Understanding responses to climate change: Psychological barriers to mitigation and a new theory of behavioral choice

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The dimensions and impacts of climate change are massive; the importance of this topic is widely recognized, from the Nobel Prize given to the Intergovernmental Panel on Climate Change, to the 2015 global summit in Paris that led to an agreement by all the important countries of the world (except one), to the high-level national and international debates about possible solutions, to the formation of hundreds of local, municipal, and regional grass roots groups devoted to finding solutions.

Human health is already affected through the increased range of tropical disease vectors, and the very landscape is changing through the increase in the frequency of extreme events, such as the burning in 2009 of about 450,000 ha (1100,000 A) on Australia's Black Saturday (Wikipedia, n.d.), a 2011 Texas wildfire that scorched an area the size of Connecticut (CNN Wire Staff, 2011). As this is written, 36,000 residents of British Columbia have been evacuated in the face of about 220 active wildfires (http://www.cbc.ca/news/canada/british-columbia/b-c-wildfires-evacuations-relief-1.4197826). Climate change will affect almost every person and animal on the planet in one way or another. Perhaps no other problem today is more important for so many people and other living beings.

Some individuals in every society are changing their behavior and that of others in response to climate change, but humans in the aggregate continue to produce greenhouse gases in *increasing* quantities (Intergovernmental Panel on Climate Change, 2014). Most experts conclude that although some changes cannot be avoided, given the amount of greenhouse gases already in the atmosphere, over the next several decades humans collectively can either decelerate the rate of change or increase the temperature even more than has already occurred. Mitigation is the enormous challenge.

Fortunately, environmental psychologists and allied researchers have developed considerable knowledge about what it takes to change behavior (e.g., Sussman, Gifford, & Abrahamse, 2016). Understanding the drivers of sustainable (and unsustainable) behavior is increasingly important for the future of humans and many other species (Kahle & Gurel-Atay, 2014). As the APA Task Force on Climate Change (Swim et al., 2011) pointed out, psychologists and allied social scientists are (or should be, as behavior experts) at the forefront of climate change, as those best

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qualified to understand the choices and behavioral tendencies of the now-7.3 billion actors whose everyday choices either ameliorate or worsen the damage already done. Former U.S. President Obama sought help for climate change in the form of a social and behavioral science research unit.

6.1 Why aren't we taking (more) action?

Many people are concerned about climate change, but they often engage in behavior that is detrimental to the environment or fail to engage in behavior necessary to ameliorate or prevent these problems. Much of the work in environmental psychology has focused on individuals' environmental knowledge, concern, and values, which are notoriously inconsistent, and usually weak correlates with proenvironmental behavior (e.g., Chaiken & Stangor, 1987; Finger, 1994; Vining & Ebreo, 2002). In a classic metaanalysis of 128 studies, the relations between knowledge and attitudes, attitudes and intentions, and intentions and environmentally responsible behavior were weak at the best (Hines, Hungerford, & Tomera, 1987). A more recent metaanalysis found that the overlap between reported and actual behavior is merely 21% (Kormos & Gifford, 2014). Self-reports of behavior are notably inaccurate, but this accounts for only part of the attitude-behavior gap. Several methodological and theoretical explanations for the "attitude-behavior gap" have been offered, including levels of specificity for attitude-behavioral measurement, direct vs vicarious experience with attitude objects (Newhouse, 1990), conflicts among motives (Kollmuss & Agyeman, 2002), and the low-cost/high-cost model (Diekmann & Preisendöerfer, 1992), which propose that even when people care about the environment, they may choose to engage in less effortful behavior, such as recycling, but continue to engage in high-cost behaviors such as driving, whose contributions to climate change outweigh the beneficial impact of recycling.

When obstacles for environmental behavior are considered and statistically controlled, the correlation between attitude and behavior strengthens (e.g., Corraliza & Berenguer, 2000; Kaiser & Gutscher, 2003). Several scholars have investigated perceived barriers to environmental behavioral change. For example, Blake (1999) identified three major barriers: intrapersonal (e.g., attitude and temperament), lack of felt responsibility, and lack of practicability (e.g., perceived shortages of time, money, or information).

In some cases, the bases for inaction are structural, that is, beyond an individual's reasonable control. For example, having a low income limits one's ability to purchase solar panels, living in a rural area usually means that public transport does not exist as an option to driving, and living in a region with very cold winters greatly restricts one's ability to reduce home heating-based energy use. Of course, if local or national governments do not support these structural improvements, they are part of the problem. However, many individuals do have the financial and structural capacity to act, but do not, or do much less than they could. Thus, the question remains: What limits more widespread proenvironmental behavior on the part of

individuals, whether those are everyday citizens, CEOs, senior government officials, or other important carbon players, for whom such actions *are* feasible? Fully understanding the perceived, or psychological, barriers requires a more comprehensive perspective—one that recognizes the wide variety of potential constraints that may render proenvironmental values, attitudes, and intentions inert.

Recently, Gifford (2011) introduced a comprehensive list of 30 psychological barriers, called the dragons of inaction, grouped into 7 categories. This chapter describes updated work with the dragons of inaction and is organized as follows: First, it reviews these seven categories of psychological barriers to climate change mitigation and adaptation (limited cognition, ideologies, significant others, sunk costs, discredence, perceived risk, and limited behavior).

Second, it reviews studies that focus on measuring the dragons of inaction, particularly in the context of the main greenhouse gas-heavy behavioral domains, such as household energy use and mitigative food choices.

Third, based on that work, we introduce the Dragons of Inaction Psychological Barriers (DIPBs) instrument, designed for investigating the climate change and sustainable behavior domains.

Finally, we discuss how the barriers can be practically applied to designs of behavior change interventions, provide insights to future research directions, and form a key part of a new theoretical framework called the theory of behavioral choice (TBC).

6.2 Psychological barriers: The dragons of inaction

If so many are concerned about the environment and climate change, why aren't more citizens more engaged in actions that would help to ameliorate the problems? Of course, many citizens have taken some steps in this direction, and some have taken many steps. Nevertheless, as a whole, humans continue to degrade the environment and produce massive quantities of greenhouse gases. The current levels of atmospheric CO_2 are at a historic high.

In order to begin the process of discovering all of the important psychological barriers, Gifford (2011) assembled a compendium of 30 factors that may serve as obstacles to behavior change for climate change and sustainability. That "intuitive" list stemmed from having to respond to journalists' reasonable question: "If so many people are in favor of the environment, why is so little being done?" Dragons were dredged from the literature and slowly grew in number from 7 to 10 and more over several years of giving presentations and hearing of valuable new suggestions from audience members. As of the publication of the 2011 paper, they are as follows, as

shown in Table 6.1. Several new dragons have been discovered since that could not be included in the present investigations[1], and more may be discovered in the future.

6.2.1 Limited cognition

Humans are less rational than once believed, before cognitive dissonance was introduced to psychology (Festinger, 1957), or Tversky and Kahneman (1974) demonstrated to economists that the "rational man" model was inaccurate. The science fiction writer Robert Heinlein wrote—using the gender language of the time—that "Man is not a rational animal, he is a rationalizing animal" (Heinlein, 1949, p. 59). This is as true for thinking about climate change and environmental issues as it is in other behavior domains. Seven "genera" of the "dragons of inaction" (psychological barriers) represent the territory of limited human rationality about behavior change related to sustainability and climate change.

Ancient brain. The human brain has not evolved much in thousands of years. At the time it reached its current physical development, our ancestors were mainly concerned with their immediate tribe, immediate risks, proximate exploitable resources, and the present. These here-and-now concerns are incompatible with solving climate and environmental problems, which often involve distant risks and delayed impacts. Our ancient brain obviously is *capable* of dealing with the slow impact of global climate change, but it is not top-of-mind.

Ignorance. By now almost no one is unaware of the many disturbing environmental realities. However, many individuals are paralyzed by their lack of knowledge about (1) *which* actions to take, (2) *how* to undertake actions that they know about, and (3) the *relative benefits* of different actions.

Environmental numbness. Our life spaces (Lewin, 1935) include far more sensory cues than we can successfully monitor, so we attend to a few selected cues that seem important. Thus, people are often unaware of problematic environmental changes, such as those in the climate or the environment. Another kind of environmental numbness occurs when environmental danger messages from the media, the government, or scientists are too similar or too frequent: They are no longer seen as news and are ignored, and, as a consequence, the underlying behavior does not change.

Uncertainty. Perceived or real environmental uncertainty, such as when climate scientists present a range of future temperature increases, or fisheries officials proclaim a range of probable sizes of an ocean fish stock, reduces the frequency of proenvironmental or sustainable behavior. This was demonstrated in a fishing

[1]The 30 dragons have increased to 36, and the newer ones have not yet been integrated into the current studies. These are: Authority Rules (forced to burn carbon by a superior), Confirmation Bias (choosing to attend to media that support one's antienvironmental views), Contrarian Personality (a person is against "whatever you got"), Time is Money (when individuals think of their time in terms of earnings, they tend to burn carbon), splitting Judgmental Discounting into Spatial and Temporal Discounting, and splitting Lack of Perceived Control/Self-Efficacy into separate dragons.

Table 6.1 The dragons of inaction as of 2011

Limited cognition	Ideologies	Comparisons with others	Sunk costs	Discredence	Perceived risks	Limited behavior
Ancient brain	Worldviews	Social comparison	Financial investments	Mistrust	Functional	Tokenism
Ignorance	Suprahuman powers	Social norms and networks	Behavioral momentum	Perceived program inadequacy	Physical	Rebound effect
Environmental numbness	Technosalvation	Perceived inequity	Conflicting values, goals, and aspirations	Denial	Financial	
Uncertainty	System justification		Place attachment[a]	Reactance	Social	
Judgmental discounting					Psychological	
Optimism bias					Temporal	
Perceived behavioral control/self-efficacy						

[a]Lack of place attachment was discussed in Gifford (2011), but accidentally omitted from this table.

microworld experiment: As uncertainty about the number of fish available for catching rose, the degree of overharvesting increased (Hine & Gifford, 1997). That is, many individuals interpret uncertainty in ways that will serve their self-interest. For example, those who still believe that global warming may not be occurring, and desire a fuel-inefficient vehicle for other reasons, may well purchase one, justifying their behavior by citing the "possibility" that climate change "may not" be real.

Judgmental discounting. People tend to undervalue geographically and temporally distant risks. In an 18-nation study (Gifford et al., 2009), respondents tended to believe that environmental conditions were worse in countries other than their own—and, of course, people in those *other* countries believed the same thing about countries distant from *their* own. If a problem is presumed to be worse elsewhere, people are less motivated to improve their own environment. If it is said to have an impact in the future, motivation to act now is less.

Optimism bias. Optimism generally is healthy; personal and societal progress largely depends on it, but optimism can be overdone. For example, many falsely believe that they have a lower risk of cardiovascular disease than their peers, which of course will tend to hinder their health-promoting actions. Relevant to the present topic, individuals tend to underestimate their own objective risk from 22 environmental hazards (Schmidt & Gifford, 1989), which presumably dampens their motivation to engage in actions to mitigate those hazards.

Lack of perceived behavioral control. Climate change is a global problem, so many believe that, as individuals, they can do nothing about it, which of course blunts their motivation to act. Without a sense of self-efficacy (e.g., Bandura, 1977), an important motivation for action is missing.

6.2.2 Ideologies

Some broad belief systems (political, religious, and others) influence many aspects of a person's life in ways that can act as strong barriers to environmental behavior change.

Political worldviews. One source of inaction on global warming is unfettered belief in free-enterprise capitalism, proponents of which tend to exploit natural resources as quickly and fully as technology and available capital permit. This economic approach leads to greater greenhouse gas emissions than would a more sustainable approach to development (e.g., Heath & Gifford, 2006).

System justification. This is the tendency to defend the societal status quo. Climate action in the form of regulatory changes might influence the economic context, which some fear will threaten their comfortable lifestyle. This results in opposition to regulatory change and less personal proenvironmental action.

Suprahuman powers. Some individuals engage in little or no climate-positive action because they believe that a religious deity or Mother Nature (as a secular deity) is in complete control. Inaction is the result.

Technosalvation. Technological innovation clearly has improved the standard of living of many people. It obviously also can help with environmental problems.

However, if individuals believe that engineers alone can and will solve all climate and sustainability problems, this absolves them from taking action.

6.2.3 Significant others

Humans are social animals; we often compare our situation to that of others and act accordingly. These comparisons can affect whether people act on climate, or not.

Social norms. People look to others to derive their norms about what is the "proper" course of action. Descriptive norms are what individuals believe, from scanning their environments, to be typical behavior; prescriptive norms are what individuals are told represent proper behaviors. Norms can be a force for progress in environmental issues, but they can also be forces for regress or inaction. If significant others, family, friends, or other nations are not doing their part (or *believed* to not be doing their part), individuals are likely to decide that they should not exert environmental efforts either.

Social comparison. Explicit comparisons made with another person or entity form a slightly different dragon of inaction. "If X is doing it (or *not* doing it), then maybe I should do it, too (or not, as the case may be)?"

Perceived inequity. Perceived inequity takes social comparison a step further. Individuals not only notice a difference between their choices and those of others, they assess the difference as being unfair. "Why should I change if *they* won't change?" Well-known persons, organizations, or other nations are cited as environmental foot-draggers, and these are used to justify one's own nonaction on perceived fairness grounds.

6.2.4 Sunk costs

Investments of money, time, and in behavior patterns can be valuable—unless they are harmful to the environment.

Financial investments. Once invested in something, dispensing with it can be difficult. If one has purchased a car and is now paying for its insurance and other costs, why should this cozy portable "living room" be left at home? Owning shares in an oil company will create cognitive dissonance about environmental actions; it can be easier to change one's mind about climate change than to divest oneself of oil stocks.

Behavioral momentum. Many habits are extremely resistant to change. Some that contribute to most environmental degradation (e.g., driving, diet, residential energy use, and flying) have a great deal of behavioral momentum.

Conflicting goals and aspirations. Everyone has multiple goals, many of which clash with the goal to improve one's environmental choices. Being willing to combat climate change, for example, is not compatible with aspirations such as buying a larger house or the latest electronic gadget. The larger house is a sunk cost in the sense that it normally means a continuing fixed increase in one's household energy costs.

Place attachment. Individuals may be more likely to care for a place to which they feel attachment than for one they do not. Place attachment is complex (Scannell & Gifford, 2010a), but can act as an impediment to action, in some contexts more than others. For example, being emotionally attached to a place might lead to opposition to green energy in the form of proposed new wind turbines in one's vicinity (more than another resident whose attachment to the same place is weaker). In this sense, one's attachment to a place is a commitment that forms a sunk cost. However, for the rootless or restless person who has little or no tendency to form place attachments, always being on the move is a kind of sunk cost in terms of the resulting commitment to use transportation energy.

6.2.5 Discredence

When individuals have a preexisting disbelief in experts or authorities, they are unlikely to take direction from them. For example, if scientists and politicians are disbelieved about the environment as a matter of course, suggestions from them to be more environmentally sustainable are likely to be ignored.

Mistrust. Trust is essential for healthy relationships. When it is absent, as it is between some citizens and scientists or government officials, resistance to their behavior-change suggestions will follow.

Perceived program inadequacy. Policymakers have implemented many programs designed to encourage climate-friendly behavior. However, citizens choose whether to accept these offers, and some will decide that the program is "not good enough" for their participation.

Reactance. Some people strongly react against policy that seems to threaten their freedom. This can go beyond mere inaction into actively choosing climate-harmful actions of products to spite policymakers.

Denial. Mistrust and reactance easily slide into denial. This may include denial that climate change is occurring, or that it has any anthropogenic cause, or that one's own actions are exacerbating climate change. Mitigative actions are unlikely to follow.

6.2.6 Perceived risk

Changing any important behavior holds at least six kinds of potential risk. Broadly speaking, people are risk-averse, so each of the six risk species below can act as a "drag on"[2] climate action.

Functional risk. Will it work? If one purchases, for example, an electric vehicle, it might, as a relatively new technology, have battery or range problems. Similar rationalizations can be offered about many new green technologies.

[2]One of the reasons for the choice of beings to use as a metaphor for justifying inaction.

Physical risk. Some adaptations may have, or be perceived as having, danger to self or family. Is this electric car as crash-safe as the SUV that I sold to buy it? Cycling is great for climate change, but it may result in a visit to an emergency room.

Financial risk. Green solutions require capital outlays. How long is the payback? If the product becomes a fixed part of a residence (e.g., solar panels), will I recoup the installation costs or accrue enough energy savings before moving?

Social risk. Others notice our choices. This leaves us open to judgment by our friends and colleagues, which could lead to damage to one's reputation. If I become a vegetarian, will my significant others push back, or my acquaintances deride me behind my back? If I don't fly home, will my family think that I no longer love them?

Psychological risk. Those who are teased, criticized, rebuked, or even bullied by their significant others, colleagues, or schoolmates for making some green choices, risk damage to their self-esteem in addition to the social loss. It's easier to ease off on that green behavior.

Temporal risk. The time spent planning a green course of action might fail to produce the desired results. Most people spend considerable time deciding whether to buy an electric vehicle, become a vegetarian, or plan how to cycle to work or school. What if it doesn't work out? The time was wasted, and time is valuable, and so some will not take this "risk."

6.2.7 Limited Behavior

Many people are engaged in at least minimal proenvironmental action. However, most people could do more. How do we justify doing less than we should?

Tokenism. Some proenvironmental behaviors are easy to adopt but have little impact on the big problems. "I recycle, so I've done my part." The ease of adopting some green behaviors means that these actions tend to be chosen over actions with higher effort costs but are more mitigative.

The rebound effect. After some mitigating effort has been made, the gain sometimes is diminished or erased by subsequent actions. For example, after acquiring a more fuel-efficient vehicle, owners tend to drive them farther (e.g., Linn, 2016). The net climate effect is negative. These 30 species of dragons include many, if not most, of the psychological barriers, or rationalizations or justifications, for not engaging in (more) proenvironmental behavior. Collectively, these dragons are a powerful group that presumably help to explain why most people agree that "there's a problem but" … and that is the operative word that prevents concern from leading to action: *but*.

A reasonable question is whether these seven genera, which were proposed on an intuitive basis, are valid in an empirical sense. This is the question we raise in the next section.

6.3 Developing an instrument for measuring psychological barriers

Psychological barriers might help enhance existing theories of proenvironmental behavior by providing an explanation for the value-action gap or the intention-behavior gap (e.g., TBC discussed further in this chapter). The three studies described in this section are part of a continuous effort to improve understanding of (perceived) barriers and develop a useful structure and psychometrically sound measurement model. These studies have focused on barriers in the major climate-relevant behavior domains, in both student and community populations (e.g., Chen & Gifford, 2015; Gifford & Chen, 2017; Lacroix & Gifford, in press). Constructing and validating sound psychological barrier scales also has practical value for designing policy and programs.

Gifford (2011) theorized psychological barriers were measured in approximately the same way in each study. Participants were first presented with a list of proenvironmental behaviors and asked to "pick a behavior that you or others believe should be done to help the environment, but which you are not doing right now, or are not doing enough." They were then presented with a series of barrier items and asked how much each was true for them on 7-point Likert scales, from "strongly disagree" to "strongly agree."

Barrier scales and items were analyzed after each study [e.g., interitem correlations, reliability indices, principal-component analyses (PCAs)]. Each new study allowed the authors to improve on the barrier measurements, remove less-useful items, and clarify items as needed. Two of these studies are described here, followed by a third that presents a revised barrier measurement model (i.e., the DIPBs instrument; Lacroix, Gifford, & Chen, in preparation).

An example from the food domain. In the first study, 251 Canadians were asked about the psychological barriers they face when making climate-positive food choices (Gifford & Chen, 2017). Climate-positive food-choice intentions were measured using six items (e.g., eat less meat, purchase organic food). Thirty-six barrier items were used to measure the psychological barriers, created to represent Gifford's (2011) list of dragon species and additional food specific barrier items.

Barrier components were extracted using PCA. Four were retained: Denial, Conflicting Goals and Aspirations, Interpersonal Influences, and Tokenism, which suggests that a four-factor structure is appropriate for the food domain. Of the four, Interpersonal Influences was the only one that was not significantly related to reported food choices. This may have been caused by the relatively weak reliability of the Interpersonal Influences component (α=.66) or perhaps because, although eating is inevitably a social practice, the impact of social influences on food choices is less-often noticed.

Using confirmatory factory analyses, the fit of the four-factor model was compared with that of a seven-factor model, based on the original seven categories described in Gifford (2011), and with a unidimensional model. Both the four-factor

and the seven-factor models demonstrated good model fit, although the seven-factor model was slightly better. The authors conclude that both models are equally valuable. The seven-factor model is more comprehensive, but some of its scales had low reliability. The four-factor model was more parsimonious and the scales more reliable.

An example from the energy domain. In a second study, 151 residents of British Columbia were asked about the psychological barriers they face when attempting to adopt household energy-saving behavior (Lacroix & Gifford, in press). These behaviors were measured using 11 items (e.g., "I switch off the television and computer when not in use"). Five (i.e., Limited Cognition, Ideologies, Comparisons with Others, Sunk Costs, and Discredence) of the seven theorized (Gifford, 2011) barrier categories were included in this study based on their presumed suitability to the study's energy objectives. These were measured using multiple items per barrier.

Barrier components were extracted using PCA. Six components were retained: Denial, Conflicting Goals and Aspirations, Interpersonal Influences, Mission Impossible, Technosalvation, and Ignorance (i.e., not knowing how to change). The latter was the only component not significantly correlated with the energy conservation behaviors measured in the study. The energy conservation behaviors included in the study were low-cost ones; perhaps participants knew how to implement these energy conservation behaviors. The Ignorance barrier might apply more to difficult, high-cost behaviors.

Some differences and some similarities emerged between the two studies. The food domain study attempted to measure all seven theorized barrier categories (i.e., from Gifford, 2011). However, it did so using mostly single-item measures for the specific barrier manifestations. The energy domain study attempted to measure only five of seven barrier categories but used multiple-item measures. Both studies measured the barriers in only one behavior domain. Nonetheless, three of the retained barrier components were the same in both studies; Denial, Conflicting Goals and Aspirations, and Interpersonal Influences. Additional components were found, but may have differed because of the different measurement approaches used in each study (e.g., single-item vs multiple-item measures, including only five of the even barrier components). This called for additional analyses using multiple items to measure a comprehensive set of barriers.

A revised barriers scale. The above studies provided the groundwork for a third study designed to address their limitations (Lacroix, Gifford, & Chen, in preparation). The previous two studies were domain specific (food and energy). One objective of this third study (Lacroix, Gifford, & Chen, in preparation) was to provide a comprehensive but parsimonious measurement of psychological barriers to proenvironmental behavior that could be used across multiple domains. The study included proclimate behaviors from six major climate-relevant domains (i.e., food choices, energy use, transportation, waste and disposal, purchasing, and water conservation).

New items were added to supplement the hypothesized barrier factors; the resulting 65-item instrument, intended to cover all the barriers in Gifford's (2011)

taxonomy using multiple items per barrier, was tested in a Canadian community sample (n=380). Exploratory factor analyses were conducted to discover the barrier constructs underlying the set of barrier items. Six factors emerged. To reduce the number of items used to measure each barrier factor, so as to create a relatively short, efficient set of scales, four items were selected to represent each factor, using factor loadings, corrected interitem correlations, and reliabilities (alpha). The items were also chosen to ensure that as many of the specific hypothesized barriers (cf. Table 6.1, above) as possible were retained, while eliminating items that shared considerable variance, in the service of parsimony and the practical usability of the instrument. The six-factor barrier structure was validated using confirmatory factory analyses using a new sample.

6.4 The Dragons of Inaction Psychological Barriers (DIPBs) instrument

This revised six-factor instrument, with four items per factor, explained 57% of the variance in psychological barriers. Each barrier factor had good internal reliability (i.e., alphas between .79 and .86). The barrier factors are as follows: No Need to Change, Conflicting Goals and Aspirations, Interpersonal Relations, Government and Industry, Tokenism, and Lacking Knowledge.

Overall, this experimentally derived six-factor instrument is quite similar to the originally theorized seven-factor structure (Fig. 6.1). However, some of the 2011 barrier categories were combined to form a new factor (i.e., Ideologies and Discredence were combined to form the new No Need to Change factor), some were separated from their original group to form their own factor (e.g., perceived program inadequacy now forms the Government and Industry factor), and some barrier categories were eliminated, but their items redistributed elsewhere (i.e., Perceived Risks were redistributed into the Interpersonal Relations, Conflicting Goals and Aspirations, and the Lacking Knowledge factors). Many of the original barrier categories remain practically unchanged except for their names (i.e., Comparison with Others, Sunk Costs, and Limited Behavior). The revised six categories of psychological barriers to proenvironmental behavior are described next.

No Need to Change (AKA Mission Unnecessary). This barrier represents a belief that proenvironmental behavior is not necessary, because a person believes either that there is no environmental problem or that the problem will resolve itself. In the case of climate change, for example, those who are susceptible to this barrier tend to deny that it is occurring or that it is human-caused. If they do accept that the climate is changing, they believe that the problem will resolve itself through technological advancement, suprahuman powers (e.g., a religious deity), or through nature's resilience. Often, these individuals have a general mistrust of climate scientists and authorities or believe there is no need to act because the environmental risks are geographically or temporally distant.

In terms of the barriers taxonomy initially presented by Gifford (2011), this category encompasses mistrust, denial, reactance, technosalvation, suprahuman

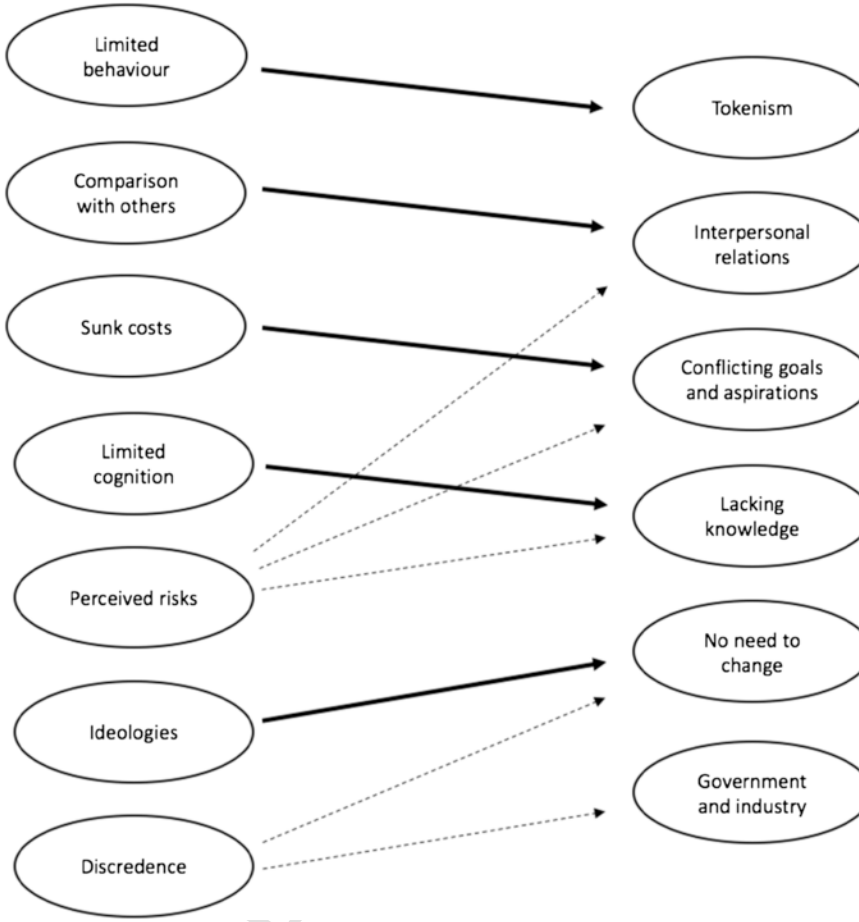

Figure 6.1 Gifford's (2011) seven barrier categories (left) in relation to the DIPB instrument (right). *DIPB*, Dragons of Inaction Psychological Barrier.

control, lack of self-efficacy, system justification, optimism bias, and confirmation bias. A prototypical item is "There is no need for change because I don't believe that a serious environmental problem exists."

Conflicting Goals and Aspirations (AKA Mission Contested). Some individuals recognize the need to change but cite financial or time constraints. Generally, they perceive a conflict between their other goals and engaging in proenvironmental behavior (e.g., wanting a bigger or more luxurious car, but also wanting to keep fuel consumption low). They may believe that changing their behavior will negatively impact their lifestyle or well-being and therefore are unwilling to change. Also, they might simply prefer to engage in climate-negative activities that they enjoy. Of the theorized specific barriers presented by Gifford (2011), financial investment, behavioral momentum, temporal and financial

perceived risks, and conflicting goals barriers typically fall into this category. A prototypical item is "Making this change would interfere too much with my other goals in life."

Interpersonal relations (AKA Mission Others). Some people would like to change, but they wait for others to change first or they fear that their family or friends would not approve of the proenvironmental behavior. Within the Gifford (2011) taxonomy, social comparison, social norms, and perceived social risk typically fall into this category. A prototypical item is "Making this change would be criticized by those around me."

Government and industry (AKA Mission Upstairs). Some individuals would like to change, but they believe that it is not *their* responsibility to act. They believe that for them to make sacrifices when industry is causing most of environmental problems is unfair. These individuals often believe that the government should take charge and make it easier for them to change by implementing incentives and programs. The perceived program inadequacy barrier (Gifford, 2011) applies to this category. A prototypical item is "It's the government's responsibility to regulate this change."

Tokenism (AKA Mission Accomplished). Generally, this group of barriers applies to individuals who recognize that changes are necessary to address environmental problems. In fact, many of them have already made changes in their own lives. The objective positive impact of these changes might be inconsequential, but once they have adopted one or two proenvironmental actions, they believe that they have done enough. The tokenism and rebound effect barriers (Gifford, 2011) typically fall into this category. A prototypical item is "I've already made sacrifices to solve environmental problems, so there is no need for me to do more."

Lacking Knowledge (AKA Mission Confused). Finally, some individuals would like to change but report that they do not know how. This barrier probably applies to behaviors that are easier to change, although this hypothesis will need to be tested. Of the specific theorized barriers (Gifford, 2011), perceived functional risks, ignorance, and environmental numbness fit into this category. A prototypical item is "I would like to change, but I'm not sure where to begin."

More research is needed to understand the impact of these dragons. Why? Partly for theory and fundamental knowledge, but also to learn where, in the pursuit of optimal policy and regulations, to most efficiently invest scarce societal resource funds and efforts. Evidence-based, targeted policy is efficient. The next section expands on this theme.

6.5 Practical applications

Identifying psychological barriers to proenvironmental behavior is key to the design of successful behavior change interventions. The DIPB will enable researchers to conduct behavior-specific investigations to establish barrier probabilities for each behavior and for different groups of individuals. Once these psychological barriers

have been identified, program designers can begin to "slay the dragons" more efficiently through public campaigns, policies, and programs.

A reasonable starting point is to consider whether all dragons impede all constructive behaviors for all individuals. The very probable short answer is "no." I (RG) have proposed a three-dimensional "Rubik's cube" model for this: Dragons x Behaviors x Persons. First, one can safely speculate that different individuals (age, culture, wealth, personality, motivation, etc.) will employ different justifications (dragons) to excuse their actions for different behaviors. Further, the different major behavior domains (domestic energy use, food choices, transportation, and the acquisition and disposal of material goods) probably will elicit different justifications. Bearing this three-dimensional model in mind, some examples of strategies for addressing each of the six experimentally derived psychological barrier factors are described next.

In the context of climate change, the No Need to Change (Mission Unnecessary) barrier factor is often associated with climate change denial or skepticism about its causes. The gateway belief model (van der Linden, Leiserowitz, Feinberg, & Maibach, 2015) suggests one potential avenue for addressing the barrier. According to this model, highlighting the scientific consensus on climate change (i.e., that 97% of climate scientists agree it is happening and human-caused) increases the belief in climate change, which subsequently increases support for climate action (van der Linden et al., 2015; van der Linden, Leiserowitz, & Maibach, 2016; van der Linden, Leiserowitz, Rosenthal, & Maibach, 2017).

The Conflicting Goals and Aspirations (Mission Contested) barrier factor is often associated with a perception that one's current behavioral habits are too difficult to change (Gifford & Chen, 2017; Lacroix & Gifford, 2017; Lacroix, Gifford, & Chen, in preparation). To the extent that the conflicting goals are habit-driven, some tools (e.g., implementation intention) are available for changing habits (Danner, Aarts, Papies, & de Vries, 2011; Gardner, Lally, & Wardle, 2012; Gardner, Sheals, Wardle, & McGowan, 2014; Turton, Bruidegom, Cardi, Hirsch, & Treasure, 2016). If time or inconvenience also is a barrier, these efforts could be combined with structural changes for more effective programs (e.g., improving public transportation). For changes that seem too difficult, way of increasing self-efficacy should be explored.

Highlighting the power of social norms can help to address the Interpersonal Relations (Mission Others) barrier factor. For example, informing household residents that they were consuming more electricity than most of their neighbors decreased their energy consumption (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). Modeling proper composting behavior increased composting in school cafeterias and public restaurants (Sussman & Gifford, 2013; Sussman, Greeno, Gifford, & Scannell, 2013). Efforts to increase social support may create more effective interventions.

The Tokenism (Mission Accomplished) barrier factor highlights the importance of emphasizing efforts to change high-impact behaviors (Capstick, Lorenzoni, Corner, & Whitmarsh, 2014; Schultz & Kaiser, 2012; Stern, Gardner, Vandenbergh, & Dietz, 2010; Wolske & Stern, this volume). In the context of climate change,

behaviors like flying less, eating less meat, and driving less or driving a more fuel-efficient car have a relatively higher potential to reduce greenhouse gas emissions than others (Lacroix, in preparation; Wynes & Nicholas, 2017). Research aimed at strengthening proenvironmental intentions toward less-impactful behavior still has its place, especially because it contains potential for these behaviors to spillover onto other behaviors. The Tokenism barrier is more likely to be surmounted (and positive spillover facilitated) when environmental motivation, attitude, and identity are stronger (Lanzini & Thøgersen, 2014; Schultz & Kaiser, 2012; Stern, 2011; Thøgersen & Crompton, 2009).

Positive spillover is also more likely when new skills have been learned. The promotion of self-efficacy (Bandura, 1977) is one potential avenue for addressing the Lacking Knowledge (Mission Confused) barrier factor. Generally, interventions that target self-efficacy should focus on strengthening individuals' perceptions of the benefits of change, and increasing their performance abilities (Anderson, Winett & Wojcik, 2007; Cherry, 2015; Haverstock & Forgays, 2012; Jancey et al., 2014; Janda & Trocchia, 2001; Lea, Crawford & Worsley, 2006; Menezes et al., 2015).

6.6 Future research directions

Using the DIPB should help to shed light on several questions that remain unanswered. For example, research might compare the perception of psychological barriers across public and private domains. Does the Interpersonal Relations (Mission Others) barrier more strongly hinder behaviors that occur outside one's home, and are thus more visible (e.g., using public transit), than behavior that takes place in private (e.g., wearing sweaters to conserve household energy)? The perception of psychological barriers might vary between individuals according to their values, worldviews, perceptions of social norms, or their financial situation. These psychological barriers may also be situation-dependent, that is, interact with structural barriers (e.g., the availability of alternative transportation).

Future research also could compare the influence of these barriers between easier and more difficult proenvironmental behaviors. One might hypothesize that a lack of knowledge about how to become a vegan (i.e., Mission Confused) is more common than not knowing how to change a lightbulb. Similarly, expecting the government to regulate a behavior (i.e., Mission Upstairs) might be more applicable for high-cost behaviors.

Once one has overcome some initial barriers, tokenism might hinder further action (Gifford, 2011). This hints at the possibility that at least some barriers are subject to a temporal or causal sequence. As another example of this, the first DIPB barrier, No Need for Change, characterizes individuals who do not see a need for change, whereas the remaining five barrier factors characterize the thinking of individuals who recognize that climate change exists and would like to do more to help, but nevertheless do too little. Future research should unpack the temporal sequence of barriers.

Future research might also investigate the interactions between psychological barriers. For example, does decreasing the perception of one barrier change the perception of other barriers? One might expect that once individuals accept that a given environmental problem exists and considers changing their behavior, they might become more conscious of the social norm surrounding that behavior. In other words, barriers might spill over (either negatively or positively) onto other barriers.

6.7 Incorporating psychological barriers into a new model of behavior choice

One of the most important future challenges for dealing with climate change is to develop a validated theory of human response to these environmental challenges. Understanding that one can fruitfully build on existing work, we are developing a TBC that should improve upon the often-used, but often-criticized, theory of planned behavior (TPB; Ajzen, 2011). Promoting sustainable behavior is not easy, so an optimal model of the phenomenon in question is crucially important.

What influences pro- and anticlimate choices and behaviors? Which are most and least powerful? How do these influences relate to one another? The general reasoned-action approach (Fishbein & Ajzen, 2010) is the latest version of the theoretical ideas of the earlier theory of reasoned action (Fishbein & Ajzen, 1975) and TPB (Ajzen, 1985). It offers an integrative framework for the prediction and change of human social behavior. It has stimulated over a thousand empirical studies since 1975.

Essentially, Fishbein and Ajzen (2010) propose that human behavior can best be predicted from a person's *intentions*. Intention is the cognitive representation of a person's readiness to perform a given behavior, and it is considered to be the immediate antecedent of behavior. This intention is said to be determined by three influences: *attitude* toward the specific behavior, *subjective norms*, and *perceived behavioral control*.

The approach has been the target of much criticism and debate, and Ajzen (2011) recently replied to many of the reactions and reflections. Most critics accept the theory's basic reasoned action assumptions but question its sufficiency or inquire into its limiting conditions. The TPB is reasonably good at accounting for behavioral intentions, but a number of critiques have highlighted its shortcomings (e.g., Aarts & Dijksterhuis, 2000; Wegner, 2002).

Based on a review of the TPB's strengths and weaknesses, and of other research, including our research on barriers, we propose, and are in the midst of testing, a new model called the TBC (see Figure 6.2). The goal for the TBC is to rectify the main shortcomings of the TPB and thereby serve as a superior predictor of behavioral choices. The TBC shares some constructs with the TPB (which, after all, is a reasonable model) but adds four elements: desire to enact (or NOT to enact) a particular behavior, perceived (i.e., psychological) barriers, structural (i.e., objective, external) barriers, and reported behavior.

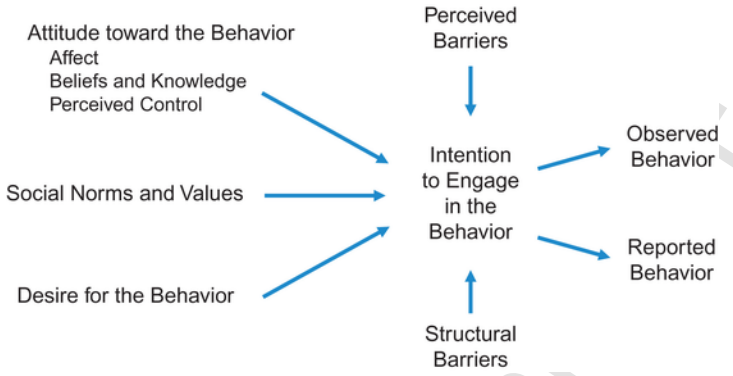

Figure 6.2 The theory of behavioral choice.

The work we have discussed above illustrates the importance of *perceived barriers*. In addition, some people face truly objective, external *structural barriers* (how can one choose public transit in a town that does not have any? How can one install solar panels as a poor person, or even as a middle-class renter?). Barriers of either sort seem to us to explain why individuals have intentions that are not turned into behaviors. "I would do that, but …" leads directly to one or more perceived or structural barriers.

Reported behavior is included in the TBC because of the clear distinction between actual and reported behavior that was demonstrated in our recent metaanalysis: Across numerous proenvironmental behaviors, the correlation between reported and observed actual behavior was r=.46, representing a 21% overlap (Kormos & Gifford, 2014).

Desire is not clearly part of the TPB, but as one of the authors (RG) discovered from a listener at one of his presentations who asked "What if I just *want* to fly to Costa Rica?", this volitional element deserves some discussion. The extended model of goal-directed behavior (EMGB; Perugini & Conner, 2000) was one attempt to gain a better understanding of cognitive and affective decision-making processes. It deliberately extended the TPB and the model of goal-directed behavior (MGB; Perugini & Bagozzi, 2001) by focusing on behavioral volition and linking those volitions to goals. Perugini and Bagozzi (2001) posit that behavioral desire mediates the effects of the TPB antecedents (attitude, subjective norm, and perceived behavioral control) on behavioral intention.

An extension of the MGB to the EMGB (its extended version) incorporates two additional elements, goal desire and goal perceived feasibility. However, a recent study (van de Vreede, 2006) concluded that perhaps the EMGB is too unwieldy to be effective. Although it is admirably inclusive, it lacks parsimony. Some of the proposed mediations did not occur. The TBC aims to find a balance between the inclusion of all usefully predictive elements with no superfluous elements.

The knowledge gained during the development and validation of the TBC model can be applied by policymakers and nongovernment organizations to enhance the

degree of climate-positive behavior in the community. By demonstrating how each element of the model influences individuals' intentions to act (or not act) in climate-positive ways, and determining how perceived and objective obstacles interfere with the transition from intention to action, these studies will serve as a guide for creating policies and practices that maximize the frequency of climate-positive behavior choices in the general population.

6.8 Conclusion

This chapter outlines the case for, and development of, a comprehensive and psychometrically sound instrument (the DIPB) for assessing the psychological barriers that hinder individuals from helping to mitigate the impacts of climate change and acting more sustainably. We also offer a new model (the TBC) that incorporates these psychological barriers, structural barriers, desire, and the distinction between actual and reported behavior into a model that should improve upon earlier models of behavior by increasing the range of influences while remaining reasonably parsimonious.

The DIPB and TBC aim to assist in efforts to deal with what is perhaps the *most* important current and future challenge, climate change. As someone said whose job it was to deal with all the important issues of our time, "There's one issue that will define the contours of this century more dramatically than any other, and that is the urgent and growing threat of a changing climate" (Barack Obama, UN Climate Change Summit, September 23, 2014).

Given that recent changes to the climate have mainly been caused by the collective behavior choices of 7.2 billion individuals, one obvious way forward is to increase our understanding of climate-related behavioral choices. One way to accomplish this is to create a useful predictive model for understanding those choices. Such a framework, in turn, needs reliable and valid measures. Improved models of human decision-making will serve as a crucial platform for community leaders and members of the community to craft policies that will soften the impact of an already changing climate for the generations to come. We hope that the DIPB and the TBC will be of use for this very important challenge.

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