The Scenic Route: A Developmental Approach Emphasizes the Importance of Human Interiority in Transformative Approaches to Climate Change

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Abstract: What is effective climate change adaptation, at a time in history where the call for transformative change is on the increase? This article considers how to expand and deepen the largely techno-managerial concept of adaptation, often framed as that of reacting to and accommodating climate change, by integrating human interiority in a more balanced way. While the psychological and social dimensions of the climate change issue have been studied, they are less equally weighted alongside the climate science; some studies suggest that improving the integration of psycho-social change processes will be important for effective adaptation and may bode helpful in enacting transformative change. In this article, I explain my rationale and methods for including the lesser-known discipline of adult developmental psychology to examine how people make meaning of climate change, which may have important implications for adaptation policy and practice. Studies exist on 'what' people believe about climate change, but the insights from developmental psychology help to explain 'why' meaning is organized as it is. Explaining what understandings people hold is akin to the shortest distance between two points, but considering why meaning was construed as such is the scenic route. I argue that 'taking the scenic route' to consider the perspective-taking processes that produce such a spectrum of views on climate change may hold potential for a more comprehensive response to such a complex issue, not only to grasp why these meanings differ so vastly, but also to support improved collaboration and to help engage in adaptation as transformation.

Keywords: Adaptation, adult development, climate change, human dimensions, meaning-making, transformation.

Introduction

Climate change is a dominant global issue today, and policy-makers place an acute focus on how society can effectively adapt to new climatic conditions. Approaches for adaptation remain largely techno-managerial, reactive and instrumental, such as, building sea walls, promoting new forms of agricultural production, or genetically selecting new climate impact-resistant varieties. While important, such approaches can miss the structural and psycho-social dimensions of

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climate change, and have been found to be incommensurate with the full complexity of the issue (Ensor et al., 2019; O'Brien, 2016; Ziervogel et al., 2016). In recognition that effective adaptation may involve a more comprehensive change agenda, and as a way to more fully and adequately understand and respond to this complex issue, my research seeks to uncover the lesser emphasized psycho-social, or "interior," aspects in our response to climate change – such as meaning-making, cognition, culture, and consciousness. Research into this interiority exists and is increasing, and yet it remains unevenly weighted alongside other scientific studies on climate change (Doherty and Clayton, 2011; Gifford, 2011; Overland and Sovacool, 2020). Balancing these contributions, better integrating the existing studies on the interior dimensions of climate change adaptation, and further empirical research on how interiority matters, is an important area of study (Brink and Wamsler, 2019). This is because, in so doing, it may provide a more comprehensive and commensurate approach, and thus a more effective and sustainable response.

I have been studying and doing research into the interior dimensions of climate change for three years. This research is grounded in studies with coffee production stakeholders across a global value chain, extending from growers in the isolated highlands of Guatemala, to exporters and buyers in Guatemala City, to executives in retail headquarters in the United States. In this paper I will give an overview of these studies, preliminary conclusions, and future plans.

The expressions of "interiority" that I focus on in my research include: 1) the stages of meaning-making people hold about climate change as studied in developmental psychology, 2) the interpersonal processes that we might need to collaborate more effectively across this range of meanings within layered, complex contexts, and 3) the ways in which the definition and engagement of adaptation can be broadened and deepened so as to be transformative. Here, dissimilar to incremental change, transformative change includes significant changes in form, structure, and/or meaning making (Leichenko and O'Brien, 2019; O'Brien, 2018). This present article addresses the first of those, with possible implications for the second and third.

To date, the plasticity of climate change meanings has been noted and various studies have looked into what people actually understand by the term. Many of these studies focus on beliefs and climate literacy, some have investigated indigenous views, others have carried out values-based segmentation studies (Brace and Geoghegan, 2011; Graham et al., 2014; Roser-Renouf et al., 2009). Fewer studies have looked into why and how people come to understand climate change the way they do. Within that, some have used qualitative, critical methods to understand climate knowledges as a product of people's experiences with place (Clifford and Travis, 2018), while others have examined worldviews in relation to climate change as ideal-types[2] (de Witt, 2015). Other studies have sought to find relationships between cultural identity and political outlook, such as in Kahan's (2011) cultural cognition theory. This work has looked into the "identity-protective" cognition and how groups on either extremes of the hierarchical-individualist or egalitarian-communitarian may reject or dismiss information that challenges their deeply held beliefs (Maibach et al., 2011; Roser-Renouf et al., 2009; van der Linden, 2016). Critiques of that work find that it gets caught in a tautological loop (where political ideology is defined as culture and culture as political ideology) and conflates worldviews, culture and values

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[2] A term used in sociology to refer to the 'pure' attributes that are common to most cases of a given phenomenon, as put forth by Max Weber (Aronovitch, 2012).

in an unhelpful way. Van der Linden (2016) distinguishes between worldviews as unique compared to values and culture in that they are situation-invariant "orienting mechanisms" (i.e. as lens of perception) (p. 4). I suggest that these orienting mechanisms are important to examine on their own terms, untangled from their relation to values and culture, to help disclose why meaning is organized as it is and how such lenses of perception change over time. It is in this respect that developmental psychology might be very useful.

Rather than going directly to *what* people understand about climate change, this article 'takes the scenic route' of *why* meaning was made as it was. Developmental psychology turns attention to the cognitive processing through which a person is construing meaning, 'slowing down the journey' of this inquiry to 'meander through' the many perspectives that have had to be coordinated to come up with someone's present understanding of climate change. Aside from some theoretical papers or empirical studies in an associated area (such as sustainability or leadership), there are no studies I am aware of that have delved empirically into what a developmental perspective could offer the climate change field. Adult developmental theories map empirically validated phases of maturation in the complexity, depth, and nuance with which an individual makes meaning of the world, including the types of perspectives that they can take on self, others, and reality. Applied to climate change, developmental capacity is a significant factor for (1) leaders and decision-makers at local, state/province, national and even international levels; leaders of religious and community groups; leaders in business; activists; educators; and engineers – i.e. those crafting or implementing responses to the climate change threat; and (2) citizens and consumers – i.e. those whom leaders and decision-makers are trying to satisfy and influence. Overly simplistic, black-and-white, ideological, ethnocentric/nationalistic, or short-sighted views of climate change in either of these stakeholder groups will severely limit society's ability to address it. Understanding these limiting perspectives more deeply is a first step in moving beyond them; a task for which developmental psychology may bode useful. I suggest that 'taking the scenic route' to consider these perspective-taking processes that produce such a spectrum of views on climate change may hold potential for a more comprehensive response to such a complex issue, and may also help to engage with adaptation as (a form or process of) transformation.

Adaptation, as defined by the IPCC (2014, p. 5), is "the process of adjustment to actual or expected climate and its effects." Ensor et al. (2019, p. 228) refer to "mainstream adaptation approaches" as those that proceed from certain assumptions that in turn constrain practices for dealing with, and surviving in, a changing climate, often precipitating an over-emphasis on reactive, incremental and techno-managerial adaptation (Ziervogel et al., 2016), i.e. "to reduce climate-related risks to things we value" (Dow et al., 2013, p. 305), but often inadequately engaging changes in social arrangements (O'Brien, 2018). *Transformation*, on the other hand, is defined as, "a change in the fundamental attributes of natural and human systems" (IPCC, 2014, p. 5). In my estimation, this refers to broad, profound systems-wide changes to shift our societal trajectory towards thriving with and through climate change to greater degrees of equity and sustainability, possibly even including a post-carbon emissions future and drawing down existing carbon dioxide from the atmosphere to reverse the global warming phenomenon. As such, adaptation and transformation are very different concepts, which can have markedly different objectives. Yet, in the Intergovernmental Panel on Climate Change literature, transformation is considered alongside adaptation (IPCC, 2014, p. 27). Added to this, definitions of the term

'transformation' are varied, some ambiguous, often left undefined or used as metaphor (Feola, 2015), and this lack of specificity and clarity may also bode difficult when it comes to application in relation to adaptation.

In this gap, scholars call for different epistemological starting points that comprehend the entangled nature of the climate change issue (Ensor et al., 2019) and holistic approaches are being sought that conceptually bridge or connect adaptation and transformation in a context of climate change (O'Brien, 2012; Pelling, 2011; Pelling et al., 2015).[3] Examples include "integral adaptation" by O'Brien and Hochachka (2010) and O'Brien's (2018), "Three Spheres of Transformation" heuristic, that describes the Practical, Political and Personal spheres as necessary for a comprehensive shift towards sustainability. The current, conventional definition of transformation tends to miss interiority and reduce it to the Practical sphere, which is easier to measure and quantify (O'Brien, 2018); but then the transformation being sought in turn is constrained to it being a technical problem, rather than an "adaptive challenge" or a transformative social change problem (Heifetz et al., 2009; O'Brien and Selboe, 2015). Further empirical research into specifically how transformative change occurs in the personal sphere, how personal change relates with changes in human systems, and how to better integrate all of these spheres towards an overall sustainability transformation, would be a helpful contribution to this overall inquiry.

In this article, I explain the ways in which I am studying developmental psychology, particularly using the STAGES framework, to better understand human interiority in climate change and to contribute insights into the design of an integral approach to climate adaptation carried out as a transformation to sustainability. What might a deeper understanding of why people construe meaning about climate change as they do tell us about an expanded and deepened practice of adaptation, within a more comprehensive transformative change agenda? In this review article, I focus on the potential I see in including developmental psychology in climate change research, explain my rationale using the STAGES model, my approach and methods on the topic to date, and I also share some preliminary findings along this scenic route of the many perspectives on climate change.

Literature Review

Climate change is almost unparalleled in its complexity: it is both a biophysically immense phenomenon yet it has profound and direct personal implications; it involves every dimension of human society including powering the very computer you are reading this article on; and it is co-arising alongside and as a result of the societal development that both made this problem as well as our ability to study and solve it. To adequately curb carbon emissions that drive climate change requires us to turn inward and ask ourselves deep and profound questions about our very selves, the nature of change and the choices we are making. Yet, the focus to date has almost necessarily been scientific-materialist: including inquiring into the interlocking global environmental changes that are involved in this global warming, the extensive and varied

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[3] The research project, *AdaptationCONNECTS*, which stands for *Combining Old and New kNoweldge to Enable Conscious Transformation to Sustainability*, of which my PhD research is a part, endeavors to examine precisely that question.

feedback loops, the contributing factors, and the ecosystem impacts – all of which are paramount questions to explore – and yet these, along with the political and economic analysis of the climate change phenomena (Giddens, 2011; Stern, 2007), can tend to ignore the key *interior,* i.e. psychological, developmental, and hermeneutic, factors. Such human dimensions are critically important; such as, mental models, risk-perceptions, strong emotions, denial, compassion fade, contested values, political will, and the glaring fact that it has been human actions underpinned by our values for a particular developmental trajectory that has created the problem in the first place. Understanding the science and removing structural and behavioral barriers for action are essential, but that could be insufficient without also addressing the psychological dimension of this issue (Gifford, 2011).

As much as it is an issue of natural science, climate change is now also characterized as a psychological and social issue (Doherty and Clayton, 2011), and with that has come scholarship exploring the varied, subjective layers at play within it. Research in this area ranges from studies on psychological barriers, or "dragons of inaction" (Gifford, 2011), values, risk perception and communication strategies (Graham et al., 2014; Hine et al., 2014; Leiserowitz, 2006; Maibach et al., 2011), lay-knowledges about climate change (Brace and Geoghegan, 2011; Hulme, 2009; Moloney et al., 2014; Pyhälä et al., 2016), indigenous framings (Rosengren, 2016; Scoville-Simonds, 2018; Vinyeta and Lynn, 2013), psychological distance (Brügger et al., 2015; Spence et al., 2012; Spence and Pidgeon, 2010), emotions (Moser, 2007) and worldviews (De Witt et al., 2016; Hedlund-de Witt, 2013), to name a few of the categories covered. However, scholars also note that this body of work is less visible in climate change discourse (Doherty and Clayton, 2011; Moser, 2007; O'Brien, 2018). While some of this research is present, it is not equally weighted in mainstream academic discourse alongside other scientific studies on climate change.[4] Further studies are needed to move beyond the current biophysical emphasis, and to better understand the role that interiority plays in global environmental change (Esbjorn-Hargens, 2010; O'Brien and Hochachka, 2010; Wamsler, 2018).

In this article, I argue that the *developmental* aspects of interiority are one of the most fundamental, yet are underrepresented even within the climate change literature focusing on interiors. Climate change is considered both a "wicked problem" (Wilber and Watkins, 2015) and a "hyperobject" (Morton, 2013) due to its expansiveness in space and time, its multidimensionality, and its elusive nature when people try to directly experience or completely understand it; as a result of this, people end up making meaning of climate change in a range of ways (Hochachka, 2019). This has been referred to as the "plasticity" of climate meanings, which in turn produce persistent problems for climate change engagement that have evaded resolution (Hulme, 2009). For example, an implicitly common, albeit much-maligned frame, held by scientists and policy makers is to consider citizens' knowledge to be wrong, rather than different, sometimes referred to as a "knowledge deficit" (Moloney et al., 2014). This corresponds with a dominant (somewhat contested) approach to raising climate awareness called the "information deficit model" (Moser and Dilling, 2011; Suldovsky, 2017) in which more of the same climate information is provided to society who, for the most part, is assumed to be climate illiterate. Other researchers point to how this 'incorrect' understanding about climate change can lead to essentially irrelevant solutions (Wolf and Moser, 2011). These may be true statements, from a certain perspective, but they risk dismissing important epistemologies,

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[4] Which in turn is drawn upon by intergovernmental bodies like the IPCC.

understandings and meanings about climate change which may bode locally- and culturally-relevant regardless of being mis-aligned scientifically. As such, this knowledge deficit model doesn't disclose the whole picture of how meaning is being made about climate change, and privileges that of climate science. A developmental understanding is helpful to make sense of this plasticity of meanings, to let go of the notion that lay knowledges are wrong and instead to see that these are construed by different perspective-taking capacities about a complex, multiple object, and as such ask a different set of questions about how effective engagement might be realized (Hochachka, 2019).

Along with this recognized need for further research on interiority, and within that on developmental psychology, in climate change research, the term "transformation" is increasingly being used in climate change discourse. Although adaptation strategies tend to emphasize accommodating climate change, some scholars point out that successful adaptation will in fact require deliberate, social transformation that critically questions and moves society beyond the structural underpinnings that give rise to the climate change phenomena (O'Brien, 2018, 2016). That the concept of transformation is now part of the IPCC documentation and that it is being called for more frequently in other intergovernmental literature on global environmental issues (IPBES, 2019) is an important step forward for the field. Yet the term, "transformation," is being used diversely, in some cases vaguely and metaphorically (Feola, 2015) and as such it runs the risk of not being engaged or assessed effectively (Salomaa and Juhola, forthcoming).

The disciplines that are brought to bear in the study of transformation in sustainability cover a broad range, including sustainability science, social science, and social-ecological systems theory. O'Brien (2018) presents a three-spheres heuristic for engaging transformational change in regards to Personal and Practical aspects (i.e. reflecting on values, their alignment with action), and their interface with the Political systems in which change is sought, which is included in the IPCC (2014). But aside of what can be found in that framework, there are few holistic models that detail ways to engage transformation from a personal or psychological perspective within a larger change agenda. Meadows (1999) considered that changing "the mindset or paradigm out of which a system arises" to be among the most powerful leverage points for systems change, yet did not provide an empirical methodology to engage that. Abson et al (2017) emphasized a shift in mindsets (referred to as a "re-think") as a key part of leveraging sustainability transformation, but without providing pragmatical detail on how such mindsets might shift nor why they seem so difficult to shift. Others have sought to understand the role of worldviews in climate change in relation to sustainability and sustainable lifestyles (Hedlund-de Witt, 2013, 2011), in regards to psycho-cultural transformation in a depth psychology frame (Berzonsky and Moser, 2017), and still others focus on the mindfulness-sustainability nexus (Wamsler and Brink, 2018). Innovation is increasing on "technologies of the self," to mobilize agency in large-scale systems transformation projects (Manuel-Navarrete, personal communication, Transformations2019 conference). Yet to date, *how transformative change occurs in consciousness itself* is harder to find in the climate change literature. In other words, there is an increasingly sense that transformation is needed personally and socially – for example, in regards to our paradigms and values – but how such change actually happens is less well represented in the research.

Paradigms don't shift easily, and getting people to 're-think' can be far more complicated and contested than it may seem; these psychological change dynamics are intricate and understanding them might be well-served by a body of work that specifically has sought to grasp how they work. How do the deeper leverage points of mindsets or paradigms[5] described by Meadows (1999) actually shift? Is there a transformative process involved in Abson et al's (2017) "re-think", and if so, what is it? Interesting angles to such questions could be disclosed through a greater representation of developmental psychology in climate change research, with nuances brought to bear on these existing studies to further highlight and catalyze the potential for personal transformation in a larger shift to sustainability. It is one thing to speak generally or metaphorically about psychological or social transformation or 'paradigm-shifting,' but adult developmental theories provide a sequence of specific stages or levels, grounded in empirical science, that can help us understand key differences across a range of worldview stages. Without a sense of these developmental stages, climate change scholarship is missing that particular lens on how people perceive, relate to and act on climate change as they mature, grow and change through life.

Developmental psychology concerns itself with precisely that, as it attempts to get to the deeper layer of where change is happening, investigating the 'deep structures' or causal mechanisms behind how a person makes-meaning of phenomena through the life-span. Not only is the study of interiors underrepresented, as I said above, but there is even less presence of a *developmental* psychology perspective in the mainstream-progressive literature on climate change engagement (Hochachka, 2019). To date, studies that have attempted to use developmental psychology in climate change or sustainability in general have presented theoretical ideas, but the empirical studies to date are few and preliminary (De Witt et al., 2016; Divecha and Brown, 2013; Lynam, 2012), and are relatively obscure in climate change knowledge networks. Yet further empirical work on how transformations occur in the personal sphere, as understood in developmental psychology, and how that in turn meshes with transformation in the practical and political spheres, would be helpful for many reasons, not least of which is in how to engage climate adaptation as a comprehensive social transformation (Leichenko and O'Brien, 2019).

To fill this gap, I draw upon the developmental psychology scholarship in one part of my climate change research, specifically using the STAGES model. Below, I briefly describe the STAGES model and my rationale for using it prior to explaining my specific application of it in my climate change study.

The STAGES Model

Developmental psychology considers transformation to have occurred if there has been a shift in the order of complexity from one stage to another, a bit like expanding to an larger doll in a nested set of Russian dolls (Hochachka, 2019). Depending on what facet of consciousness is studied – be it meaning-making (Cook-Greuter, 2013), ego-development (Loevinger, 1966), value systems (Graves, 1970), morality (Kohlberg, 1981), or cognitive complexity (Kegan, 1998)

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[5] I use the terms mindset, a worldview, paradigm, and meaning-making consciousness relatively synonymously in this paper.

– transformation occurs when the previous stage has been transcended and included into a higher-order of complexity (i.e. a later stage) (Wilber, 2000).

For studying shifts in such complexity, of the developmental assessments available to me, I sought to work with O'Fallon's STAGES model. The STAGES model is an extension of the work of Cook-Greuter (2000) on post-autonomous levels of development, which in turn is an extension of Loevinger's (1966) model of "ego development" (also called "leadership maturity"), all of which have high statistical rigor (Murray, 2017). STAGES defines 12 developmental stages across three tiers of increasing maturation and complexity, starting from the very concrete through to the more and more abstract. O'Fallon describes these tiers as the Concrete, Subtle, and Meta-aware (i.e. called 'Metaware' in the model), each of which consists of 4 stages.[6] The progression is also defined through the increasing perspective-taking capacities that become available to individuals. Therefore, these stages progress through 6 "person perspectives," each of which has an early (passively-oriented) and late (actively-oriented) phase. Thus, the stages are identified as 1.0, 1.5, 2.0, 2.5...6.5, where the "1." to "6." reflect the six person perspectives, and the ".0" and ".5" reflect the early and late phases of each. The stages in each tier have been found in O'Fallon's empirical research to progress through a sequence of orientations: Receptive (i.e. passive), Active (i.e. agentic), Reciprocal (i.e. relational), and Interpenetrative (i.e. interconnected), which make up one of the logics applied during assessment and scoring. For a detailed description of the STAGES model, see other articles in this journal special issue, and see the Tables 1 and 2 in the Appendix and explained later.

I chose STAGES for various reasons. Other available developmental assessments include Kegan's Subject-Object interview, Dawson's Lectica assessment, and Cook-Greuter's Leadership Development Profile (LDP). Most of these, like the STAGES model, require specialized training to score subject performances, and are thus both more rigorous and more costly than fixed-choice and self-rating psychological assessments. Kegan's interview takes an hour or more with the research subject; Dawson's Lectica involves a series of written performances addressing a problem ("dilemma") which is then later analyzed by her team. Cook-Greuter's and Torbert's assessments use variations on the Sentence Completion Test (SCT) instrument also used by STAGES. Although each operate slightly differently, it has been suggested that the common dimension most of these systems seek to assess is some aspect of hierarchical complexity, understood as a nested holarchy, using the metaphor of Russian dolls, or matryoshkas (Hochachka, 2019, p. 4).

The Lectica assessments, based on neo-Piagetian theories of Fischer (1980) and Commons (2007) is, like the SCT, a written assessment scored by trained experts. A significant difference in comparison to the SCT is that Lectica uses a dilemma-solving task, whereas the SCT is a "projective" task in which, like a Rorschach ink blot task or a word-association task, the subject is responding freely and (ideally) not trying to produce a best or "correct" answer, and as such allows the text analysis to take a more in-depth look into the psyche of the subject. Also, Lectica tests are thought to focus on variations of "reflective judgment," an aspect of meaning-making that is more strictly cognitively oriented than the SCT, which measures "ego development," involving social/emotional skill sets and personality maturity. Kegan's method of the subject-

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[6] 1.0 through 2.5 are in the Concrete tier, 3.0 through 4.5 in the Subtle tier, and 5.0 through 6.5 in the Metaware tier.

object interview is assessing a territory very similar to that of the SCT (i.e. the constructs of "ego development," "perspective taking skills," and "meaning-making maturity" are largely overlapping). However, Kegan's interview-based method is much more labor-intensive to both administer and score, giving the SCT some advantages in the ways I sought to apply it.

Among the SCT alternatives, STAGES has several benefits over the other SCTs (i.e. LDP and, later, the Maturity Assessment Profile (MAP)) for my project. The main advantage is the assessment logic that STAGES operates by. Whereas the LDP/MAP SCT scoring is largely content and exemplar-based, relying heavily on the specific concepts and language used, STAGES is more structure-based, relying on underlying properties of the language productions. In relying on particular content from scoring manuals created over time, as does the LDP/MAP, there could be a risk of bias due to over-dependence on such content (Dawson, 2003). With STAGES, O'Fallon does draw on the robust scoring methods from Cook-Greuter, Loevinger and Torbert (the LDP), but has significantly revised the logic by which it is applied. The logic that guides a STAGES assessment is less about the content (i.e. the text that shows up at specific stages) and more about the structure of the text and its underlying developmental parameters. The STAGES model and scoring are based on these primary parameters:

1. Object of awareness (i.e. concrete, subtle or meta-aware);
2. Receptive, active, reciprocal, interpenetrative orientation (e.g. "I may be…"; "I plan to...", "together we might…"); and
3. Individual or collective orientation (e.g. construing meaning through the lens of "I" versus "we").

As my research sample includes participants across a global value chain, extending from coffee producers in isolated highlands of Guatemala through to exporters and buyers in Guatemala City to executives in retail headquarters in the United States, perhaps more so than other field-researchers, I needed an assessment model that scored deeper than content, given the different cultures in my sample. STAGES in its three-criteria assessment is structured to be able to get at the hierarchical complexity of meaning-making that is operating more deeply than the content used therein.

O'Fallons' STAGES integrates the insights of Ken Wilber's (2000) Integral Theory, specifically the quadrants, states and shadow elements.[7] While other models may include some consideration of these, O'Fallon has explicitly included these in a way that supports understanding of, and may clarify aspects in, the process of ego-development. Specifically, her model sheds insight into certain intriguing phenomena in the construction of meaning that are important in climate change research for understanding the entangled dimensions of change processes. For instance, why do people who are able to understand external complex systems not necessarily turn that complex view inward to their own self-understanding? Or, why do individuals at later stages tend to speak with greater wisdom, not derived from perspectival maturity per se, but rather from contemplative insight? Or, how is it that mature, complex-

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[7] The AdaptationCONNECTS project, of which my dissertation is a part, includes Integral Theory in its overall design, as one of the analytical frameworks brought to bear on how we construe the research questions, on the methods used, and in the analysis of the study. This congruence was helpful in my selection of STAGES methodology.

thinkers still have instances where earlier, often emotional impulses seem to hijack their entire self-system? Finding a model such as STAGES that accounts for, and can answer such questions, is relevant for my study of how we might more fully understand complexity, collaborate across diverse epistemologies and cultures, deal with strong emotions, and effectively act on climate change.

Additionally, because I am specifically interested to study the later stages of meaning-making and what potentials they might hold for an issue like climate change, I sought a developmental model that extended sufficiently to be able to assess such later stages. The research "lineage" stemming from Loevinger (1960-70s) to Cook-Greuter (80s-90s) to O'Fallon (90s-00s) essentially went further with each researcher into how to assess meaning-making in the later, transpersonal stages. Cook-Greuter extended Loevinger's system by differentiating two stages (which she called Construct Aware and Unitive) within Loevinger's final stage. O'Fallon's research has taken this progression further, differentiating four stages within the same late-stage territory. This additional precision at the later stages is relevant to the climate change field because this issue is characterized as being wicked, hypercomplex, and hard to understand; and it also triggers emotional and identity-centric themes that are difficult for most people to manage. It is possible that climate change is 'unknowable' in an abstract and systematic manner by earlier concrete meaning-making frames, but knowable in concrete terms and impacts. Later stages, however, might offer important insight into how meaning is made of climate change when more of its complexity is able to be perceived and also how to translate that complexity into the meaning-making mode of prior stages.

Finally, the STAGES model has additional key features not found in the other SCT models. Because it does not rely on exemplars but on underlying language properties, it is easier to create modifications that are psychometrically valid. That is, STAGES 'specialty protocols' can be developed using alternative stems and different lengths, that are relatively easy to test for internal validity – such as the climate change specialty protocol O'Fallon and I developed and validated psychometrically, described below. Since one of the objectives of my research is to make a case for interiors in climate change, I needed to find a developmental methodology that could be modified for use in empirical research on climate change without compromising its rigor, which is what I found in the use of STAGES. In addition, because STAGES focuses on underlying structure rather than specific exemplars, it allows for the developmental analysis of arbitrary text such as reflective essays and story narratives, which are more naturally occurring vs. the more artificial sentence completion test.

Methods

Modified STAGES Assessment for Photo Voice Data

My research began to fill this gap by piloting a developmental analytical framework in climate change adaptation (Hochachka, 2019). In this, I drew on previous data from El Salvador and used a modified STAGES analysis on 'photo-texts,' to examine the question: Why do people make meaning of climate change differently, and how can a maturation of perspective-taking capacities help us to understand this plasticity of meanings?

I used a "modified STAGES assessment" in a pilot case study of how the development of meaning-making might affect views of climate change. I re-analyzed previous data from El Salvador, in which participants explored their own perspectives on climate change and adaptation by taking photos in response to the questions: *What is climate change to me?*, *What are the impacts of climate change for me and my community?*, and, *How am I adapting?* Using photos and their written photo-interpretations, I examined how different perspective-taking capacities arrived at different meanings about climate change, based on the object of awareness, complexity of thought, and scope of time.

The data consisted of 27 photos and their interpretations that were transcribed and translated by native Spanish speakers. The method of Photo Voice was selected for its ability to invite research participants into their own perspectives on the issue in order to better include the Personal sphere of transformation and then to problematize and discuss these perspectives together (the UL and LL quadrants of an integral approach to adaptation). Photo voice is a critical methodology that interrogates the epistemological power imbalances that can arise in a context of environmental change, with some uses of this methodology in the area of climate change (Harper, 2002; Hergenrather et al., 2009; Hissa, 2016). It has been found to support people in 'making visible' and meaningful the various socio-political realities they are embedded in, with theoretical grounding in education for critical consciousness (Migliorini and Rania, 2017; Sutton-Brown, 2014). Participants (23 rural Salvadorans; 13 men and 10 women) were from low-income families and were primarily farmers or were involved in household-level economic activities. While participants had limited education, several had been involved in informal education opportunities, such as awareness-raising and capacity-building workshops, via NGOs and the Catholic Church, and overall this region is renowned for political resistance and social change engagement, both during and after the Salvadoran civil war (1980-1992). As such, community members may have participated in previous critical consciousness-raising work (or conscientization (Freire, 1974)) on other themes.

Much of the project engaged a collective-analysis process I was involved in professionally prior to my doctoral studies, in which Salvadoran community researchers conducted photo voice in Chalatenango, El Salvador, then certain representatives traveled to the capital, to a bioregional meeting, and also to Canada, sharing and discussing the research results and the photo-texts. Some years later, within the frame of my dissertation, I revisited the data and brought a different analytical lens (Table 1) based on the STAGES model of adult development (O'Fallon, 2013) to understand the data in a new way.

Within that frame, I analyzed the photos and their interpretations (n=27, as 4 of the 23 participants had two photos) for perspective-taking capacity applying the modified STAGES assessment, which was then verified, and corrected if needed, by developmental psychology researcher, Dr. Terri O'Fallon. The STAGES assessment is usually carried out as a Sentence Completion Test (SCT) involving 36 sentence stems. I sought a modified version of this assessment more suited for community-based climate work. Using a subset of the scoring logic from the SCT scoring manual, data was assessed for perspective-taking capacity by coding the photo-interpretations according to the three following themes, and considering an array of variables within each. These are based on and relate closely with O'Fallon's scoring logic above,

but I modified them in a manner that I thought would be pragmatically useful to climate researchers in the field. They included:

1. Object of awareness (concrete, subtle or meta-aware),
2. Complexity of thought (atomistic, mechanistic, context-dependent, or systems thinking); and
3. Scope of time (no-time; present and past; past, present and future; evolutionary).

This generated scores for perspective-taking capacities range from 2.5, 3.0, 3.5, and 4.0 – corresponding with the *conformist*, *expert*, *achiever*, and *pluralist* stages of meaning-making. This modified STAGES assessment was piloted in the Salvadoran sample and helped contribute insight into the stages of meaning-making represented in the photo-transcripts. It was not as comprehensive as the full 36-stem test would have been, but instead was used illustratively to better understand why there is such plasticity of meanings and to orient the design of further research.

Results and Discussion

The results from the "pilot project" using the modified STAGES assessment of the photo-transcripts has been published (Hochachka, 2019) and the findings were interesting enough to warrant a further collaboration with O'Fallon. Together, we designed a climate change Specialty Protocol (explained further below) which, because it employs the 36-stem metric and statistical consistency trials, will offer a more rigorous, nuanced view into the stages of meaning-making about climate change. Some of what was found in the Salvadoran pilot project will be checked and "double-fitted" by the more detailed data from the Specialty Protocol, so to refine and iterate the analytical framework, if the need be. Here, I summarize the shape these findings are taking to date, based largely on what I have already published, discuss their application, and then propose the further research implications for the Specialty Protocol data.

Complexity of Meaning-Making

In psychology, it has been noted that the cognitive line of development – i.e. awareness – tends to lead overall self-development (Wilber, 2000). This is to say that development, in large part, has to do with how complex an object one is able to be aware of; as development increases, one's ability to observe ever more complex objects tends to increase. Climate change is among the more complex of objects that humans have tried to understand and address (see Morton, 2013 on "hyperobjects"). Theoretically, through the complexification of psychological development, *more* of climate change complexity will be rendered visible to one's meaning-making.

Findings in my empirical research correspond with this, and help us understand how meaning is constructed based on iteratively more complex stages (Tables 1 and 2). These included concrete conceptions of weather, direct impacts on crops and on the senses (i.e. colder, humid, hotter, etc.) with the Conformist stage of ego-development. Subtle conceptions included a multiplicity of associated factors based on cause-and-effect, mechanistic thinking with the Expert and Achiever stages. Further subtle and situated-knowing, considering place, context, positionality, and history, derived from an interdependent and self-reflective knowing, were

demonstrated with a Pluralistic stage of meaning-making. These findings suggest that *increasing degrees of complexity of the object of climate change can be known more fully by the increasing complexity of the subject's meaning-making.*

This could provide novel explanations to some persistent confusions in the climate change field. For example, the common conflation "weather" with "climate" change is a paramount concern for scientists and the informed public, largely because weather is understood as natural and uncontrollable whereas climate change is understood to be human-caused and is partially controllable. The concern lies in how framing climate change as weather change may in turn undermine agency and action towards mitigation and adaptation. My research suggests an explanation for this may lie in the complexification of meaning-making. That is, this may not be a preference to use the term weather over climate, but rather reflect the perspective-taking capacity of the subject. The concept and process of 'climate change' is conceptually more complex and abstract that that of 'weather,' which can be understood in a very concrete sense. As such, although the notion of climate change will be present in the background for people through what is heard in the media and social milieu (i.e. it will "subsist"), it may not "exist" until a certain meaning-making stage in which abstract, subtle, cause-and-effect logics are used to organize meaning (Hochachka, 2019, p. 5). This helps to explain why, for example, people using conformist meaning-making (or earlier) may tend to be skeptical of 'global warming' when it's cold out in the present moment: they are likely organizing meaning about climate change through the tangible, concrete, here-and-now vagaries of weather, rather than construing this phenomenon of climate as a subtle, abstract object, arising across vast timelines. Rather than be frustrated by that, a more generative reaction may arise through comprehending the meaning-making structure behind it. Further, while often people carry a lay sense of climate, such as, "Florida has a humid climate" vs. "Arizona has a dry climate," one would have to ask further questions to understand what that actually means to them: what complexity of thinking they are applying, what object of awareness they are tracking, and what range of time and space does their meaning include.

Greater Probability for Alignment in Communications

There are various implications of the plasticity of meanings about climate change. From other developmental psychology research, it is known that communications that assume and rely on a certain meaning-making frame can miss their mark; that is, such messages may not be comprehensible within other meaning-making lenses of the audience (Kegan, 1998). For example, "adapting to climate change" is a phrase that has become increasingly used by scientists working in the climate change arena, which in their use refers to "how human beings can best anticipate and respond to inevitable and predicted shifts in climatic conditions and their associated biophysical impacts;" (Moloney et al., 2014, p. 7). Yet it remains unclear whether that is an understanding held by lay people – do they connect the discrete things they are doing in a changing context into the abstract concept of "adapting?" and, if not, are scientifically-framed communications using such a term misaligned with their intended audiences?

My preliminary results reveal that *greater alignment is possible when stages of meaning-making are recognized not as preferences, but actual sense-making mechanisms through which people interface with reality.* In addition to understanding what is seen through a person's

meaning-making lens, the developmental perspective helps explain how meaning is organized by that lens, and as such would help climate change communicators to more adeptly and authentically connect with local actors. Building on my example between weather versus climate change above, this finding may explain why, for example, Bostrom and Lashof found that framing climate change with more concrete metaphors, such as a, "'thickening blanket of carbon dioxide' that 'traps heat' in the atmosphere," helped to connect with certain actors (Bostrom and Lashof, 2007, p. 31).

One strength of developmental psychology, and particularly the STAGES model, is that it orients analysis to some foundational concepts (such as, the object of awareness being concrete, subtle or meta-aware; and whether one's orientation to an idea is passive or active) that are key distinctions in understanding how a person is organizing meaning, and what they do with that understanding. As such, it could also provide a developmentally-informed design logic to help in further aligning communications with each stage of meaning-making and ameliorating communication misses.

Sovereignty over Translating Meanings into Actions

Despite being intangible and difficult to conceptualize, people encounter climate change either through media or conversations, or through its impact on their lives, thus they must make sense of climate change however they can. For many, climate change is understood as an entangled amalgam of multidimensional changes in the environment, culture and practices (Ensor et al., 2019) and proxies (such as snow-pack level or rainfall patterns) are used to track its impact on local lives (Clifford and Travis, 2018). Valuable lay knowledge-resources and energy can get lost when the meaning-making that people natively hold is dismissed as irrelevant or wrong (Boillat and Berkes, 2013; Wolf and Moser, 2011). Instead, scientific or 'proper' definitions of climate change can end up being patched haphazardly onto people's existing meaning-making apparatus. When that occurs, the concept of climate change can end up "cognitively isolated" with the rest of one's knowledge on the topic, and thus hamper the commitment to follow through with adaptation strategies (Findlater et al., 2018, p. 178).

The two articles of my dissertation collection that focus on developmental psychology to inquire into how meaning is organized and why *help to disclose the mechanisms behind such meanings, and in so doing, subsequent climate adaptation can be situated from within these meaning-making frames.* I introduced the ideas of "sovereignty" and "translation" in my 2019 article to present the idea that, rather than being dismissed as climate illiterate, edited by a 'proper' definition, or patched on to one's overall mental model, these native ways of making-meaning about climate change have value in their own right. Retaining *sovereignty* over one's own meaning-making essentially helps to disrupt the uneven power dynamics that shape what is considered valid knowledge. If people are not dismissed as "climate illiterate," and if lay understandings are given a chance, people may *translate* their own meanings into action and, in so doing, demonstrate greater ownership and energy to see them through. It may also be worth studying further the possibility of 'knock-on effects' in which more respectful framings about lay knowledges introduces a change in the overall cultural system, fostering greater openness, curiosity, and learning between different perspectives.

Research Implications

In this section, I explore why this method may be important to other academics, policy-makers, and practitioners working in climate change, and share some of the further research plans I have at the crossroads of a developmental psychology and climate change.

STAGES Specialty Protocol

The pilot project was compelling enough to warrant further investigation using the STAGES model. In this further research, I am looking more deeply and closely at the ego-development stages and their views on climate change. This research examines two questions, one focused on earlier stages and the other on later stages.

The first question seeks greater detail on both the strengths and limitations of meaning-making in the earlier stages. This helps to move away from the notion of earlier stages as being problematic or primitive, and offers an alternative to the (pluralist) sentiment that 'everyone needs to be worldcentric' to achieve sustainability. Instead, when seen through the findings of developmental psychology, to disparage people at earlier stages for their view, or behooving people at earlier stages to grow up faster, is neither accurate, fair, nor useful – particularly in meeting the challenge of climate change. Here, I ask: what are the real strengths and limitations of earlier meaning-making stages about climate change, and how can we emphasize the former in climate change engagement?

The second question brought to bear on this data will examine whether there might be unique meaning-making capacities that occur at the later stages that are important when seeking to understand a hyperobject like climate change. Theoretically, possible positive contributions of later stages might be their ability to perceive more of the complexity of the issue of climate change (Esbjorn-Hargens, 2010; Hochachka, 2019; O'Brien and Hochachka, 2010). Empirical studies in leadership development have found that later stages are more able to access trans-rational ways of knowing and tend to engage systems-, complexity- and integral theories to complex problems (Brown, 2011). Further empirical studies of such later-stage meaning-making capacities of climate change, and what implications that in turn may have, are yet needed and could yield important insights for the field.

To get this more detailed grasp on why there is such diversity of ways meaning is made about climate change, I collaborated with Dr. Terri O'Fallon to design a 'specialty protocol' using a modified version of the 36 sentence stems of the Sentence Completion Test (SCT). O'Fallon has constructed other Specialty Protocols by altering 6 of the 36 stems to address a particular domain. Tests of psychometric reliability (the Cronbachs alpha measure) confirmed the internal consistency of both the new stems as a group, and the entire modified protocol – for all of the approximately five specialty protocols designed to date (see the STAGES research papers in this special issue). Replicating that process, we replaced six of the 36 sentence stems in the original SCT with stems relevant to climate change. To do so, I considered what each new stem sought to evoke as a projective test – that is, what aspect of the self-system would the new stem relate with. For example, accounting for the findings of prior psychological scholarship on climate change, I sought to create stems that would relate with the scope of view that the person is able

to take on phenomena in general, his or her perception of where agency is located (self or other), psychological distance from the issue, emotions and perceived barriers for action, and empathetic range (i.e. me, us, all of us) as related to global warming. (These are written in brackets with the sentence stems below but not included on the test itself). These were then edited where needed by O'Fallon, and included in the Speciality Protocol.

1. The environment [scope of view]…
2. Climate change is [meaning-making]…
3. Regarding climate change, I [agency, locus of control, distance]…
4. My biggest concern about climate change [perception of risk, emotions of climate change]…
5. People who deny climate change [range of compassionate embrace]…
6. Actually, climate change [barriers spectrum: ignorance, uncertainty, denial]…

The test involved an online assessment, involving completing 36 sentences, taking between 30 minutes and 1 hour to complete. I used snowball sampling both within as well as outside of my own networks, trying to get as broad a range of individuals to take it as possible. However, there were some limitations to this sampling, which warrant mention. First, it was hard to expect people to do a written online assignment for a full hour, and so there may have been a self-selection bias in which the participants who ended up completing it may have had prior interest in this model or in developmental theories. Secondly, if these were individuals in my network, or even extended network, there was a strong possibility they were already aware of or educated about climate change. Finally, most of these participants were adults, with the exception of one youth.

21 participants took the speciality protocol for this study. We ran statistical trials on the data to date to ensure we were still accurately measuring ego-development. The goal was to maintain ego-development consistency, so that the scale was reflecting general meaning-making "stages" as well as providing a view into specific stages of meaning-making about climate change. If so, the data would show the overall stage of meaning-making, as well as the stage of the specific climate change responses provided. As was the case with prior Specialty Protocols, the Cronbach's alpha statistic for internal consistency was strong for both the set of six new stems (0.82) and for the 36-item survey as a whole (0.96) (N=32).

Given this affirmation of validity, analysis will then be carried out on the data to look at the stages of the discrete responses as well as the amalgam of the six climate change stems viewed together in relation to the stage of the participant. With the larger questions above in mind, the specific goal is to analyze what specific trends and themes emerge about climate change for each developmental stage and what new understanding specifically the later stages might hold for climate change communication and engagement.

Collaboration in Contexts of High Positional and Perspectival Diversity

One aspect of my future research will study how collaboration between actors could be carried out, not only considering this spectrum of meanings, but also the many other important layers that make these situations complex (such as positionality and power dynamics, the

realities of some actors living with multiple stressors and in a context of 'double exposure' (Leichenko and O'Brien, 2008), and the many cultural and political differences within a social group). Considering the context of winners and losers that climate change particularly exacerbates, what might effective collaboration look like when studying a global value chain for coffee, with actors at every point along the chain, each with their own cultures, experiences, sphere of influence, *and* stages of meaning-making?

This is an applied question, which takes seriously the implications that a developmental perspective brings to the issue of climate change adaptation, and tests the strength of its insights empirically. I have conducted two focus groups on this in Guatemala – the first with the producers in an organic, fair trade cooperative in the highlands of Huehuetenango, and then with a range of actors across the coffee value chain, including producers, buyers, exporters, the director for specialty coffee in the Export Association of Guatemala and representatives from the national coffee association in Guatemala City. I plan to hold at least another focus group with the North American end of the value chain, with representatives from the wholesale retailers, senior managers, buyers, and consumers. One of the foundational constructs of the STAGES model (that was not included in my earlier modified analytical framework) describes a shift in meaning-making from receptive (passive), to active (agentic), to reciprocal (relational), to interpenetrative (intermerged). Applying this lens to the analysis of the data may contribute critical understanding to the variance of perspectives regarding who is responsible and who is to blame for climate change – a topic which invariably arises when a multi-sectoral international group is convened in this way.

While some field work is pending for 2020 and the data from the first focus groups has not yet been comprehensively analyzed, so far, the data suggests that including the full range of actors, their contexts and their meaning-making constructs seems to produce an expanded and deepened definition of 'adaptation' which includes the structural and system-change dimensions of the issue as well as acknowledges the perspectival diversity across participants.

I am interested to complete the analysis to examine to what extent this re-frame may assist the value chain in moving from adaptation to transformation. Alongside "adaptation", the IPCC (2014, p. 27) includes the term "transformation" as an important and viable pathway that is part of our future response, yet often the notion of "transformation" ends up relying on sustainability transitions research, such as the multi-level perspective (Geels, 2011). However, the IPCC hints at a broader and deeper change agenda, and references the Three Spheres of Transformation (Practical, Political and Personal), further described by O'Brien (2018). Here, I perceive the gap between what is called for and how we might realize that call (i.e. the empirical evidence and methods for engaging transformation) is uncomfortably large, given the urgency of the need for climate change action. This area of further research will contribute to an exploration of what bridges might exist to move from the current expressions of adaptation (largely focused on techno-managerial changes) to a 'transformative' approach that integrates practical, systemic, and psycho-social changes across society. It will raise a discussion on how transformation can be defined and engaged in various ways, depending on where an emphasis is placed (interior versus exterior, individual or collective), and thus offers an explanation as to why systems transformation and psychosocial transformation end up being quite distinct endeavors. I intend to present ideas for how they might be engaged in an integrative way, adding to the empirical work

on the application of the Three Spheres model, and specifically examining in depth what transformation might mean in the Personal sphere through the lens of developmental psychology.

Conclusion

In this article, I have argued that the findings from developmental psychology are an important yet missing knowledge-set in climate change adaptation. I have contextualized this in two ways. First, in a global situation, in which adaptation is set alongside transformation, despite the fact that the gap between them remains substantial. Second, in an academic context in which the psycho-social studies in climate change remain unevenly weighted alongside scientific research, despite the growing recognition that adaptation requires a more comprehensive change agenda. As part of my larger argument that we need to close that gap between adaptation and transformation and integrate the psycho-social dimensions, here I have specifically considered what the insights of developmental psychology could bring to these sticky issues. Findings from research so far suggest that developmental psychology may bring a unique and largely untapped knowledge-set to the climate change conversation on how people are construing meaning. It discloses sequentially more complex meaning-making stages and, as such, presents compelling implications for aligning communications more effectively and for supporting local people to embed their adaptation actions in their own meaning-making frames. This is important because, while personal, practical and political changes co-arise and mutually influence each other, the personal domain could be considered first among equals because the other two domains always entail persons with a meaning-making apparatus. Taking this scenic route of pausing to understand why and how meaning about climate change is being organized as it is, may shed light on how transformation happens in the consciousness of individuals, and thus provide important insights for how to engage in transformative change towards sustainability.

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Appendix: Tables 1 and 2

Table 1. Analytical Framework to describe how meaning is constructed through lifespan, including preliminary application in the area of climate change adaptation.

Meaning-making / action logic (Kegan, 1998; Cook-Greuter, 2004; O'Fallon, 2013; (Rooke and Torbert, 2005))	Worldview (Wilber, 2000) **Order of consciousness** (Kegan, 1998)	What changes through growth and lifespan (from STAGES assessment; O'Fallon, 2013)	Descriptions of how climate change adaptation would be construed and engaged. (O'Brien and Hochachka, 2010; De Witt, 2016)
1.0 Impulsive: Concrete, individual, receptive: "if I bite my finger it hurts."			
1.5 Opportunist: Concrete, individual, active: Experience in the immediate moment what is happening to them, everything is an object but all objects are alive: their cause and effect would be perceived as magical.	Magic worldview Imperial mind	Complexity of thought: atomistic	"I peed in the river, and the river is now getting back at me by flooding my home" (O'Fallon, 2018, personal communication).
2.0 Rule-oriented: Concrete, collective, reciprocal: Opens a social dimension in which there is a more reciprocal way of viewing at the world, with an associated interest to know what others are thinking and a focus on making contracts, rules, and agreements.	Traditional / mythic worldview Socialized mind	Object of awareness: concrete Time: Immediate and momentary (earlier), view of the past (later)	With a traditional worldview (or, second-person perspective), the climate change phenomenon would likely be construed as something in the hands of fate and more a matter of faith than science. Adaptation strategies would likely depend on what others were doing or what the rules and principles ought to dictate and would be applied in a parochial sense with localized strategies for survival.
2.5 Conformist: Concrete, collective, interpenetrative: Interpenetrates with principles which they will follow without question. This often includes the law of the land, so if practices related to climate change are the law they will often embrace them (e.g. recycling).			

3.0 Expert: Subtle, individual, receptive: Preliminary ability to take an objective view, such that responsibility, respect and other subtle ideas begin to arise from within the person (as such these ideas are cherished). Begins to see the future and see probabilities of what might happen.	Modern / universalistic worldview		A modern worldview (third person perspective), would likely understand climate change adaptation scientifically and economically and seen as a technical problem to be solved or the need for adaptation to be carried out as part of economic or technological progress.
3.5 Achiever: Subtle, individual, active: Can be strategic in planning, prioritizing of self-interests and achievements and with an emphasis on outcomes, results, and goals relating to future time; interested to measure what happens through time (hypothesis and testing, deductive thinking).	Self-authoring mind (early)	Complexity of thought: abstract and networked	
4.0 Pluralist: Subtle, collective, reciprocity: It becomes apparent that the actions and interactions of humans with the environment cannot be separated from their context, and the socially-constructed nature of phenomena is recognized. Cause and effect depends on the situation and the circumstances. It is local, not universal.	Postmodern / pluralistic	Object of awareness: subtle Time: past and future (early), multi-generational (late)	A postmodern (fourth-person perspective) would likely seek to co-create and collaboratively work towards climate change adaptation processes, as it is perceived that the future of the planet is in the hands of humanity, would view this critically and with greater emphasis on the power dynamics and systems injustices that create vulnerability and produce climate change.
4.5 Strategist: Subtle, collective, interpenetrative: Able to understand and sort contexts, climate change manifests contextually, but is adaptively complex and interconnected systemically, humans affect and recreate the ways that healthy systems interact with each other, and as such can reverse damage caused by human disruptions of natural complex systems.	Self-authoring mind (mature)		

5.0 Construct-aware: Meta aware, individual, receptive: The constructed nature of reality is recognized on the whole, such that humans are seen not merely as actors in the system but rather their thoughts, ideas and beliefs about the system are constructing and shaping, as well as shaped by, its evolution and trajectory.	Integral / integrative worldview	Complexity of thought: systemic and meta-systemic Object of awareness: meta-aware	An integral worldview would work towards adaptation in a trans-disciplinary manner; seeking to be aware of what people believe and how they construct meaning; ensuring that adaptive strategies can simultaneously meet the population where they are while providing some emergent ground for learning; would likely include researchers and practitioners as part of the process; and would let go of the idealistic desire for everyone to understand climate change the same way.
5.5 Transpersonal: Meta-aware, individual, active: The understanding that "my" belief and belief systems are individually constructed and often limiting – this allows people to go beyond them to individually create/construct unusual and unique solutions with an ethic behind them.	Self-transforming mind	Time: evolutionary both forward and backward in time, (including recognition of timelessness)	

Table 2. Findings of modified STAGES analysis of photo-texts in climate change adaptation in El Salvador.

Meaning-making (O'Fallon)	Empirical findings of how climate change and adaptation is construed and engaged. (Hochachka, 2019, pp. 8–9)
2.5 Conformist:	– Climate change being described as changes in weather in concrete terms, such as recent epic floods, dry spells, intense rains, unusual storms. – Photos made loose connections between objects, but these objects of awareness all remained concrete. – Demonstrated an atomistic and immediate view of climate change, with the scope of time focusing mainly on the present, stretching only somewhat towards the past. – Proposed simple, concrete behavioural changes which could support adaptation at a local level, even though such actions may not be grouped into the concept of 'adaptation' per se.
3.0 Expert: **3.5 Achiever:**	– Both expert and achiever take third-person perspectives, so the objects of awareness become more subtle or abstract, and the future comes more fully into view, therefore disclosing probabilities for logically what might happen. – Expert meaning-making included some subtle concepts (such as "diversity") and considered a larger envelope of time stretching from the past and to some degree into the future, were more passive than active (i.e. receiving a training and being taught what to do to adapt), yet was still largely anchored in concrete phenomena (i.e. acreage, trees, compost). – Achiever meaning-making demonstrated thinking that was even more abstract and used further subtle concepts (such as, "contamination"), considered relationships and links between things and tended to forecast further into the future. – Demonstrated cause-and-effect logic which brought greater agency and responsibility as more consequences of actions are taken into account. – Adaptation is carried out on several linked fronts (i.e. managing standing water, reducing garbage, and preparing for water-borne illnesses in higher temperature conditions), which are held together in a logical explanation. – Adaptation also considered to involve multiple systems in various domains: changing land-use practices, use of industrial agricultural products, and loss of traditional practices are all related to the problem-set.

4.0 Pluralist: – Included multigenerational and cultural impacts and even more subtle or abstract perspectives about climate change, such as ideas of history, intergenerationality, and impermanence.
– Used subtle processes to make sense of climate change adaptation that are now occurring in a broader contextual understanding.
– The ability to consider context and the multiple causes of a situation also has a further increase in agency and responsibility.
– Demonstrate linked-up meaning-making, to understand climate change as a phenomenon that adds to multiple stressors in the region, such as deforestation, soil erosion and degradation, increased use of pesticides, community health, and so forth.
– Some photo-texts demonstrate early systems thinking, considering how the resilience developed during the civil war may have contributed to being able to adapt to meet current challenges.
– Adaptation is considered on a notably larger time envelope and considers the context in which climate change is occurring: historical, ecological, economic, political, and social.