducing potential confounds).

Role of importance vis-à-vis hope stimulus. Issue importance plays an important role in my theorizing, based on the underlying model of hope I am employing (Lazarus, 1999; Stotland, 1969), which describes hope as arising out of the perception of a favorable (but still uncertain) outcome regarding a topic of high personal importance. Hence importance is a key factor in generating hope. Specifically, I theorize that it moderates the relationship between the probability appraisal (how likely someone thinks it is that we will successfully tackle climate change) and experiencing the affective condition of hope. Attempting to manipulate importance along with the cognitive antecedents to the probability appraisal could therefore be considered as an approach to designing hope-inducing or -reducing messages.

But manipulating importance may be an extremely powerful and difficult-to-predict factor in the design, potentially swamping and confounding the effects of other aspects of the stimuli designed to manipulate the cognitive antecedents of probability appraisals. So, instead of including a manipulation of importance in my stimulus messages, I instead measure (CCAM) importance pre-stimulus and use that score as

²⁶ The stimulus could threaten valid inferences from a correlational comparison of Chadwick vs. my measures if the stimulus a) affected one set of measures more than the other, and b) produced highly heterogeneous effects between participants. In other words, even if (a) were true, and the stimulus did increase my measures on cognitive antecedents more than the Chadwick items, that alone would not be a threat to valid inference.

moderator of the stimulus effects. That still allows me to evaluate the theory without running into issues regarding attempting to manipulate importance. Including this CCAM issue importance measure here (before the stimulus) in addition to the Chadwick importance appraisal items (see below) later in the instrument (which are very similar) allows me to obtain an initial measurement of importance before respondents become more cognitively involved in the issue by responding to subsequent questions.

Survey methodology. Survey participants were recruited on behalf of the vendor *Climate Nexus Polling* from approximately one dozen online polling recruitment and sample panel firms. Participants were notified of the survey opportunity and provided a link to the online instrument. Upon completion they were redirected to their provider. Participants were compensated approximately \$1.50. While this is not a traditional random sampling survey method, samples can be assembled high specific quota selection on demographic characteristics and cross-tab marginals to ensure a multi-dimensionally diverse and representative sample.

Target sample characteristics. Those skeptical of the existence of climate change and/or its anthropogenic cause are not appropriate subjects for the measurement of hope in solving it. I therefore screened out such participants from the study in questions early in the instrument assessing climate change belief certainty and belief in human causation. In order to minimize the amount of screening necessary, I instructed the survey vendor to provide a sample with demographic characteristics likely to maximize eligible participants: disproportionately female, young, and non-white. All respondents were age 18 or over.

Sample size and power. To determine an appropriate sample size for this study, I conducted *a priori* power analyses in *G*Power 3.1*, including for a *t*-test of difference between independent means (for comparing hope-inducing and hope-reducing messages), and for a multiple linear regression model including with 10 predictors. Both indicated that fewer than 200 participants would be needed, given medium effect sizes (Cohen's $d = 0.50$, and $f^2 = 0.15$) and adequate power ($\beta < .20$). Given that these calculations under-

estimate the sample sizes need for the more complex analyses I wanted to run, so I decided on a target of approximately $N = 1,000$ respondents to request from the survey vendor.

Other details. Before being presented with any climate change-specific questions or the stimulus messages, participants saw a definition of climate change adapted from the CCAM surveys, to ensure a common basis for understanding the issue and to provide congruity with the CCAM measurement methodology. Several attention checks were included throughout the survey, to ensure participants were reading question texts. The survey instrument, and recruitment and fielding protocols were approved by George Mason University's Institutional Review Board prior to data collection.

Measures

Items from the instrument employed in analysis in this dissertation are described below. See Appendix C for the full instrument.

Hope. The survey included several approaches to measuring the emotion of hope as it relates to climate change.

Hope measures from past climate literature. Previous studies of climate hope have taken compatible and almost-identical approaches, and so I combined them into an omnibus battery starting with the CCAM implementation as the template²⁷. The battery stem was “How strongly do you feel each of the following emotions when you think about the issue of climate change?” (from CCAM) and contained randomized list of

²⁷ And beyond climate, the National Election Survey also takes this approach (Just et al., 2007; Marcus, MacKuen, Wolak, & Keele, 2006)

emotion terms (such as “Hopeful”, “Sad” and “Angry”). Response options varied on a scale from “Very strongly”, through “Somewhat strongly” to “Not at all strongly.”²⁸ The item terms were principally from CCAM Waves 3–6. Wave 11 (which contained other, more detailed hope items) also included ‘Doubtful’ on the list (and was included in this survey to relate Wave 11 data to that from this instrument). I added “happy” to increase the number of positive affect terms for better positive/negative balance. ‘Hopeful’ was maintained as the first item (i.e., not randomized) to control for possible priming effects of seeing other items first.

Chadwick (2010, p. 419) constructed emotion measures similarly²⁹ to CCAM, so I have added her additional hope items (“eager”, “enthusiastic”, “optimistic”, “positive”, “encouraged”). Feldman and Hart (2018) used “hopeful,” “optimistic,” and “inspired” for a reliable measure of hopefulness in response to a news article, and so I have also added “inspired” to the battery.

Hope measures from past non-climate literature. I included a number of measures taken or adapted from studies of hope outside the climate change context (including Herth, 1991; Hinds & Gattuso, 1991; Miller & Powers, 1988; Nowotny, 1989; Lazarus, 1991b; see also, Farran et al., 1995). They involved “Strongly agree” to “Strongly disagree” responses to statements based on the stem “In general, when I think

²⁸ Original response categories in CCAM: “Very”, “Moderately”, “Not very”, “Not at all”.

²⁹ Chadwick used a randomized battery of items measuring the constructs of *Hope*, *Fear*, *Guilt*, *Sadness*, *Happiness*, and *Anger*, with each construct measured with 4–6 items. All of these constructs are already assessed by at least one item in the augmented CCAM battery I am employing here. Chadwick’s question stem and response options were also broadly similar to CCAM: “*When I think about climate change, I feel...*”, 1 = “*None of this emotion*” to 5 = “*A great deal of this emotion*”.

about climate change...”, such as “There’s no light at the end of the tunnel” and “I fear for the worst but long for it to be better”. Some items are reverse-coded.

Contextual hopefulness. I designed measures to provide respondents with more detailed prompts to trigger their reflections about how they feel about climate change, what I term “contextual hopefulness”. They involved a stem of “Considering climate change, how hopeful or hopeless are you about the future for each of the following?” and included items such as “Myself” and “People in other countries”. Given that climate change is a low involvement topic for most Americans, they may be relying on sparse mental models and few salient considerations or memories when answering. Thus, the more general “when you think about the topic”-style questions about hope used in past literature (see above) may only capture a superficial picture of individuals’ affective response, compared to these items, which specify specific objects of hope.

Hope-in-response. These items are designed to further establish the construct validity of a self-report method of directly querying respondents about their degree of ‘hope’. Several of the items in the battery assess the extent to which self-reported hope will vary in response to posed scenarios designed to raise the salience of constructs (importance, probability appraisal, necessary effort belief, likelihood of attempt belief, collective efficacy belief and collective response efficacy belief) that I have theorized as predictors of hope. The stem is “How hopeful would you tend to feel in response to each of these things?”. Some items (such as “Hearing something that made you think people will probably succeed in limiting climate change.”) should increase the given construct (e.g., lead to higher probability appraisal) and thus also to be rated as promoting more

hopefulness than those I have designated as likely to decrease the given construct (such as “Hearing about leaders failing to agree on how to prevent climate change.”). Finding the expected within-subjects response patterns would serve to support both my theory about the antecedents of hope, as well as the construct validation of the general measurement approach—that is, asking people directly about 'feeling hope'—at least in as much as such self-reported explicit hope appears to vary appropriately as a function of exposure to varying hypothetical scenarios.

Additional items in the battery assess the extent to which contemplating climate engagement is experienced as hope-inducing. While I do not have predictions about which (if any) of these items will receive more or less hopeful responses, I do expect that (within-subjects) reporting more hope while contemplating a given type of engagement will predict higher scores on the related dependent measure item(s) of that actual type of engagement (see below for dependent measures). Further these hope-in-response scores should (when averaged together) can be correlated with the other measures of hope to establish their convergent validity.

Probability. I measured probability appraisal beliefs several ways in the survey.

CCAM probability item. I included the verbatim CCAM probability item, as described previously in Chapter Three. I chose to ask this item before additional hope measures have an opportunity to influence response to this item. The goal is to maintain comparability of this measure between this study and the CCAM datasets to ensure the best opportunity to validate the CCAM item.

Proposed new probability appraisal measures. To expand methods to tap probability appraisals at a broad, ‘gut level’ first impression, I developed several items, such as “People will develop solutions to climate change before it’s too late.” The item wording “There is still a real chance” is adapted from other sources on hope (Farran et al., 1995, p. 213; Hinds & Gattuso, 1991).

Chadwick possibility measures. Chadwick (2010) measured an “appraisal of possibility”, which I included in the survey. It contains some items ("likely", "probable") that would seem to equate to my “probability appraisal” construct, along with items that would appear to be more specifically tapping efficacy beliefs ("achievable", "feasible", "attainable", "possible"). Items were originally measured on 5-point scales with additional descriptors (e.g., Very relevant, Relevant, Neither, Irrelevant, Very irrelevant) beyond those I employed when developing slider versions for this survey. Some items are reverse-coded.

Importance. I draw on two sources for importance measures.

CCAM importance items. I included the two CCAM importance measures (worry and personal importance) discussed above in Chapter Three. To these I added another CCAM item, “How much had you thought about climate change before today?”.

Chadwick importance measures. Chadwick (2010, pp. 421–428) measured an “appraisal of importance”, which I included in the survey. It includes items such as “Very significant”, and “Needed very much”, and appears to equate well to the CCAM importance measure.

Proposed cognitive antecedents to probability appraisal. These items are built around my model of probability appraisal formation, which postulates that probability appraisal is a function of appraisals about the potential solution to a problem: likelihood of attempt, the effectiveness of implementation (collective efficacy), and the collective response efficacy of the solution. I further theorize that individuals' assessments of the effort necessary to accomplish a goal will be antecedent to those previous three appraisals (i.e., someone's belief about the amount of effort required to combat climate change will inform their beliefs about whether it will be tried and be successful). This effort item is included in the battery to fully measure my theorized model of appraisals leading to probability appraisal.

The battery is prefaced by asking respondents to consider what they think should be done to address climate change, and then asks "How much of an effort do you think would be required to take these actions?" (necessary effort), "How likely do you think it is that people will try to take these actions?" (likelihood of attempt), "How confident are you that people could successfully take these actions if they tried?" (collective efficacy), and "If people did successfully take these actions, how effective do you think they would be in stopping climate change?" (collective response efficacy).

I have also theorized that individuals construct probability appraisals out of appraisals of the various components of a solution that they perceive (see Equation 1). This anticipates that individuals will sample from among their mental inventory of possible issue resolution pathways when they construct their judgments of probability appraisal. To elicit from individuals anything approaching the full set of pathways they

have under consideration would require an extensive and intrusive interaction, one likely to profoundly alter the nature of an individual's cognitive processes by provoking an extensive recruitment of mental resources and conscious effort to a task normally conducted in a much more cursory fashion. A more logistically realistic and ecologically valid approach would entail the solicitation of a minimum number of cognitive antecedents to hope in an attempt to capture some of the key set of considerations employed by an individual.

I adapted the above questions to test that idea, by asking respondents to think of two of the most important specific actions that could be taken to address climate change, and then answer versions of the likelihood of attempt, collective efficacy, and collective response efficacy items specific to each of those actions. That permits me to examine how well the sum of scores across the two actions respondents each picked correlate with their scores on the 'general' form of the question above, and with other measures of probability appraisal.

Individuals may possess a wide storehouse of other potential pathways for addressing climate change. They may see the actions of individuals, a global treaty, or some technological fix, etc. as viable means to addressing the issue. Soliciting judgments about just two such pathways thus merely taps a portion of an individual's thinking on the subject. In order to treat these items as proxy measures for the entire set of cognitive antecedents to hope, I must therefore make the assumption that responses on these questions provide, on average, an indication of the beliefs individuals hold across the

entire set of solution pathways they consider when arriving at their level of probability appraisal.

Outcomes. I measured the possible consequents of hope across three categories of questions, all adapted from CCAM surveys.

Personal behavior. Respondents' involvement in individual actions to address climate change was measured using five items, assessing frequency of subjects such as "Taken actions to reduce your own personal impact on the climate", and "Written letters, emailed, or phoned government officials to urge them to take action to reduce climate change."

Communication behavior. Interest in communicating about climate change (both information seeking and interpersonal communication) was assessed via five items, such as "In general, do you like to talk with other people about climate change?" and "In general, I don't like to read or hear anything about climate change."

Attitudes. Support for various climate and clean energy policies was measured via four items such as "How much of a priority do you think climate change should be for the president and Congress?" and "How much do you support or oppose the following policies?...Sign an international treaty that requires the United States to cut its emissions of carbon dioxide 90% by the year 2050."

Differences in outcome measures: stimulus vs. control conditions. The language basis for many of the above outcome measures was borrowed from items in the CCAM surveys using a retrospective format (such as "Over the past 12 months..."). This language was maintained in the Control condition, providing the opportunity to evaluate

how hope and the other constructs of interest may predict past behavior of respondents. But because the experimental design did not include a long-term follow-up component, there was no way to gauge the impact of message exposure using this approach. I thus modified outcome items slightly between the stimulus and control conditions. For the non-control conditions, they reflect a prospective, forward-looking set of intentions, in order to capture any effects of the stimulus exposure (so, “Over the next 12 months, how many times do you expect you will do the following things?”). It should not prove problematic if this effects a substantial modification between the stimulus and non-stimulus versions, as I do not plan to directly compare between the control vs. stimulus conditions.

Demographics. I included a number of demographic questions at the end of survey to serve as controls. These were measures of political party identification, ideology (liberal–conservative), Hispanic origin, race, gender, income, and educational attainment.

Measurement development considerations. There are several design decisions of note involved in this instrument.

Specification of goal object. As appraisal theories of emotion make clear, the interpretation of events that precipitate emotional responses are distinctly personal (Lazarus, 1991b). What matters are not objective empirical realities, but the meaning they hold for individuals. For example, a student’s emotional reaction to obtaining a given score on a test depends to a large degree on the expectations of that student about

what constitutes an acceptable grade. The same score might make one student overjoyed and another distraught.

Understanding what generates hope benefits from this same insight. People hope for different outcomes, and for this reason this study of hope relating to climate change excludes those whose skepticism of the reality of anthropogenic warming and/or overriding hostility to mitigation activity leads them to a completely different perspective on hope than those who recognize the need and desirability for human action to address climate change.

Additionally, even among those who support mitigation, relevant beliefs and ‘standards’ for hope may vary. Some people may find greater warming and extent of ill effects from climate change more acceptable than do others.

I thus attempted to employ language (particularly in the measures of cognitive antecedents, where the object of the question was especially relevant for how respondents would reply) that avoided pre-specified goal objects, such as “worst effects”-type language, and chose to employ this wording: *“Think about the actions you think people should take to limit climate change – including actions by governments, businesses, communities, and individuals.”*³⁰

Possible reservations regarding a non-predefined goal object. But does this decision to allow individuals to select the target of their responses pose problems related

³⁰ I prefer this statement to supplying respondents with external information or asking their beliefs about the feasibility of a specific policy (such as a 90% greenhouse gas cut by 2050) because what is relevant is to invoke respondent’s own beliefs about needed solutions. Asking the subsequent three questions based on this statement should capture a general sense of probability appraisal based on the totality of what a respondent sees as necessary.

to measurement invariance? Is hope the same, regardless of what triggers it? I would argue that, yes, hope is the same, regardless of what triggers it. The literature on emotion suggests that the cause of an emotion will not affect the experience or content of the emotion. This is the corollary to theories of appraisal and emotion: certain appraisals lead to certain emotions, so therefore a given emotion must always have the same appraisal antecedents. So, hope is hope, regardless of what triggers the feeling. It is a feeling, and can be triggered by many things and result in the same common denominator of affective experience. Many things can make you happy, but that happiness is (in theory) the same in quality (if not magnitude) regardless of source.

Of course, the cognitive appraisal antecedents to emotion (and the beliefs and circumstances and individual characteristics that give rise to them), all do very much hinge on the issue at hand, the target of hope.

As the foregoing should make clear, allowing individuals to specify their own desired outcome for climate change in the course of the measurement procedure should minimize measurement invariance problems (differences between groups in the structure of relationships among observed measures) rather than generate such problems, as might first be suspected. If measures of appraisals and cognitive antecedents were phrased in terms of some set point for resolving climate change (e.g., “preventing the worst effects”), then measurement invariance could occur in the relationship between such measures and measures of (emotional) hope. For those individuals who consider preventing *more* than merely the “worst” effects of climate change, the relationship between their responses to the cognitive items and the hope items would be attenuated

because even optimistic responses to the cognitive items would not necessarily indicate that the individuals held beliefs and appraisals sufficiently positive to generate hope for them.

If survey question wording instead omitted any explicit set point for success in tackling climate change (for instance, by employing generic language such as about “solving global warming”), this could potentially resolve the problem just discussed in the preceding paragraph. However, such wording introduces its own problem. How individuals interpreted such generic language—how much of climate change needs to be redressed for an individual to consider it “solved”?—would then become central to how they interpreted and responded to the cognitive items: the higher one’s standard, the less likely (all else equal) one would find it that the standard would be achieved. At the very least, this makes personal definitions of the desired outcome an important antecedent to the other cognitive variables, and worth including in the model for its own sake. But these personal goal definitions may also be related closely to the importance placed in the issue of climate change: the more important one views it, the lesser the extent of climate change’s effects one may find acceptable. Thus, higher personal definitions would be positively correlated with appraisal of importance, but negatively correlated with appraisal of probability. Failure to include this relationship between independent variables in statistical modeling could compromise the validity of results (for example, by employing modeling methods that assume independence among independent variables). By including an explicit measure of the necessary effort associated with an individual’s desired outcome, I am able to construct my models more accurately.

“Climate change” vs. “global warming”. The survey contained a broad range of questions about participants’ beliefs, attitudes, and behavior regarding “climate change”. While CCAM surveys have traditionally used the phrase “global warming” on their instruments, I employed “climate change” to synchronize with the phrasing employed by Chadwick (2010).

Sliding scales. The vast majority of the items on the survey employ a visual analog scale (aka “sliders”) with no graduated intermediate points because it is this configuration that appears to have accrued the most support in validation studies. I included a middle point descriptor to offer some visual guidance on the graduation of the scale. While some research comparing un-graduated Visual Analog Scales (VASs) to 4–9 point discrete point scales finds a non-linear transformation is necessary to equate results between the measurement types (Funke & Reips, 2006), other work by the same scholars concludes that the VAS functions as a true interval-level scale (Reips & Funke, 2008). This suggests that such discrepancies between discrete point scales and VASs when measuring interval (or ratio) constructs could be due to measurement error in discrete point scales.

It seems reasonable that most individuals lack the sophistication of judgment on most issues to make exceedingly fine discernments in their responses, and scales calling on them to do so are unhelpful, or worse (Krosnick & Presser, 2010). Simulation and experimental research indicates negative impacts on reliability and validity when the number of scale points is either too few or too great to appropriately encompass the extent of differentiation of which respondents are capable (Goggin & Stoker, 2014). This

work found that for single-item measures, an 11-point scale outperformed scales with seven and fewer points, as well as various forms of 101-point scale, but the researchers observe that it is generally better to err on the side of greater differentiation (more scale points) than less.

CHAPTER SEVEN: MEASUREMENT STUDY RESULTS

Sample

After removing anyone reporting an age less than 18 years, or who failed a “captcha”-style image-recognition task (to screen for bots), both of two embedded attention checks at different points in the instrument, and took at least five minutes to complete the instrument, 1,070 participants remained, of 1,479 who attempted to complete the survey (79.6%). Only included in analyses were those who believed climate change is happening (or skipped or replied “Don’t know”) and caused entirely or mostly by human activities, or equally by humans and nature. This resulted in a final sample for analysis of N=863.

Characteristics of this final sample for analysis, N=863, are displayed in Table 4. These are intentionally not nationally representative, due to a) a request of the survey vendor for a sample disproportionately female, non-white, and younger than average (to increase the propensity of those who believe climate change is real and human caused); and b) the filtering on climate beliefs described above. Thus, for example, Democrats outnumber Republicans two-to-one, about half of participants are non-white, over two thirds are female, and liberals substantially outnumber conservatives.

Table 4 Final sample characteristics, measurement study

Descriptive Statistics n = 863			
	<i>n</i>	<i>Categories</i>	<i>Percentage</i>
<i>Party identification</i>	818	Democrat	44.3%
		Lean Democrat	9.4%
		No Party/Other/Neither	22.1%
		Lean Republican	5.0%
		Republican	19.2%
			100.0%
<i>Ideology</i>	815	Very liberal	14.0%
		Somewhat liberal	22.5%
		Moderate, middle of the road	42.8%
		Somewhat conservative	14.5%
		Very conservative	6.3%
			100.0%
<i>Hispanic origin</i>	816	Yes	17.9%
		No	81.9%
		Don't know	0.2%
			100.0%
<i>Race</i>	816	Black or African American	20.6%
		White	62.0%
		Native American/Alaskan	1.6%
		Asian or Pacific Islander	7.6%
		Other/none/Don't know	8.2%
			100.0%
<i>Gender</i>	816	Male	28.7%
		Female	71.0%
		Other/both	0.4%
			100.0%
<i>Household income</i>	816	Less than \$20,000	20.1%
		\$20,000 to \$34,999	21.4%
		\$35,000 to \$49,999	15.1%
		\$50,000 to \$74,999	18.3%
		\$75,000 to \$99,999	11.0%
		Over \$100,000	14.1%
			100.0%
<i>Education</i>	792	Less than H.S. degree	2.3%
		H.S. degree or equivalent	23.7%
		Some college	32.1%
		College degree	28.4%
		Graduate degree	13.5%
			100.0%

Note. Sample characteristics after removing those who did not meet criteria for age (18+), attentiveness to the survey, and belief in climate change and its human causation.

Measure Creation

Measures of hope. I examined several methods of measuring hope that were included in the survey instrument.

Hope measures derived from past non-climate literature. The set of items designed to measure hope in climate change by adapting past (non-climate specific) hope literature (including Herth, 1991; Hinds & Gattuso, 1991; Miller & Powers, 1988; Nowotny, 1989; Lazarus, 1991b; see also, Farran et al., 1995) had an initial fair reliability (Cronbach's $\alpha = .70$). All but one of the items had a positive corrected item-total correlation, and this item ("I fear for the worst but long for it to be better") was also the only item that would substantially improve reliability (to $\alpha = .78$) if it were deleted.

A *non-climate literature hope index* created by removing that item and averaging scores of the remaining nine items produced a measure with $M = 57.6$ (Min=1.1, Max=100.0) and $SD = 17.2$; visual inspection indicated it was fairly normally distributed.

Contextual hope measures. The contextual hope measures showed good reliability (Cronbach's $\alpha = .89$). All of the items had a positive corrected item-total correlation, none would substantially improve reliability if they were deleted. A *contextual hope index* was created by averaging scores of the items produced a measure with $M = 57.4$ (Min=1.5, Max=100.0) and $SD = 21.7$, and normally distributed.

Hope-in-response items. The 32 hope-in-response measures showed initial good reliability, Cronbach's $\alpha = 0.860$. All but two of the items had positive corrected item-

total correlations. The two assessed how hopeful the respondent would feel in response to scenarios intended to influence their importance appraisal (“Hearing about new research that says climate change will be worse than we thought, if we don't do anything to stop it.” And “Hearing about new research that says climate change won't be as bad as we thought, even if we don't do anything to stop it.” [reverse-coded]). The reliability of the scale with those two items removed improved slightly to $\alpha = .870$.

A *hope-in-response index* created by averaging scores of the 30 remaining items produced a measure with $M = 60.1$ (Min = 33.3, Max = 95.2) and $SD = 13.0$, and moderately normally distributed, with some right skew.

Probability appraisal measures. I examined several different means of measuring probability appraisals that were included in the survey instrument.

Chadwick possibility items. The five possibility/probability appraisal items adapted from Chadwick (2010) showed decent reliability (Cronbach's $\alpha = .75$). All of the items had a positive corrected item-total correlation, and none would substantially improve reliability if they were deleted. A Chadwick possibility index was created by averaging scores of the items, producing a measure with $M = 64.1$ (Min = 0.0, Max = 100.0) and $SD = 18.5$. It is somewhat normally distributed, with some left skew.

New probability items. The four probability appraisal items I developed showed decent reliability (Cronbach's $\alpha = 0.78$). All of the items had a positive corrected item-total correlation, and none would substantially improve reliability if they were deleted. A Chadwick possibility index was created by averaging scores of the items, producing a

measure with $M = 62.5$ (Min = 0.0, Max = 100.0) and $SD = 17.4$. It is quite normally distributed, with only some slight left skew.

CCAM probability item. The measure of the probability appraisal identified in the CCAM instrumentation and included in this study is comprised of five ordinal categories. The frequency of each in this sample is show in Table 5. Note that the incidence of the first response option, “Climate change isn’t happening” is particularly small, likely due to the fact that I had already filtered out respondents indicating disbelief in climate change using data from a different question on the survey.

Table 5 Response frequencies of CCAM probability measure

<i>Item wording</i>	<i>Percent</i>
<i>Climate change isn't happening</i>	1.5%
<i>Humans can't reduce climate change, even if it is happening</i>	4.8%
<i>Humans could reduce climate change, but people aren't willing to change their behavior, so we're not going to</i>	27.8%
<i>Humans could reduce climate change, but it's unclear at this point whether we will do what's needed</i>	53.6%
<i>Humans can reduce climate change, and we are going to do so successfully</i>	12.3%
	100.0%

N = 862

Cognitive antecedent measures. I examined methods I had developed to measure the proposed cognitive antecedents to probability appraisals that were included in the survey instrument.

Likelihood of attempt belief. The ‘baseline’ measure of participants’ belief in the likelihood that sufficient climate mitigation will be undertaken (“Think about the actions you think people should take to limit climate change – including actions by governments, businesses, communities, and individuals... How likely do you think it is that people will try to take these actions?”), was compared with the two ‘action specific’ measures (“Now, list below two specific actions that you think are among the most important to limiting climate change, such as steps that could be taken by governments, businesses, communities, or individuals.”, and for each listed action, they were asked “How likely do you think it is that people will try to take this action?”). The three items demonstrated acceptable reliability (Cronbach’s $\alpha = .793$). All of the items had a positive corrected item-total correlation, and none would substantially improve reliability if they were deleted. A *likelihood of attempt index* was created by averaging the scores of the items, producing a scale with $M = 58.3$ (Min = 1.0, Max = 100.0) and $SD = 18.77$, which is approximately normally distributed.

Collective efficacy. The ‘baseline’ measure of participants’ belief that we have the capacity to undertake sufficient climate mitigation (“How confident are you that people could successfully take these actions if they tried?”), was compared with the two ‘action specific’ measures (for each action they listed, they were asked, “How confident are you that people could successfully take this action if they tried?”). The 3 items demonstrated

acceptable reliability (Cronbach's $\alpha = .799$). All of the items had a positive corrected item-total correlation, and none would substantially improve reliability if they were deleted. A *collective efficacy index* was created by the averaging scores of the items, producing a scale with $M = 70.1$ (Min = 3.0, Max = 100.0) and $SD = 18.27$, which is approximately normally distributed, with some left skew.

Collective response efficacy. The 'baseline' measure of participants' belief that sufficient climate mitigation would address the issue ("If people did successfully take these actions, how effective do you think they would be in stopping climate change?") was compared with the two 'action specific' measures (for each action they listed, they were asked, "If people did successfully take this action, how effective do you think they would be in limiting climate change?"). The 3 items demonstrated acceptable reliability (Cronbach's $\alpha = .821$). All of the items had a positive corrected item-total correlation, and none would substantially improve reliability if they were deleted. A *collective response efficacy index* was created by the averaging scores of the items, producing a scale with $M = 67.3$ (Min = 0.0, Max = 100.0) and $SD = 15.57$, which is roughly normally distributed, with substantial left skew.

Outcome measures. I examined several different outcome measures that were included in the survey instrument.

Communication behavior intentions. Analysis of the three communication behavior intention items indicated low reliability (Cronbach's $\alpha = .447$). The information seeking measure ("In general going forward, I won't like to read or hear anything about climate change." [reverse coded]) appeared to diverge from the two interpersonal

communication items, with which it had only a corrected item-total correlation of $r = .050$. The reliability of the two interpersonal communication items alone was an acceptable $\alpha = .793$. I thus decided to treat information seeking and interpersonal communication as two separate constructs.

Climate policy attitudes. Analysis of the four policy attitude questions indicated mediocre reliability ($\alpha = .642$). Removing the offshore drilling question (which was reverse coded) improved the scale to $\alpha = .797$, and an index was created using those remaining three items.

Climate personal behavioral intent. Analysis of the four behavior intent questions (asked of those in the stimulus conditions) indicated acceptable reliability ($\alpha = .797$). None of them would improve scale reliability were it removed. An index was created using all four items.

Convergent Validity of CCAM Hope Measure

Combined hope index. To examine the possibility of merging the various measurement approaches, I computed the reliability of an index made of up a) the CCAM hope item; b) the non-climate literature items (but removing the item that had low reliability vis-à-vis the other items of that scale); and c) the contextual hope items. I did not include the hope-in-response items because they did not correlate with the CCAM hope item. This 16-item scale was highly reliable, Cronbach's $\alpha = 0.885$. Three items would have only slightly improved reliability, and were left in. By averaging all the items, a *combined hope* scale was produced, $M = 57.2$ (Min=5.9, Max=99.7), $SD = 16.8$, and normally distributed.

Summary. Overall, there is generally support for the convergent validity of the CCAM hope item, with two of the three other approaches to measuring hope in climate change correlating well with it (see Table 6), and combining to form a reliable scale. The hope-in-response index was *not* correlated with the CCAM measure of hope ($r = 0.06$, $p > .05$). The non-climate literature hope index was moderately correlated with the CCAM measure of hope ($r = 0.47$, $p < .001$). The contextual hope index was moderately correlated with the CCAM measure of hope ($r = 0.50$, $p < .001$).

But with correlation coefficients in the range of .50, only about 25% of the variance in the CCAM hope item can be related to each of two other measurement indices, suggesting some divergence across the measurement approaches (or merely the limited reliability of a single-item measure). Notably, the two other indices correlate with

each other, $r = 0.57$, $p < .001$, better but to approximately the same degree as each does with the CCAM item, suggesting no one measurement method stands out as superior.

Table 6 Correlation matrix of various measures of climate hope

	Non-Climate Hope Lit Index	Contextual Hope Index	Hope-In-Response Index	CCAM Hope item
Non-Climate Hope Lit Index	--			
Contextual Hope Index	.57***	--		
Hope-In-Response Index	.17**	.15**	--	
CCAM Hope item	.47***	.50***	0.06	--

= $p < .01$ *= $p < .001$

The failure of the hope-in-response items to correlate with the CCAM item, and correlate only weakly with the other two indices, suggests that this measurement approach is not capturing the same underlying construct. This is plausible, as the hope-in-response items could be seen as more of a measure of *sensitivity* to different kinds of hope-inducing/reducing stimuli, not a measure of trait hope itself (contrary to how I conceived of this measurement approach during the design stage).

Validation of the CCAM Probability Appraisal Measure

Correlational evidence. The two other measures of probability appraisal correlate decently, if not extremely strongly, with the CCAM item under consideration as a measure of the construct: Chadwick's possibility items, $r = .268$, $p < .001$, and my new probability items, $r = .273$, $p < .001$. The strength of the correlation between the two indices, however, is stronger than that between either of them and the CCAM item, $r = .442$, $p < .001$. As a further test of the relationship between these measurement approaches, I conducted a reliability analysis encompassing all 10 of the individual items

across the CCAM measure and the two indices. The scale showed good reliability ($\alpha = .794$), but the only item that could improve (if only slightly, to $\alpha = .803$) the scale reliability via deletion was the CCAM measure. This is perhaps not surprising given the distinctive format of the CCAM item (five multiple choice sentences) compared to the others (slider responses anchored with words or short phrases). Taken together, this suggests some divergence between the CCAM item and the other approaches to measuring probability appraisal, but not a conclusive signal that they are wildly divergent, and thus cautious support for the convergent validity of the possibility construct. A *combined probability scale* was created from averaging all 10 of the individual items, $M = 57.0$ (Min=0.2, Max=90.5), $SD = 14.4$; it is normally distributed with slight left skew.

Stimulus Effects on Hope Measures

Comparing levels of various proposed measures of climate hope across stimulus conditions can indicate construct validity. Do measures of climate hope demonstrate construct validity by responding to hope-inducing and hope-reducing stimuli as expected?

CCAM Hope. The CCAM measure of hope showed mixed results. When comparing the measure just between the hope-inducing and hope-reducing conditions, an ANOVA indicated a slightly but significantly higher mean score ($M = 54.4$) in the hope-inducing condition than the hope-reducing ($M = 50.0$), $F(1, 557) = 3.90$, $p = .049$. When examining scores across the two stimuli groups as well as the control group, the overall

main effect in ANOVA becomes non-significant, $F(2, 860) = 2.02, p = .133$, though the pattern is as expected, with means progressively higher from the hope-reducing, control, through to hope-inducing groups (see Figure 10). (Interestingly, the effect is significant when run on the entire sample, including those otherwise filtered out in these analyses due to their disbelief in climate change).

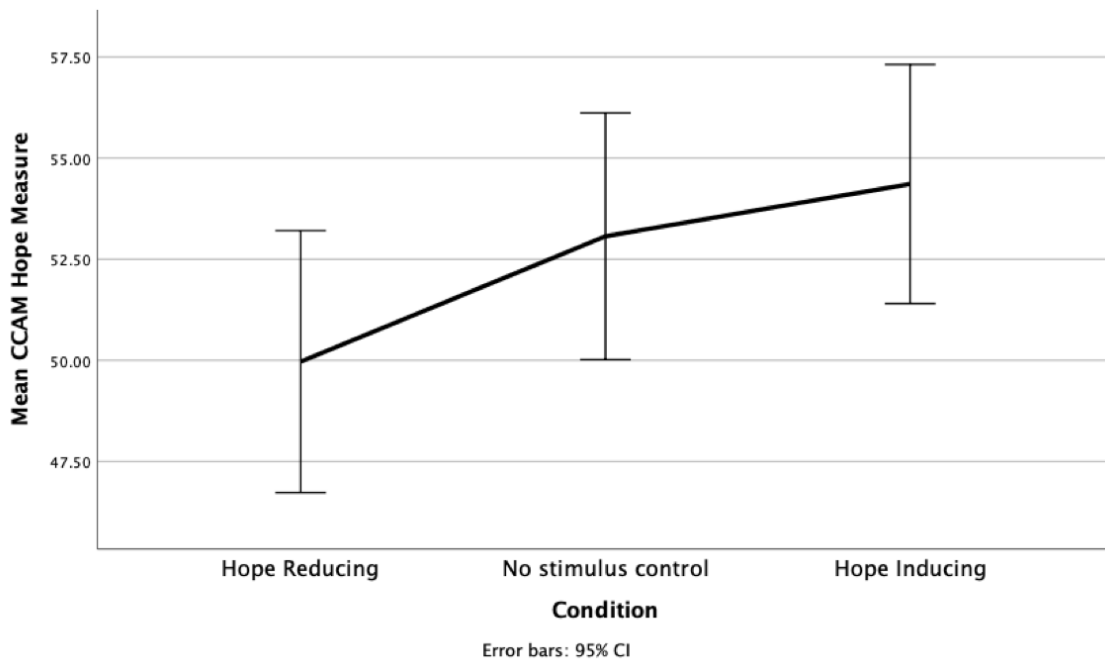


Figure 10 Mean CCAM hope measure across stimuli conditions

Non-climate change literature hope. The hope measures derived from the non-climate literature showed consistent stimuli effects. When comparing the measure just between the hope-inducing and hope-reducing conditions, an ANOVA indicated a significantly higher mean score ($M = 60.1$) in the hope-inducing condition than the hope-reducing ($M = 55.0$), $F(1, 557) = 12.77, p < .001$. When examining scores across the two

stimuli groups as well as the control group, the overall main effect in ANOVA remains significant $F(2,860) = 6.16, p = .002$, and the pattern is as expected, with means progressively higher from the hope-reducing, control, through to hope-inducing groups (see Figure 11).

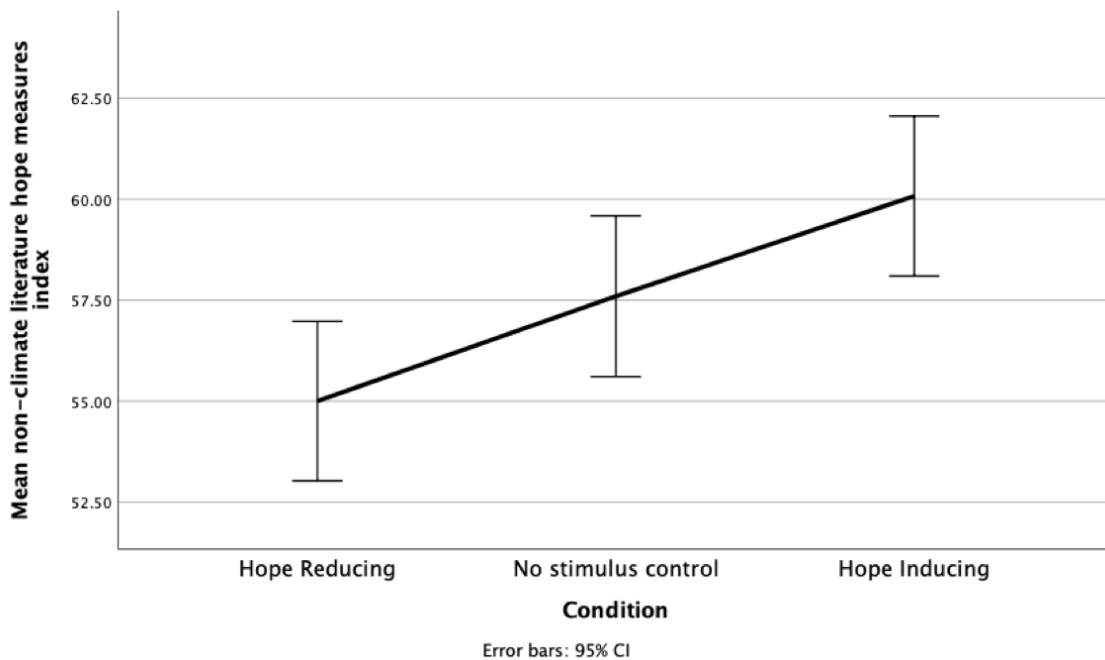


Figure 11 Mean non-climate literature hope measures index across stimuli conditions

Contextual Hope. The contextual hope measures also showed consistent stimuli effects. When comparing the measure just between the hope-inducing and hope-reducing conditions, an ANOVA indicated a significantly higher mean score ($M = 60.3$) in the hope-inducing condition than the hope-reducing ($M = 56.0$), $F(1, 557) = 5.77, p = .017$. When examining scores across the two stimuli groups as well as the control group, the overall main effect in ANOVA remains significant, $F(2, 860) = 5.77, p = .0021$, though

the pattern is only partially as expected, with means similar for the hope-reducing and control conditions, and only progressing higher in the hope-inducing condition (see Figure 12).

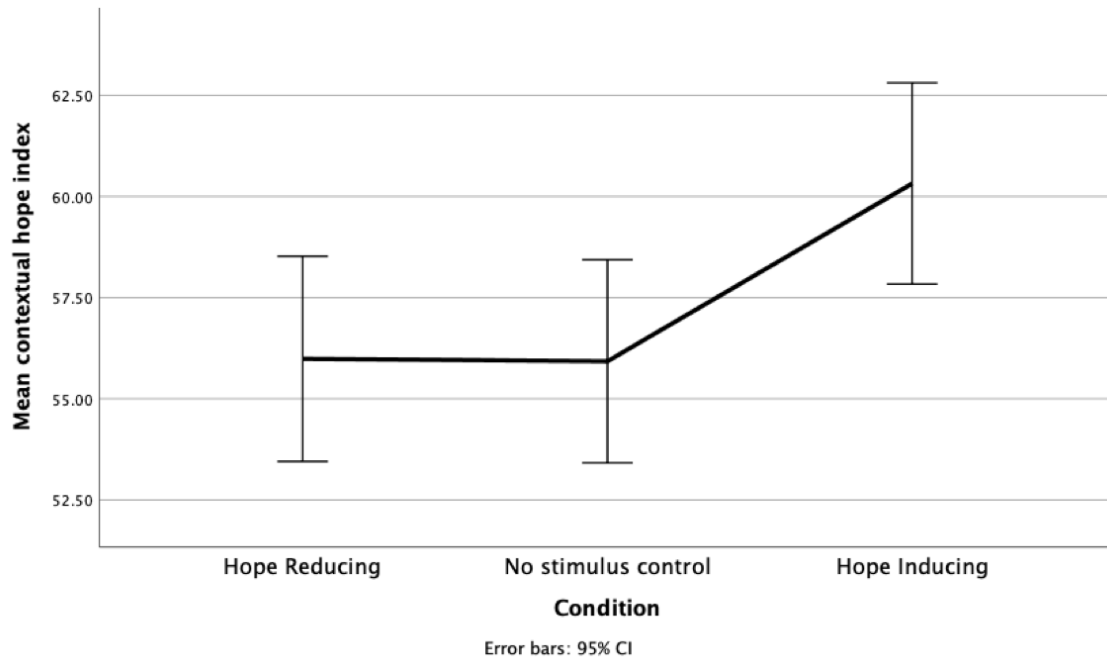


Figure 12 Mean contextual hope index across stimuli conditions

Summary. Overall, the various hope measures do show broad validity based on this approach. There is for every measure of hope the expected response pattern, with measured hope lower among those reading the hope-reducing message than with the hope-inducing message. When the no-stimulus control condition is included, the picture becomes somewhat less straightforward, and two hope measures (the CCAM item and the contextual hope questions) failing to show a significant and monotonic pattern across conditions. Nonetheless, the totality of this evidence offers support for the construct

validity of hope in climate change, and the use of these measures. The measures derived from the non-climate hope literature had the most consistent response, and so may be the preferred measurement approach.

Hopeful Stimuli Effects on Attitudes and Behavior

Communication behavior intentions. Levels of communication behavior intentions did not differ between those exposed to the hope-inducing vs. the hope-reducing stimuli. This was true both for information seeking, $F(1, 531) = 2.20, p = .139$, as well as interest in interpersonal communication about climate change, $F(1, 531) = 0.83, p = .364$.

Policy attitudes. Levels of the index of policy attitudes demonstrated an unusual pattern across conditions. While there were no significant differences by condition, a marginally significant pattern indicates that those exposed to either of the stimuli (hope-inducing or hope-reducing) may have expressed greater policy support than those in the no-stimuli control condition, $F(2, 816) = 2.41, p = .091$ (see Figure 13). An ANOVA comparing just hope-inducing vs. the hope-reducing stimuli indicated that the between-stimuli differences in attitudes were not significant, $F(1, 531) = 0.83, p = .362$.

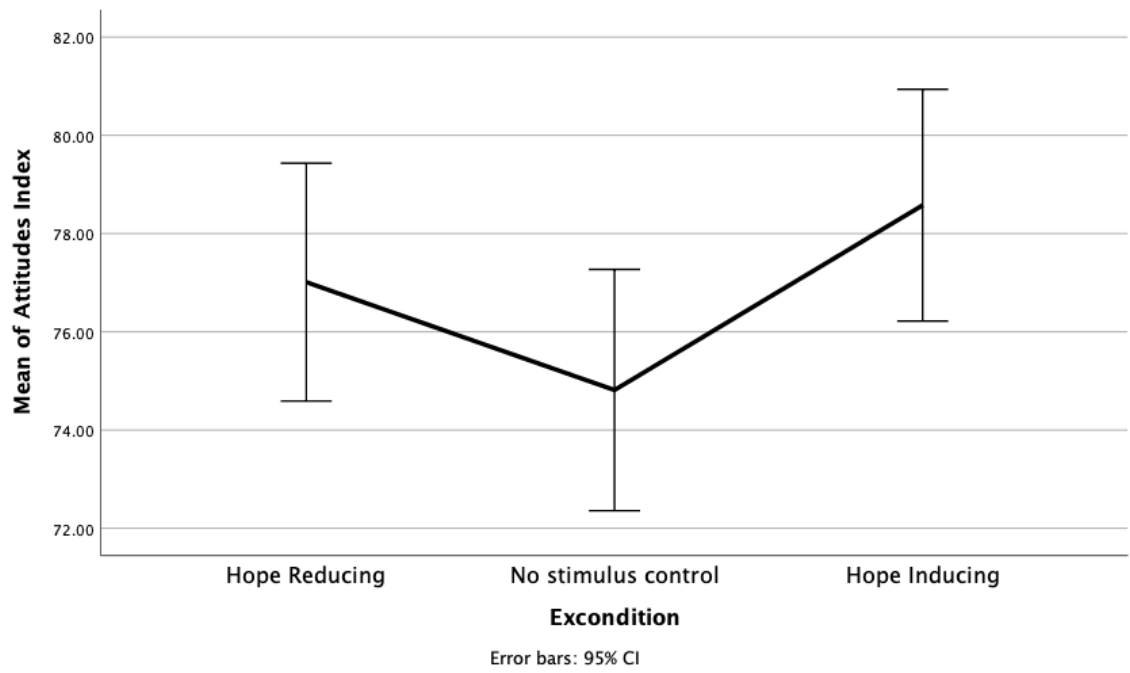


Figure 13 Attitude support across conditions

Climate personal behavior intentions. Levels of the index of personal behavior intentions did not differ between those exposed to the hope-inducing vs. the hope-reducing stimuli, $F(1, 531) = 0.25, p = .615$.

Summary of hopeful stimuli effects on attitudes and behavior. Across all dependent variables of attitudes, behavior, and intentions, there were no differences between the hope-inducing and hope-reducing stimuli groups. Because the behavior questions in the control condition were asked retrospectively (about past behavior) while the analogous measures in the stimuli conditions asked about behavioral intentions, comparisons of the stimuli groups and the control group were not possible for those variables.

Effect of hope on outcome measures

Attitudes. To investigate the first-order relationship between measures of hope and climate policy attitudes, each hope construct index was correlated with the policy support index. This indicated that the various hope indices each has a different relationship with climate attitudes. The attitude–CCAM hope item correlation was marginally significant, $r = .060, p = .089$; and that for hope measures drawn from the non-climate literature was nonexistent, $r = .015, p = .678$. On the other hand, the contextual hope index bore a small correlation with attitudes, $r = .088, p = .012$, and the hope-in-response index was strongly correlated with attitudes, $r = .464, p < .001$. The combined hope scale fared poorly and was not correlated, $r = .057, p = .101$.

Interpersonal communication intentions. To investigate the first-order relationship between measures of hope and interpersonal communication intentions, each

hope construct index was correlated with the interpersonal communication intentions index. This indicated that the various hope indices all share a modest relationship with information seeking intentions. The intentions–CCAM hope item correlation was significant, $r = .294, p < .001$, along with that for hope measures drawn from the non-climate literature, $r = .144, p = .001$, the contextual hope index, $r = .255, p < .001$, and the combined hope scale, $r = .235, p < .001$.

Information seeking intentions. To investigate the first-order relationship between measures of hope and information seeking intentions, each hope construct index was correlated with the information seeking intentions index. This indicated that the various hope indices have a negative or non-existent relationship with information seeking intentions. The information seeking intentions–CCAM hope item correlation was negative and significant, $r = -.144, p = .001$; that for hope measures drawn from the non-climate literature was nonexistent, $r = .005, p = .913$. The contextual hope index bore a marginal negative correlation with intentions, $r = -.084, p = .053$. The combined hope scale was not correlated, $r = -.053, p = .220$.

Personal behavior intentions. To investigate the first-order relationship between measures of hope and personal behavior intentions, each hope construct index was correlated with the personal behavior intentions index. This indicated that the various hope indices each bore a modest positive with those intentions. The CCAM hope item correlation was significant, $r = .316, p < .001$; along with that for hope measures drawn from the non-climate literature was nonexistent, $r = .102, p = .019$, the contextual hope index, $r = .259, p < .001$, and the combined hope scale, $r = .215, p < .001$.

Summary. As seen in Table 7, the relationship of the hope measures with various outcomes is not consistent. Policy attitudes and information seeking intentions appear to bear only a small relationship with hope, and in each case this is caveated: hope-in-response is the only hope measure strongly correlated with attitudes, but as previous analysis indicated, this measure does not bear a strong empirical resemblance to the other approaches to hope measurement. For information seeking, the one correlation with hope indicated an *inverse* relationship. This could be due to the fact that the information seeking measure was the only reverse coded item in the battery, essentially a double negative, requiring respondents to indicate they ‘disagreed’ that “In general going forward, I won’t like to read or hear anything about climate change.” if they wished to indicate an intention in information seeking. This question configuration may have led to confusion on the part of respondents, and for some to inadvertently response in the opposite of the way they intended.

Table 7 Correlations among hope measures and outcome variables

	Policy attitudes	Interpersonal communication intentions	Information seeking intentions	Personal behavior intentions
CCAM hope	<i>ns</i>	.294***	-.144**	.319***
Non-climate literature-derived hope	<i>ns</i>	.144**	<i>ns</i>	.102*
Contextual hope	.088*	.255***	<i>ns</i>	.259***
Hope-in-response	.464***	NA	NA	NA
Combined hope index	<i>ns</i>	.235***	<i>ns</i>	.215***

ns = Not significant * = $p < .05$ ** = $p < .01$ *** = $p < .001$

NA = Not applicable because the two measures were not asked on the same survey

When it came to the remaining outcome measures—interpersonal communication intentions and personal behavior intentions—, the results were more conclusive. All the measures of hope³¹ showed consistent if only moderate correlations with these two outcomes. The non-climate literature-derived hope index may have been somewhat less strongly correlated than the others, and the CCAM item more so. The combined hope scale was not particularly outstanding in any regard. Overall, because of these observed relationships between hope and expected outcomes, this pattern of results supports the construct validity of climate change hope as theorized, and the validity of the CCAM item specifically as a measure of the concept.

Evaluating proposed model of hope antecedents

Hope and probability appraisal. My theory of the origins of hope in climate change posits it is chiefly a response to beliefs about the probability that it will be solved. Initial investigation supports this hypothesis, finding a solid relationship between the two constructs. There is a medium correlation between the combined hope scale and the combined probability scale, $r = .585, p < .001$.

To investigate my hypothesis that this relationship would in fact be curvilinear (with extremely low and extremely high levels of the probability appraisal producing lower levels of hope than moderate levels of the probability appraisal), I regressed the hope index on the (zero-centered) probability index and a curvilinear term (the probability index squared). The regression model overall was a good fit, $R^2_{Adj} = 0.361$,

³¹ Excluding the hope-in-response index, which was not present on the survey instrument that included the intentions questions.

$F(2, 860) = 244.81, p < .001$, and visual inspection of a P-P plot of residuals indicated minimal heteroskedasticity. Both the probability index ($\beta = 0.623, p < .001$) and curvilinear probability index term ($\beta = 0.149, p < .001$) were significant predictors of hope, and the magnitude of the curvilinear term indicates a moderate curvilinear effect of probability appraisals on the emotion of hope.

However, an inspection of the scatterplot values of hope plotted as a function of probability indicates that the curvilinear relationship a) appears to be “U”-shaped (with hope highest at the extremes of probability), rather than the “inverted-U” shape I had predicted; and b) appears to be driven by a small number of outlier cases who have very low probability appraisals but comparatively high levels of hope (see upper left of Figure 14).

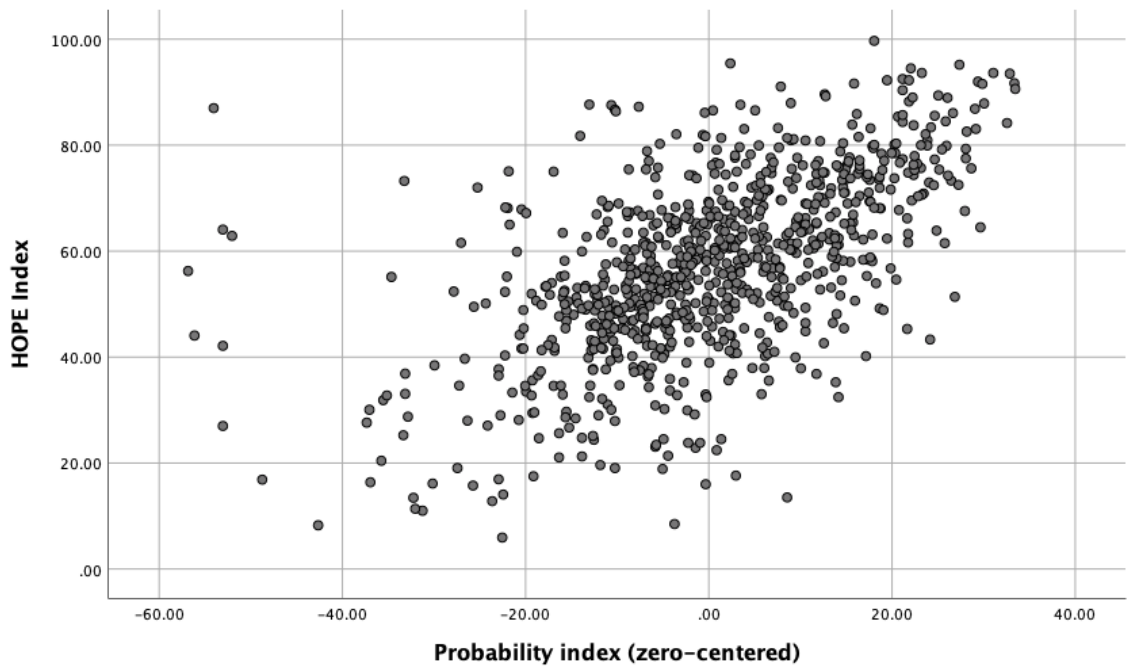


Figure 14 Hope as a function of probability appraisal

Relationship of cognitive antecedents to probability appraisal. I hypothesized that three specific beliefs—cognitive antecedents—and their interaction would be principally and proximally responsible for influencing probability appraisals. To test this, I regressed the probability appraisal index on the antecedents (climate change collective efficacy, collective response efficacy, and belief in the likelihood that an attempt will be made to address climate change), along with interaction terms³². Demographic controls were also included (party identification, ideology, race, gender, income, and education).

The full model was a good fit, $R^2_{Adj} = 0.389$, $F(13, 777) = 39.76$, $p < .001$, and visual inspection of a P–P plot of residuals indicated minimal heteroskedasticity. Several of the correlations among the predictors in the regression model exhibited coefficients

³² Means of all variables involved in interactions were adjusted to zero.

around or over $r = .60$, which may raise concerns about multicollinearity and the stability of parameter estimates of the model's predictor coefficients. Inspection of variance inflation factors (VIF) indicated all were well below 5.0, and condition indices for all dimensions were below 30.0, suggesting collinearity is not problematic (Belsley, Kuh, & Welsch, 1980).

The main effects of the three cognitive antecedents appear to be driving most of the model's prediction of probability appraisals, $\Delta R^2 = 0.381$, $\Delta F(3, 781) = 162.31$, $p < .001$ (see Table 8). Whereas the predictor block containing the two-way interactions among the cognitive antecedents offered minimal additional explanatory power $\Delta R^2 = 0.010$, $\Delta F(3, 778) = 4.42$, $p = .004$. The 3-way interaction of the antecedents was not significant. Each of the three antecedents was a unique, significant contributor to the model; likelihood of attempt belief contributed the most ($\beta = .326$, $p < .001$), followed by collective response efficacy ($\beta = .268$, $p < .001$), and then collective efficacy ($\beta = .199$, $p < .001$).

Table 8 Probability appraisal predicted by cognitive antecedents

Independent Variables	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
	Demographics	Antecedents	2-way interactions	3-way interaction
Intercept	.08	.06	.04	.04
Party ID (Republican vs Dem)	-.03	-.03	-.02	-.02
Conservatism	.01	.06	.05	.05
Race (Nonwhite vs. white)	.06	.04	.04	.04
Gender (female)	-.02	-.01	-.01	-.01
Income	.05	.01	.01	.01
Education	-.05	-.06	-.06	-.06
Likelihood of attempt (LoA)		.32 ***	.32 ***	.33 ***
Collective efficacy (CE)		.16 ***	.20 ***	.20 ***
Collective response efficacy (CRE)		.27 ***	.26 ***	.27 ***
LoA×CE			.12 **	.12 **
LoA×CRE			-.13 *	-.13 *
CE×CRE			.08	.07
LoA×CE×CRE				-.02
R^2_{Adj}	.00	.38	.39	.39
F_{total}	1.08	55.27 ***	43.10 ***	39.76 ***
N	791	791	791	791

Dependent Variable: Probability index

Entries are standardized regression coefficients (excepting intercepts)

* $p < .05$, ** $p < .01$, *** $p < .001$

These results support the core of my hypothesis in this domain, suggesting that probability appraisal beliefs are inspired by the three cognitive antecedents I identified (and even after controlling for potential demographic confounds). That said, only less than 40% of the variance in probability appraisals was explained by this model, indicating that substantial additional unidentified sources from which people draw their probability beliefs about climate change (and or that there exists substantial measurement error). The extension to my hypothesis, that probability appraisals are formed not just as a linear combination of the antecedents, but as a multiplicative function of them, was largely not born out in the interaction analysis. The interaction of antecedents added little to the model, and in fact the Likelihood of Attempt \times Collective Response Efficacy

interaction was negative, the opposite direction to my hypothesis. Overall, however, this analysis represents solid evidence in support of my core hypothesis that probability appraisals are informed by beliefs around likelihood of attempt, collective response efficacy, and collective efficacy. And notably, likelihood of attempt belief—a new construct theorized for the first time in this work—bore the single strongest predictive relationship with probability appraisals.

Comprehensive structural model analysis

In order to investigate H7 and H8, regarding the comprehensive effects of hope-inducing and -reducing stimuli across the range of constructs under consideration, I undertook path model analysis in *Mplus*. I specified the stimulus as the single exogenous variable in each model, with mediating relationships via cognitive antecedents, probability appraisal, and hope between it and each of the engagement outcome indices. I built a separate model for each outcome index, and they were otherwise identically specified. Results of the model that involved interpersonal communication intentions is displayed in Figure 15. For this model as well as each of the others, model fit indices were decidedly poor. Though a number of individual paths showed strong relationships, given the poor overall fit it is not appropriate to extensively investigate the individual paths. These results indicate a failure to confirm H7 and H8, which predicted hope stimulus effects out behavioral outcomes, mediated via cognitive antecedents, probability appraisal, and hope.

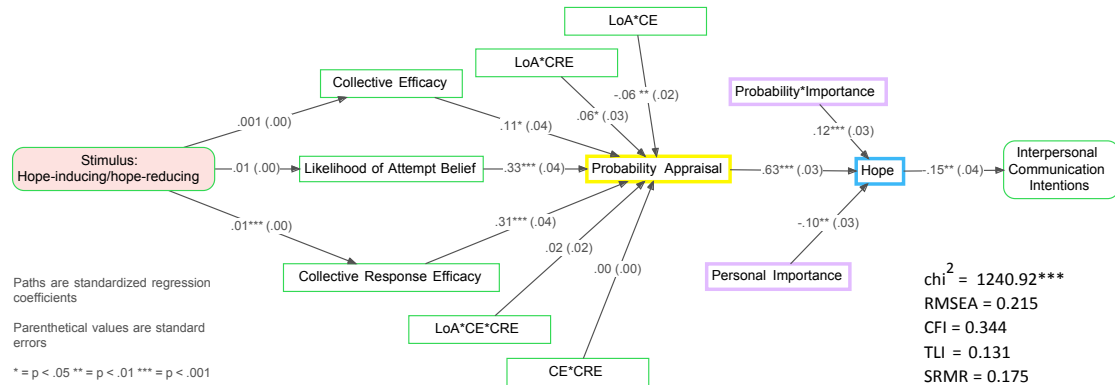
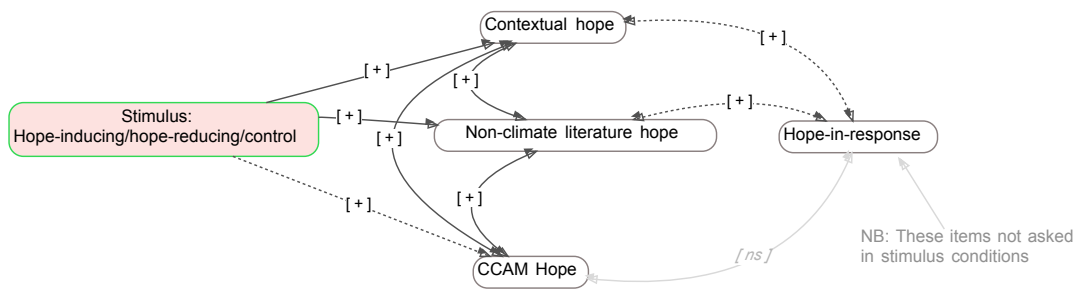


Figure 15 Path model of the effect of hope stimulus on interpersonal communication intentions

Summary of Measurement Study Results

Figure 16, Figure 18, and Figure 18 present a synthesized view of the results discussed in detail above. Figure 16 illustrates the measurement models and validation analyses, illustrating reciprocal relationships among the hope measures and their responsiveness to the varying stimulus or control conditions; as well as the reciprocal relationships among the probability measures. Figure 18 summarizes the path diagram among cognitive antecedents, probability appraisal, and hope; Figure 17 relates findings regarding stimulus effects on various behavior and attitudinal engagement outcomes.



KEY

[+] = Positive path

[-] = Negative path

⚡..... = Small effect size

⚡[ns] = Not significant path

⚡[±]... = Positive & negative path

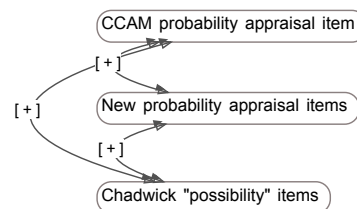
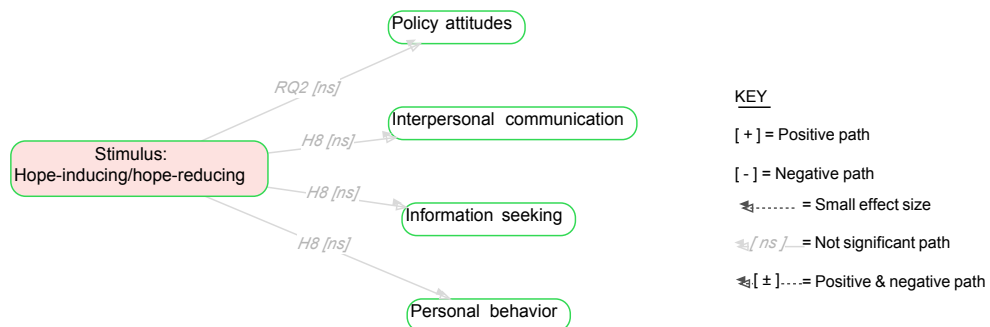


Figure 16 Summary of measurement study scale validation results



KEY

[+] = Positive path

[-] = Negative path

⚡..... = Small effect size

⚡[ns] = Not significant path

⚡[±]... = Positive & negative path

Figure 17 Summary of stimulus effects on outcomes

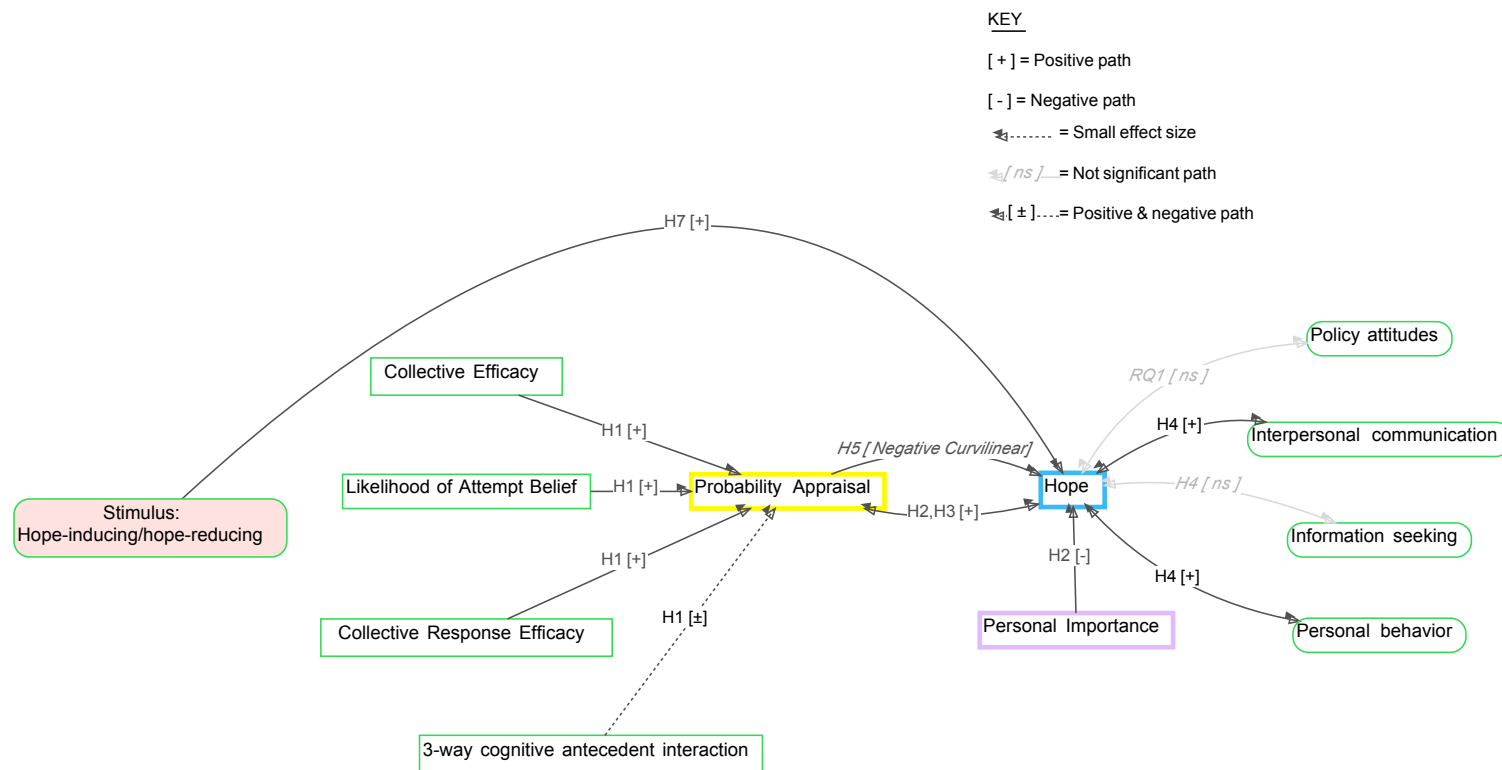


Figure 18 Summary of measurement study results

CHAPTER EIGHT: SUMMARY AND DISCUSSION

Summary of Results

The CCAM study used existing data to examine the relationships between probability appraisal, issue importance, the emotion of hope, and various forms of issue engagement as they relate to climate change. Broadly, the analysis found that my theory specifying the relationship amongst these variables was not supported by modeling of the data, though glimmers of promise did emerge. The minimal to null findings begged the question as to whether the lack of purpose-built measures in the CCAM dataset were hampering the investigation. I followed up that study with a second study that involved the design and execution of a measurement survey-experiment. Analysis of the resulting data generally indicated that the CCAM measures were valid and reliable measures of their respective constructs when compared against measures from existing literature and those that I designed or adapted specifically for this study.

On the one hand, the successful validation work of the measurement study supported the foundational validity of the constructs under investigation, principally the notion of hope in regards to climate change itself. None of the existing small body of research on climate hope (cf., Chadwick, 2010; Feldman & Hart, 2018; Ojala, 2012) had previously assessed the construct and related variables from as many different approaches, including drawing on the measurement paradigms of hope researchers working in other issues realms.

At the same time, the measurement study's validation of the CCAM measures would suggest that the lack of findings in the CCAM study were not an artifact of faulty measurement, but rather an actual indication that my theory was not successful at explaining the underlying relationships among the constructs. But this stands in tension with the other conclusions from the measurement study, which indicated that my hypotheses were in fact being borne out by the data. This divergence in conclusions could have several explanations:

- a) While the measurement study did find modestly strong relationships between the CCAM items and other (multi-item) measures of hope and probability appraisal, the relationships were not extremely strong, and relying on the individual CCAM items could still entail a high degree of measurement error (recall that the CCAM item only shared about 25% of its variance with the other hope indices). This could be affecting the CCAM study and explain the lack of observed effects;
- b) The differences in samples and contexts between the two study participant pools could explain the different observations; among other possible mechanisms, the greater focus on themes of emotion and future possibility found throughout the measurement study instrument could have made the emotion of hope and related cognitions more salient and lead to greater elaboration and consistency in item response by those participants versus participants in the CCAM surveys, which contained a wider range of survey items;

- c) Analytical strategies differed somewhat between the studies, which could explain the divergent findings; the bivariate and regression-based exploratory analysis of the CCAM dataset presented a promising picture, which was not borne out in SEM; perhaps a similar approach with the measurement study dataset would similarly erode its conclusions.

Review of Hypotheses

H1: Probability appraisal will vary as a multiplicative function of an individual's issue-relevant collective efficacy, collective response efficacy, attempt likelihood beliefs.

H1: Mostly supported. The measurement study investigated this hypothesis, finding partial support for it. All three of the cognitive antecedents were positively related to the probability appraisal, as predicted, but the (multiplicative) interactions among the antecedents were small, absent, and/or contradictory (the Likelihood of Attempt \times Collective Response Efficacy interaction negatively predicted probability appraisals, while Likelihood of Attempt \times Collective Efficacy positively predicted it). The core of my theory dealt with the importance of these antecedents in an absolute sense; the interaction hypothesis was more peripheral. The analysis thus supports at least the central tenant of this hypotheses, related to the role the antecedents play informing probability beliefs.

H2: The beliefs that an individual holds about the likelihood of some desired societal outcome (probability appraisal) will produce the affective response of hope as a joint function of that likelihood and the personal importance that the individual places in the outcome.

H2: Mixed. Both the CCAM and measurement studies found significant bivariate relationships between measures of hope and probability appraisal, supporting one component of this hypothesis. The CCAM study structural equation modeling incorporated Probability \times Importance interaction terms, but the models were not good overall fits for the data, so it is not possible to know if that specific interaction can be supported by the analysis. The bivariate correlations from the CCAM study indicated a significant *negative* correlation between the CCAM measure of hope and the Probability \times Importance interaction term (despite positive correlations among each of the variables on their own), suggesting H2 may not be supported. So, as with H1, the interaction component of my theory was not borne out, but preliminary evidence does support the underlying main effect relationships among the constructs.

H3: Hope will positively predict probability appraisal.

H3: Tentatively supported. The CCAM study offered partial support for H3. Though the structural equation models were not good fits for the data in general, a comparison of various model variants found clues that could suggest that a predictive path from hope to probability may have been a better fit for the dataset than the reverse. This leads modest credence to my theory that the emotion of hope can color with ‘rose colored glasses’ our cognitive perceptions of possibility.

H4: Hope and probability appraisals will increase issue-relevant
behavioral engagement.

H4: Mixed support. The lack of fit in the CCAM measure structural equation models prevents a full determination of the relationship between either hope or probability appraisals and engagement, though the bivariate correlations from the dataset

indicate modest but significant relationships between the engagement indices and the measures of hope and probability. In the measurement study, bivariate correlations indicated robust covariance between various hope indices and measures of interpersonal communication and personal behavior, but not for policy attitudes nor information seeking.

H5: At extremely low and extremely high levels of probability appraisal, individuals will exhibit virtually no hope.

H5: Disconfirmed. Analysis from the measurement study indicates a (modest) curvilinear relationship between hope and probability that is shaped in the *opposite* direction to my prediction, with those at the lowest and highest levels of probability appraisal evincing the most hope.

H6: Personal issue importance will moderate the influence of probability appraisals on behavioral engagement in several ways, as described in Table 1.

H6: Unclear. An Importance \times Probability Appraisal interaction term with a path to behavior was included in the CCAM study models I examined, but their poor fit prevented an examination of its strength.

RQ1: Do hope or probability appraisals influence attitudinal engagement?

RQ1: Unsupported. The measurement study examined correlations between attitudes and each index of hope measures (including the combined hope index). I found only one substantial relationship, between attitudes and the hope-in-response battery. This battery appears to function as a measure of sensitivity of response to various hope

inducing or reducing scenarios, rather than a measure of an individual's trait level of climate hope; it is unclear why it is particularly well correlated with climate policy attitudes, especially when other hope measures were not.

H7: Messages constructed to increase or decrease beliefs regarding the likelihood of solutions being attempted, collective efficacy, and collective response efficacy will have corresponding effects on those beliefs, and thereby on probability appraisals and thus on the emotion of hope.

H7: Tentative support. The measure study found that messages designed to increase or decrease the cognitive antecedent beliefs (likelihood, collective efficacy, and collective response efficacy) did indeed move hope emotions in the expected direction. I did not examine message effects on the antecedent beliefs themselves, nor any mediated effects via probability.

H8: Exposure to hopeful(less) messages will increase (decrease) behavioral engagement, mediated via probability appraisals and hope.

H8: Not promising. As an initial exploratory analysis, in the measurement study I found that behavioral engagement indices did not differ across the hope-inducing and hope-reducing message conditions. A complete mediation analysis has the potential to partial out additional variance and uncover a relationship, but these initial bivariate results do not look promising for H8.

RQ2: Will exposure to hopeful(less) messages increase (decrease) attitudinal engagement?

RQ2: Unconfirmed. The measurement study examined attitude measures across the hope-inducing and hope-reducing message conditions and found no differences.

Discussion of findings on hypotheses. Overall, five of the 11 hypotheses and research questions received support from the evidence I have analyzed. That ratio alone indicates empirical hurdles for my theorizing going forward. Yet several core elements of my thinking conformed with the data: my theorized antecedents to probability appraisals appear related to it, as do probability and hope. Hope also appears related to various types of climate engagement, and stimuli messages constructed to alter levels of hope accomplished that.

My model performed less well in its more nuanced predictions, such as the various interactions and curvilinear effects I expected. My research questions inquiring about possible relationships between policy attitudes and hope were also rebuffed. These collectively represented more peripheral and speculative extensions of my theory, and less of the ‘hard core’ (in the Lakatosian sense [1999]) key tenants of my thinking. As such, the number of instances in which my hypotheses failed to find support is not in and of itself the most important indicator from which to draw conclusions about where this body of thinking stands.

It was notable that policy attitudes showed a very limited relationship with the various measurement approaches to hope. As specified in RQ1, I theorized this as an open question, and so am not surprised that the relationship largely failed to materialize. I largely expected hope to be more influential where proactive energy and enthusiasm were required—such as behavior and interpersonal communication—and information seeking, where avoidance of aversive emotional states associated with encountering climate

change information could drive low-hope individuals away from seeking behavior.

Attitudes, on the other hand, can easily be (passively) held even in the absence of hope and enthusiasm.

The greater mystery is the strong observed relationship between attitudes and the hope-in-response index. This construct demonstrated divergence from the other prospective hope measurement approaches in the study, so that it would behave differently in other ways is not surprising. But that it should specifically be correlated with policy attitudes evinces no obvious explanation. While it now appears that the measures comprising the hope-in-response index must represent a type of sensitivity to hope-inducing or -reducing information, it is not clear why such sensitivity would be related to more supportive climate attitudes.

Perhaps the most concerning data point was the negative correlation between hope and a Probability \times Importance interaction term in the CCAM study. This directly implicates a central component of the theory tradition dating back to Stotland (1969), which understands hope as an interaction between probability and importance. This data point, however, is one correlation coefficient among many, and additional investigation is needed to ascertain the full implications of this single observation.

A significant evidentiary impediment in evaluating my hypotheses arose in the CCAM study in the form of the statistical limitations to the structural equation modeling I undertook. Model identification issues, unavailability of appropriate model fit comparison statistics, and the need to fit a recursive model to the data in place of the non-recursive approach better suited to my theory prevented me from fully implementing an analytical program with those data. That said, all of the modified models I was able to

successfully specify turned out to be a poor fit, which was sufficiently probative to suggest more serious questions about measurement and/or theory. This in turn motivated the measurement validation work in my second study, which produced results more salutary to my theories.

Though not captured in the above digest of hypotheses, the measurement study contributed important advancements in validation of the constructs and measures called into question by the null findings of the prior CCAM study analyses. By confirming that hope, probability appraisals, and cognitive antecedents can be measured in reliable, internally consistent, and construct-valid ways, this study lays the groundwork for future investigation. For example, findings from the measurement study suggest that a 10-item scale—comprised of the CCAM hope item, along with measures of contextual hope and the highest-performing hope measures from beyond the climate hope literature—has strong reliability and validity. Further investigation could determine if a subset of these items represent the best practical balance of parsimony and validity.

The rich dataset produced could itself be examined with structural equation modeling and confirmatory factor analysis to confirm my measurement and factor model, along with addressing more thoroughly the mediation hypotheses of my theory which were not tractable with the CCAM dataset, and which could shed additional light on messaging processing dynamics.

Finally, while a number of bivariate relationships were observed that backed my theories, and regression modeling offered further support, the consistently poor fit of the overall path models I constructed—and which represented the most comprehensive and robust test of my theories—offers a significant cautionary note. If my theories fit the data

so poorly, it may indicate a systematic predicative failure of theory, or at least a strong indication that more model investigation and analysis is warranted to fully appreciate the parameters of the relationships.

A Closing

A number of years ago, a movement within psychology decided to fundamentally reorient their perspective on the human condition which had framed their work. They shifted from seeking mental faults and pathologies in patients and the means to merely rectify them, and turned to appreciate the many among us who are ordinary and unremarkable, healthful and flourishing, and sought to understand how to promote those qualities, as much or more than to treat those who exhibited problems. Hence was born “positive psychology.” Climate change social scientists—and the climate community writ large—have long had substantial focus on the negative: denial, disinterest, fear. While enduringly worthy topics for ongoing remedy and research, the turn has well begun to also look at positive climate social science—what motivates passion, action, and inspiration on the level of the challenge? For to build the enduring movement to demand change and generate political will on climate change will require more than merely redressing the barriers and psychoses that scourge our body politic on this issue. It will require understanding, harnessing, inculcating, and celebrating hope. I will feel gratified if what comes of this document can play some small part in that most audacious of pursuits.

APPENDIX A

Behavioral Engagement Items (CCAM Study)

Over the past 12 months, how many times have you done these things?

Rewarded companies that are taking steps to reduce global warming by buying their products.

0=Don't Know; 1=never; 5=many times

Punished companies that are opposing steps to reduce global warming by NOT buying their products.

0=Don't Know; 1=never; 5=many times

Volunteered with or donated money to an organization working to reduce global warming?

0=Don't Know; 1=never; 5=many times

Over the past 12 months, how often have you written letters, emailed, or phoned government officials to urge them to take action to reduce global warming?

0. Don't know 1. Never 2. Once 3. A few times (2-3) 4. Several times (4-5) 5. Many times (6+)

APPENDIX B

Attitudinal Engagement Items (CCAM Study)

Here are some issues now being discussed in Washington, D.C. Do you think each of these issues should be a low, medium, high, or very high priority for the next president and Congress?

[Global warming]

1 = low

2 = medium

3 = high

4 = very high

How much do you support or oppose the following policies?

1=strongly oppose; 4=strongly support

Regulate carbon dioxide (the primary greenhouse gas) as a pollutant.

Require electric utilities to produce at least 20% of their electricity from wind, solar, or other renewable energy sources, even if it costs the average household an extra \$100 a year.'

Sign an international treaty that requires the United States to cut its emissions of carbon dioxide 90% by the year 2050.

Expand offshore drilling for oil and natural gas off the U.S. coast.

Build more nuclear power plants.

Fund more research into renewable energy sources, such as solar and wind power.'

Provide tax rebates for people who purchase energy-efficient vehicles or solar panels.

APPENDIX C

Hope Stimulus and Survey Instrument (Measurement Study)

=====

Text inside [brackets] are measure descriptors and statements inside grey boxes are to explain design choices; these will not be seen by participants. Question numbering is for identification purposes during design phase and may not be ordinal.

=====

[Introduction]

To determine if participant satisfies age 18+ requirement.

#63 What is your age?

[TEXT BOX]

[IF #63 AGE IS LESS THAN 18, THEN DIRECT OUT OF STUDY]

To determine if participant is human (not a bot).

#95 What is this a picture of?



- ☐ Car
- ☐ Boat
- ☐ Plane
- ☐ Train
- ☐ Don't know

[IF #95 IS NOT "BOAT", THEN DIRECT OUT OF STUDY]

[Optimism]

Measure of optimism–pessimism (Scheier, Carver, & Bridges, 1994). To compare against measures of hope to determine if hope is a distinct construct. Preamble language somewhat mirrors language in my introduction (above), but was part of original Scheier et al. instrument. (Items 2, 5, 6, and 8 are fillers, to be excluded from analysis)

#94 Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

[EACH ITEM PROVIDED RESPONSE OPTIONS: I AGREE A LOT / I AGREE A LITTLE / I NEITHER AGREE NOR DISAGREE / I DISAGREE A LITTLE / I DISAGREE A LOT]

- 3. If something can go wrong for me, it will.
- 4. I'm always optimistic about my future.
- 7. I hardly ever expect things to go my way.
- 9. I rarely count on good things happening to me.
- 10. Overall, I expect more good things to happen to me than bad.

[Climate Change Definition & Beliefs Screener]

This definition of climate change is provided for congruity with the measurement methodology in CCAM ([Climate Change in the American Mind](#)) studies. Those skeptical of the existence of climate change and/or its anthropogenic cause are not appropriate subjects for the measurement of hope in solving it and will be screened out of the study.

#05 Recently you may have noticed that *climate change* has been getting some attention in the news. Climate change refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future, and that the world's climate may change as a result.

#06 What do you think? Do you think that climate change is happening?

- ☐ Yes
- ☐ No
- ☐ Don't know

[SHOW IF ANSWERED "YES"]

How sure are you that climate change is happening?

- ☐ Extremely sure
- ☐ Very sure
- ☐ Somewhat sure
- ☐ Not at all sure

[SHOW IF ANSWERED "NO"]

How sure are you that climate change is not happening?

- ☐ Extremely sure
- ☐ Very sure
- ☐ Somewhat sure
- ☐ Not at all sure

#07 Assuming climate change is happening, do you think it is...

- ☐ Caused entirely by human activities
- ☐ Caused mostly by human activities
- ☐ Caused about equally by human activities and natural changes in the environment
- ☐ Caused mostly by natural changes in the environment
- ☐ Caused entirely by natural changes in the environment
- ☐ None of the above because climate change isn't happening

[Appraisal of Importance, CCAM]

#08 How important is the issue of climate change to you personally?³³

Not at all important

Somewhat important

Extremely important

A horizontal slider bar with a vertical line indicating the selected value. The line is positioned approximately one-third of the way from the left end.

#91 How worried are you about climate change?

Not at all worried

Somewhat worried

Very worried

A horizontal slider bar with a vertical line indicating the selected value. The line is positioned approximately one-third of the way from the left end.

#92 How much had you thought about climate change before today?

Not at all

Some

A lot

A horizontal slider bar with a vertical line indicating the selected value. The line is positioned approximately one-third of the way from the left end.

³³ Originally 5 point scale in CCAM: Not at all important, Not too important, Somewhat important, Very important, Extremely important.

Including this CCAM issue importance measure here in addition to the Chadwick importance appraisal items later (which are very similar) because I want to obtain an initial measurement of importance before respondents become more cognitively involved in the issue by responding to subsequent questions.

[Manipulation]

Participants will be randomly assigned to one of three condition for this section of the survey: a) to read a 'hope-inducing' message, b) to read a 'hope-reducing' message, or c) see no message. The messages are below.

[IF "CONDITION" = A OR B, SHOW #96]

#96 Please read the following short article before completing the rest of the survey.

-----[Hope-INDUCING]-----

The case for climate change optimism: Together we can—and will—act to save the world.

Climate change—there's reason for hope. It's a big problem, and the latest research is pointing to a surprisingly optimistic picture. Turns out, addressing climate change won't be as hard as we thought. Fortunately, it's looking increasingly likely that ordinary people and world leaders will be able to come together to implement effective solutions before it is too late.

- Addressing climate change won't take as much money as many people think. Experts say it would cost less than 1% of our economy.
- We can work together to solve this problem: in many states such as Illinois, Michigan, and Florida diverse and bipartisan coalitions have recently enacted renewable energy laws to combat climate change.
- It's not too late! Scientists say that we still have about a decade to substantially cut carbon pollution to avoid the worst of climate change—and we can do that with available policies and technologies.
- The smart money is now on the world taking action. Investors and even fossil fuel companies know new laws are coming, and they are getting ready to change their business practices.

Climate change is a serious problem, but it's possible to solve with reasonable effort. We have the collective ability to implement viable solutions and there's a decent chance we'll pull them off in time.

The case for climate change pessimism: Can we really—and will we— act together to save the world?

Climate change— it may be a lost cause. It's a big problem, and the latest research is pointing to an un-surprisingly pessimistic picture. Turns out, addressing climate change will be much harder than we thought. Sadly, it's looking increasingly unlikely that ordinary people and world leaders would be able to come together to implement effective solutions—and it's probably too late, anyway.

- Addressing climate change will take more money than many people think. Experts say it would cost as much as \$200 billion per year.
- It is a challenge for us to work together to solve this problem: in only a few states have diverse and bipartisan coalitions recently enacted renewable energy laws to combat climate change.
- It may be too late! Scientists say that we have only about a decade to drastically cut carbon pollution to avoid the worst of climate change—and it's not clear we can do that with available policies and technologies.
- The smart money remains on the world not taking action. Investors and fossil fuel companies don't see new laws coming, and they aren't worried about changing their business practices.

Climate change is a serious problem, and it won't be possible to solve without a very big effort. It's not clear that we have viable solutions or the collective will to implement solutions at all, and we're running out of time.

[Hope in Response to Key Constructs]

[NO-STIMULUS CONTROL CONDITION ONLY]

These items are designed to further establish the construct validity of a self-report method of directly querying respondents about their degree of 'hope'. Items in sections #74–#79 assess the extent to which measured hope will vary as a result of changes in constructs expected to predict hope. Those items marked with a [+] I expect to increase the given construct (e.g., lead to higher efficacy beliefs) and thus also to be rated as promoting more hopefulness than those marked with a [-], which I expect to decrease the given construct. Finding the expected patterns would serve to support both my theory about the antecedents of hope, as well as the validation of my measurement approach. Items in section #80 assess the extent to which contemplating climate engagement is experienced as hope-inducing. While I do not have predictions about which (if any) of these items will receive more or less hopeful responses, I do expect that (within-subjects) reporting more hope while contemplating a given type of engagement will predict higher scores on the related dependent measure item(s) of that actual type of engagement (see below for dependent measures).

How hopeful would you tend to feel in response to each of these things?

**[RANDOMIZE ALL ITEMS FROM AMONG FOLLOWING SECTIONS INTO A SINGLE BATTERY]
[FOR EACH ITEM, USE “NOT AT ALL HOPEFUL” TO “VERY HOPEFUL” SLIDER SCALE, AS ABOVE]**

#74 [Importance Appraisal]

[+] Hearing something that made you feel combating climate change was important to do.

[-] Hearing something that made you feel combating climate change was not that important to do.

[+] Hearing about new research that says climate change will be worse than we thought, if we don't do anything to stop it.

[-] Hearing about new research that says climate change won't be as bad as we thought, even if we don't do anything to stop it.

#75 [Probability Appraisal]

[+] Hearing something that made you think people will probably succeed in limiting climate change.

[-] Hearing something that made you think people will probably fail in limiting climate change.

[+] Hearing about positive developments in preventing climate change.

[-] Hearing about setbacks in preventing climate change.

#76 *[Necessary Effort belief]*

[+] Hearing something that made you think it will actually take only a little bit of work to prevent climate change.

[-] Hearing something that made you think it will take a lot of work to prevent climate change.

[+] Hearing about new research that says climate change will be easy to stop.

[-] Hearing about new research that says climate change will be hard to stop.

#77 *[Likelihood of Attempt belief]*

[+] Hearing something that made you think people are more likely to try and limit climate change.

[-] Hearing something that made you think people are less likely to try and limit climate change.

[+] Hearing about politicians call for more action to limit climate change.

[-] Hearing about politicians question whether climate change is real.

#78 *[Collective Efficacy belief]*

[+] Hearing something that made you more confident that people could carry out a plan to limit climate change.

[-] Hearing something that made you wonder if people could even carry out a plan to limit climate change.

[+] Hearing about people working together to prevent climate change.

[-] Hearing about leaders failing to agree on how to prevent climate change.

#79 *[Collective Response Efficacy belief]*

[+] Hearing something that made you more confident that what people can do could succeed in limiting climate change.

[-] Hearing something that made you less confident that what people can do could succeed in limiting climate change.

[+] Hearing that the plans under consideration to address climate change would be enough to keep it to a safe level.

[-] Hearing that the plans under consideration to address climate change would not be enough to keep it to a safe level.

#80 *[Related to potential Consequents of Hope]*

Thinking about buying from or boycotting companies to send them a message about what they are doing about climate change.

Thinking about volunteering with or donating to an organization working to reduce climate change.
Thinking about contacting government officials to urge them to take action to reduce climate change.
Thinking about the policies that the government could implement to reduce climate change.
Talking about climate change with someone you don't know.
Talking about climate change and emphasizing how important you think it is.
Talking about climate change with your family.
Talking about climate change and providing people with new information.

[Probability Appraisal, CCAM]

Asking this CCAM item before additional hope measures have an opportunity to influence response to this item. The goal is to maintain comparability of this measure between this study and the CCAM data.

#11 Which of the following statements comes closest to your view?

[RANDOMLY REVERSE ANSWER DISPLAY ORDER]

- [1] Climate change isn't happening
- [2] Humans can't reduce climate change, even if it is happening
- [3] Humans could reduce climate change, but people aren't willing to change their behavior, so we're not going to
- [4] Humans could reduce climate change, but it's unclear at this point whether we will do what's needed
- [5] Humans can reduce climate change, and we are going to do so successfully

[Hope Measure, Past Climate Literature]

The items are principally from CCAM Waves 3–6. Wave 11 (which contained more detailed hope items) also included ‘Doubtful’ on the list (and so may be useful in relating Wave 11 data to that from this instrument). I added “happy” to increase the number of positive affect terms for better positive/negative balance.

Emily Vraga suggested making ‘hopeful’ the first item (i.e., not randomized) to control for possible priming effects of seeing other items first.

Chadwick (2010, p. 419) constructed emotion measures similarly³⁴ to CCAM, so I have added her additional hope items (“eager”, “enthusiastic”, “optimistic”, “positive”, “encouraged”).

Feldman and Hart (2018) used “hopeful,” “optimistic,” and “inspired” for a reliable measure of hopefulness in response to a news article, and so I have also added “inspired” to the battery.

I will conduct a factor analysis to determine if the above items load separately from the other emotion terms in the instrument, and—if so—will perform a reliability analysis of these hope items as an index.

#09 How strongly do you feel each of the following emotions when you think about the issue of climate change?³⁵

[RANDOMIZE ORDER, EXCEPT KEEP “HOPEFUL” FIRST]

	Very strongly	Somewhat strongly	Not at all strongly
Hopeful	<input type="text"/>		
Helpless	<input type="text"/>		
Interested	<input type="text"/>		
Angry	<input type="text"/>		
Disgusted	<input type="text"/>		

³⁴ Chadwick used a randomized battery of items measuring the constructs of *Hope*, *Fear*, *Guilt*, *Sadness*, *Happiness*, and *Anger*, with each construct measured with 4–6 items. All of these constructs are already assessed by at least one item in the augmented CCAM battery I am employing here. Chadwick’s question stem and response options were also broadly similar to CCAM: “When I think about climate change, I feel...”, 1 = “None of this emotion” to 5 = “A great deal of this emotion”.

³⁵ Stem wording from CCAM. Original response categories in CCAM: “Very”, “Moderately”, “Not very”, “Not at all”

Sad	<div><div></div></div>
Afraid	<div><div></div></div>
Depressed	<div><div></div></div>
Guilty	<div><div></div></div>
Eager	<div><div></div></div>
Enthusiastic	<div><div></div></div>
Optimistic	<div><div></div></div>
Positive	<div><div></div></div>
Encouraged	<div><div></div></div>
Happy	<div><div></div></div>
Doubtful	<div><div></div></div>
Inspired	<div><div></div></div>

[Hope Measures, Past Non-Climate Literature]

The following are measures taken or adapted from studies of hope outside the climate change context (including Herth, 1991; Hinds & Gattuso, 1991; Miller & Powers, 1988; Nowotny, 1989; Lazarus, 1991b; see also, Farran et al., 1995).

#14 How much do you agree or disagree with the following statements?

In general, when I think about climate change...

Strongly disagree

Neither Agree nor Disagree

Strongly agree

--	--

[RANDOMIZE ITEMS]

- I am overwhelmed
- I get a sense of dread
- I feel at a loss
- There's no light at the end of the tunnel
- I feel positive momentum
- I feel there are great things yet to come
- I look forward to the future
- I just know there is hope
- I try to make myself believe things will get better
- I fear for the worst but long for it to be better

[Perceived Solvability, CCAM]

Perceived solvability (L. Beall, personal communication, March 18, 2018) is a new construct measured in a recent CCAM wave.³⁶ I include one of the six original perceived solvability items here. It is conceptually an antecedent to the probability appraisal in so far as the problem of climate change must be perceived to be solvable in order for one to assess the probability that it will be solved. It will also a test of discriminant validity for the probability and hope items, to ensure that they are measuring a construct distinct from perceived solvability.

#70 In your opinion, is it possible to reduce climate change enough to prevent catastrophic future harm to the stability of Earth's climate?

³⁶ The original perceived solvability instrument in the CCAM survey included additional items using the "future harm to" stem: "People in the United States", "People in poor countries", "Plant and animal species", "Future generations of people", "Not applicable, because climate change isn't happening". The original response scale had five points, anchored with "definitely, no" and "definitely, yes", and with a "not sure" midpoint.

Definitely no

Not sure

Definitely yes

[Attention Check #1]

#42 Respond strongly disagree if you are not just entering answers randomly.

Strongly disagree

Neither Agree nor Disagree

Strongly agree

[Contextual hopefulness]

I designed these measures of contextual hopefulness to provide respondents with more detailed prompts to trigger their reflections about how they feel about climate change. Given that climate change is a low involvement topic for most Americans, they may be relying on sparse mental models and few salient considerations or memories when answering. Thus, the more general “when you think about the topic”-style questions about hope used in past literature (see above) may only capture a superficial picture of individuals’ affective response, compared to the items here, which specify specific objects of hope.

#93 Considering climate change, how hopeful or hopeless are you about the future for each of the following?

Not at all hopeful

Moderately hopeful

Very hopeful

[RANDOMIZE ORDER]

Myself

My family

Members of my community

The United States

People in other countries

Future generations

[Chadwick appraisal items]

From Chadwick (2010, pp. 421–428), who found that each of these four appraisals (importance, goal congruence, future expectation, and possibility) was related (directly or indirectly) to hope. Chadwick’s “appraisal of importance” appears to equate to the CCAM importance measure above. Chadwick’s “appraisal of possibility” measure contains some items that would seem to equate to my “probability appraisal” (“likely”, “probable”) construct, along with items that would appear to be more specifically tapping efficacy beliefs (“achievable”, “feasible”, “attainable”, “possible”). Original items were measured on 5-point scales with additional descriptors beyond those I will use with the sliders (e.g., Very relevant, Relevant, Neither, Irrelevant, Very irrelevant). Some items are reverse-coded.

#51 [Chadwick appraisal of importance]

Protecting the climate...

Does not matter at all to me Neither Matters very much to me

[RANDOMIZE ORDER]

Protecting the climate is...

Very important Neither Very unimportant

Of no concern Neither Of very much concern

Not needed at all Neither Needed very much

#52 [Chadwick appraisal of goal congruence]

Do you agree or disagree with the following statements?

Protecting the climate...

[RANDOMIZE ORDER]

is one of my	Strongly Disagree	Neither Disagree nor Agree	Strongly Agree
--------------	-------------------	----------------------------	----------------

goals.	<div><div></div></div>
helps me meet my personal goals.	<div><div></div></div>
fits with my personal values.	<div><div></div></div>
is consistent with my ideals.	<div><div></div></div>

#53 [Chadwick appraisal of future expectation]

Do you agree or disagree with the following statements?

[RANDOMIZE ORDER]

	<i>Strongly Disagree</i> <i>Neither Disagree nor Agree</i> <i>Strongly Agree</i>
Not protecting the climate will make the future awful.	<div><div></div></div>
Protecting the climate will create a bright future.	<div><div></div></div>
A worse climate equals a much worse future.	<div><div></div></div>

#54 *[Chadwick appraisal of possibility]*
[included in a battery with the Chadwick appraisal of importance items, above]

Protecting the climate is ...

[RANDOMIZE ORDER]

Very impossible Neither Very possible

Very likely Neither Very unlikely

Very improbable Neither Very probable

Very achievable Neither Very unachievable

Very attainable Neither Very unattainable

[Proposed New Probability Appraisal Measures]

These items are intended to tap a broad, 'gut level' first impression of probability appraisal. "There is still a real chance" item adapt from other sources (Farran et al., 1995, p. 213; Hinds & Gattuso, 1991).

#16 How true or false do you think each statement is?

[RANDOMIZE ORDER]

Efforts to address climate change are going in a positive direction.	<div>Definitely false</div> <div>Equally true and false</div> <div>Definitely true</div> <div> <input type="text"/> </div>
There is still a real chance to avoid the worst effects of climate change.	<div>Definitely false</div> <div>Equally true and false</div> <div>Definitely true</div> <div> <input type="text"/> </div>
People will develop solutions to climate change before it's too late.	<div>Definitely false</div> <div>Equally true and false</div> <div>Definitely true</div> <div> <input type="text"/> </div>

#17 Considering what you know, what is the likelihood that we will succeed in stopping climate change?

A likelihood of **100%** means it is certain that we **will** succeed in stopping climate change.
 A likelihood of **0%** means it is certain that we **won't** succeed in stopping climate change.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

[Attention Check #2]

#43 Respond strongly agree if you are paying attention.

Strongly disagree

Neither Agree nor Disagree

Strongly agree

[IF RESPONDENT FAILS BOTH #43 AND #42 ATTENTION CHECKS, EXIT FROM STUDY]

[Proposed Antecedents to Probability Appraisal]

These items are built around my model of probability appraisal formation, which postulates that probability appraisal is a function of appraisals about the potential solution to a problem: likelihood of attempt, the effectiveness of implementation (collective efficacy), and the collective response efficacy of the solution. I further theorize that individuals' assessments of the effort necessary to accomplish a goal will be antecedent to those previous three appraisals (i.e., someone's belief about the amount of effort required to combat climate change will inform their beliefs about whether it will be tried and be successful). This effort item is included in the battery to fully measure my theorized model of appraisals leading to probability appraisal.

Think about the actions you think people should take to limit climate change – including actions by governments, businesses, communities, and individuals.³⁷

#22a [Necessary Effort]

Tiny effort

Moderate effort

Huge effort

How much of an effort do you think would be required to take these actions?

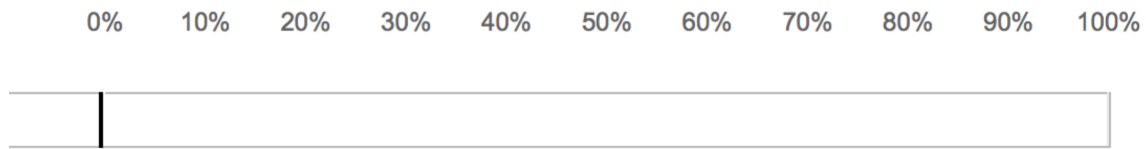
#22b [Likelihood of attempt]

How likely do you think it is that people will try to take these actions?

³⁷ I prefer this statement to supplying respondents with external information or asking their beliefs about the feasibility of a specific policy (such as a 90% GHG cut by 2050) because what is relevant is to invoke respondent's own beliefs about needed solutions. Asking the subsequent three questions based on this statement should capture a general sense of probability appraisal based on the totality of what a respondent sees as necessary.

A likelihood of **100%** means it is certain **people will try** to take these actions.

A likelihood of **0%** means it is certain **people won't try** to take these actions.

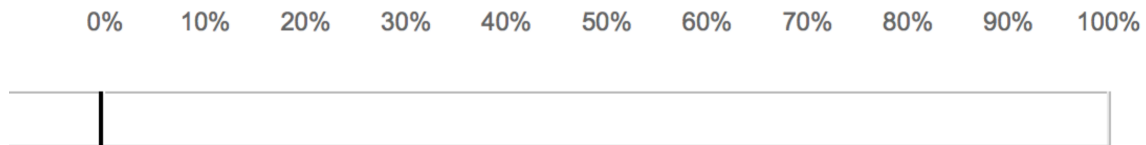


#22c *[Collective Efficacy]*

How confident are you that people could successfully take these actions if they tried?

A likelihood of **100%** means it is certain **people would succeed** if they tried.

A likelihood of **0%** means it is certain **people would fail**, even if they tried.



#22d *[Collective Response Efficacy]*

If people did successfully take these actions, how effective do you think they would be in stopping climate change?

It would **do nothing** to limit
climate change

It would do a moderate amount

It would **completely eliminate**
climate change

I have theorized that individuals construct probability appraisal out of appraisals of the various components of a solution that they perceive. These questions attempt to test that idea: how well does the sum of scores across the two actions they pick correlate with their scores on the 'general' form of the question above, and with other measures of probability appraisal?

Now, list below four specific actions that you think are among the *most important* to limiting climate change, such as steps that could be taken by governments, businesses, communities, or individuals.

[TEXT BOX 1]

[TEXT BOX 2]

You listed this as an important action to limit climate change:

[PIPE CONTENTS OF FIRST TEXT BOX]

#33a [*Likelihood of attempt*]

How likely do you think it is that people will try to take this action?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

#33b [*Collective Efficacy*]

How confident are you that people could successfully take this action if they tried?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

#33c [*Collective Response Efficacy*]

If people did successfully take this action, how effective do you think they would be in limiting climate change?

It would **do nothing** to
limit climate change

It would do a moderate
amount

It would **completely eliminate**
climate change

[REPEAT #33A–C WITH RESPONSE FROM EACH TEXT BOX TO CREATE #34, #35, #36]

[Dependent Measures]

Past Behavioral Engagement Items (CCAM)

[NO-STIMULUS CONTROL CONDITION ONLY]

Over the past 12 months, how many times have you done the following things?

#73 Taken actions to reduce your own personal impact on the climate.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

#27 Rewarded companies that are taking steps to reduce climate change by buying their products.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

#29 Volunteered with or donated money to an organization working to reduce climate change.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

#30 Written letters, emailed, or phoned government officials to urge them to take action to reduce climate change.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

Behavioral Engagement Intention Items (modified from CCAM)

[STIMULUS CONDITIONS ONLY]

Over the next 12 months, how many times do you expect you will do the following things?

#81 Take actions to reduce your own personal impact on the climate.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

#82 Reward companies that are taking steps to reduce climate change by buying their products.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

#84 Volunteer with or donate money to an organization working to reduce climate change.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

#85 Write letters, email, or phone government officials to urge them to take action to reduce climate change.

Never	A few times	Many times
<input type="text"/>	<input type="text"/>	<input type="text"/>

Attitudinal Engagement Items (CCAM)

[BOTH STIMULUS CONDITIONS AND NO-STIMULUS CONTROL CONDITION]

#31 How much of a priority do you think climate change should be for the president and Congress?

Very low priority

Medium priority

Very high priority

#32 How much do you support or oppose the following policies?

Sign an international treaty that requires the United States to cut its emissions of carbon dioxide 90% by the year 2050.

Strongly oppose

Neither support nor oppose

Strongly support

#59 Expand offshore drilling for oil and natural gas off the U.S. coast.

Strongly oppose

Neither support nor oppose

Strongly support

#60 Fund more research into renewable energy sources, such as solar and wind power.

Strongly oppose

Neither support nor oppose

Strongly support

Past Communication Behavior Items (CCAM and new)

[NO-STIMULUS CONTROL CONDITION ONLY]

#58 How much do you agree or disagree with these statements?

“In general, I don't like to read or hear anything about climate change.”

Strongly disagree

Neither Agree nor Disagree

Strongly agree

#61 In general, do you like to talk with other people about climate change?

Strongly dislike talking

Neither

Strongly like talking

#71 How often do you discuss climate change with your co-workers, family, and friends?

Never

Occasionally

Very often

Communication Behavior Expectation Items (CCAM and new)

[STIMULUS CONDITIONS ONLY]

#86 How much do you agree or disagree with these statements about the future?

“In general going forward, I won’t like to read or hear anything about climate change.”

Strongly disagree

Neither Agree nor Disagree

Strongly agree

#88 In general going forward, do you think you will like to talk with other people about climate change?

Strongly dislike talking

Neither

Strongly like talking

#90 Going forward, how often do expect that you will discuss climate change with your co-workers, family, and friends?

Never

Occasionally

Very often

[Controls]

#38 Generally speaking, do you think of yourself as a...

- ☐ Republican
- ☐ Democrat
- ☐ Independent
- ☐ Other. Please specify: _____
- ☐ No party/not interested in politics

[ASK IF RESPONDING “INDEPENDENT”, “OTHER”, OR “NO PARTY...”]

Do you think of yourself as closer to the...

- ☐ Republican Party
- ☐ Democratic Party
- ☐ Neither

#39 In general, do you think of yourself as...

- ☐ Very liberal
- ☐ Somewhat liberal
- ☐ Moderate, middle of the road
- ☐ Somewhat conservative
- ☐ Very conservative

#68 Are you of Hispanic, Latino, or of Spanish origin?

- ☐ Yes
- ☐ No
- ☐ Don't know

#64 How would you describe yourself?

[RANDOMIZE ORDER]

- ☐ Black or African American
- ☐ White
- ☐ Native American or Alaska Native
- ☐ Asian or Pacific Islander
- ☐ Other/none
- ☐ Don't know

#65 To which gender identity do you most identify?

- ☐ Male
- ☐ Female
- ☐ Other/both

#66 What is your approximate household income?

- ☐ Less than \$20,000
- ☐ \$20,000 to \$34,999
- ☐ \$35,000 to \$49,999
- ☐ \$50,000 to \$74,999
- ☐ \$75,000 to \$99,999
- ☐ Over \$100,000

#67 What is the highest level of education you have achieved?

- ☐ Less than high school degree
- ☐ High school degree or equivalent
- ☐ Some college
- ☐ College degree
- ☐ Graduate degree

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