The Psychology of Climate Change Communication

A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public

Center for Research on Environmental Decisions

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Writers

Debika Shome and Sabine Marx

With contributions from the following members of CRED

Kirstin Appelt, Poonam Arora, Roberta Balstad, Kenny Broad, Andrew Freedman, Michel Handgraaf, David Hardisty, David Krantz, Anthony Leiserowitz, Massimo LoBuglio, Jenn Logg, Anna Mazhirov, Kerry Milch, Nancy Nawi, Nicole Peterson, Adrian Soghoian, Elke Weber

Reviewers

Mary-Elena Carr, Kelly Hayes-Raitt, Betsy Ness-Edelstein, Clare Oh, Gavin Schmidt, Renzo Taddei, Bud Ward

Editor

Andria Cimino, Leapfrog Communications

Illustrator

Ian Webster, Hazard County Illustration

Graphic Designer

Erich Nagler, Design Means

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About the Center for Research on Environmental Decisions

CRED is an interdisciplinary center that studies individual and group decision making under climate uncertainty and decision making in the face of environmental risk. CRED's objectives address the human responses to climate change and climate variability as well as improved communication and increased use of scientific information on climate variability and change. Located at Columbia University, CRED is affiliated with The Earth Institute and the Institute for Social and Economic Research and Policy (ISERP). For more information, visit *cred.columbia.edu*.

We welcome feedback on this guide. Please send emails to cred@columbia.edu.

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Introduction

"The ultimate solutions to climate change are workable, cost-effective technologies which permit society to improve living standards while limiting and adapting to changes in the climate. Yet scientific, engineering, and organizational solutions are not enough. Societies must be motivated and empowered to adopt the needed changes.

For that, the public must be able to interpret and respond to often bewildering scientific, technological, and economic information. Social psychologists are aware, through their painstaking scientific research, of the difficulties that individuals and groups have in processing and responding effectively to the information surrounding long-term and complex societal challenges.

This guide powerfully details many of the biases and barriers to scientific communication and information processing. It offers a tool—in combination with rigorous science, innovative engineering, and effective policy design—to help our societies take the pivotal actions needed to respond with urgency and accuracy to one of the greatest challenges ever faced by humanity: global-scale, human-induced environmental threats, of which the most complex and far reaching is climate change."

—Jeffrey Sachs, Director, The Earth Institute, Columbia University

WHY AREN'T PEOPLE MORE CONCERNED ABOUT CLIMATE CHANGE?

Research shows that most Americans do not feel a personal connection to climate change.[1] They are aware of it, they may even rank it as a concern, but according to a 2008 Pew Research Center for People and the Press, they do not perceive it as a near-term priority on par with, say, the economic downturn or the need to reform health care. In fact, despite scientists' calls for urgent action, climate change has slipped to the bottom of the list of American priorities.[2]

Many people can recite at least a few things they could do to help mitigate global climate change, but are not. Why not? Somehow, and despite a lot of media attention following the release of *An Inconvenient Truth*, messages about climate change and what people need to do to help prevent it seem to have fallen on deaf ears.

There are many theories about why awareness of climate change does not inspire the kind of behavior changes it should. Addressing all of them goes beyond the scope of this guide. What this guide does provide are principles derived from the social sciences concerning how to communicate effectively about a topic that is complex, confusing, uncertain, sometimes overwhelming, and often emotionally and politically loaded.

CRED research shows that, in order for climate science information to be fully absorbed by audiences, it must be actively communicated with appropriate language, metaphor, and analogy; combined with narrative storytelling; made vivid through visual imagery and experiential scenarios; balanced with scientific information; and delivered by trusted messengers in group settings. This guide combines laboratory and field research with real-world examples. It blends information from the broad spectrum of disciplines that CRED encompasses: psychology, anthropology, economics, history, environmental science and policy, and climate science.

Intended for anyone who communicates about climate change, from scientists, journalists, educators, clerics, and political aides to concerned citizens, the guide's purpose is to assist communicators in reaching two key audiences—the general public and decision makers from government and business—more effectively. The principles found in this guide should help make climate change presentations and discussions more effective.

TERMINOLOGY NOTE

Climate Change vs. Global Warming

Erich Nagler

This guide uses the term *climate change* to refer to the changes that are occurring in the earth's climate system and the impacts such changes are having on ecosystems and society. *Climate change* is a better choice than the term *global warming* because it avoids the misleading implications that every region of the world is warming uniformly and that the only dangerous outcome of growing greenhouse gas emissions is higher temperatures, when that, in fact, is just the tipping point for a cascade of changes in the earth's ecosystems.

In addition, *climate change* better conveys the coexistence of human-made effects with natural climate variability, a more accurate, "state-of-the-science" portrayal of the causes for the phenomenon. Since the climate is warming in fits and starts rather than on a constant basis, each year might not be warmer than the previous one. As this guide will show, using more precise terminology (and defining easily misunderstood terms) is a vital ingredient to clear, memorable, and impactful communication.

1 Know Your Audience

WHAT IS A MENTAL MODEL?

A ***mental model*** represents a person's thought process for how something works (i.e., a person's understanding of the surrounding world). Mental models, which are based on often-incomplete facts, past experiences, and even intuitive perceptions, help shape actions and behavior, influence what people pay attention to in complicated situations, and define how people approach and solve problems.[3] Perhaps most important to climate change communicators, mental models serve as the framework into which people fit new information.[4]

People usually have some relevant knowledge and beliefs that help them interpret new information in order to reach conclusions. When hearing about risk, people often refer to known related phenomena and associations from their past to decide if they find the risk threatening or manageable. But sometimes a mental model serves as a filter, resulting in selective knowledge "uptake," i.e., people seek out or absorb only the information that matches their mental model, confirming what they already believe about an issue. This poses a potential stumbling block for climate change communicators.

MENTAL MODELS AND THE CONFIRMATION BIAS

A ***confirmation bias*** makes people look for information that is consistent with what they already think, want, or feel, leading them to avoid, dismiss, or forget information that will require them to change their minds and, quite possibly, their behavior. People often exhibit a strong preference for their existing mental models about climate change, making them susceptible to confirmation biases that lead them to misinterpret scientific data, as shown by the example below.

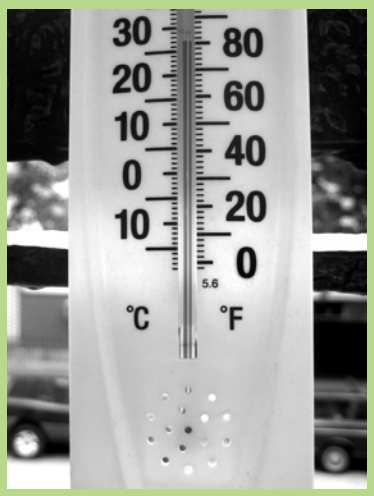
HOW TO IDENTIFY AND UPDATE MENTAL MODELS ABOUT CLIMATE CHANGE

The good news is that mental models are not static—people will update them by correcting misinformation, inserting new building blocks, and/or making new connections with existing knowledge. But for a presentation of new climate change information to succeed, communicators should first do their best to discover what climate change misconceptions the audience may have in its mental models. Communicators can then disconnect the erroneous climate change information from other parts of the model and replace it with new facts. The example on page 5 explores a common misconception that climate change communicators run into and how to counter it.

EXAMPLE

The Confirmation Bias and Climate Change

Both believers and skeptics find it tempting to over-interpret short-term hot or cold swings in temperature as evidence for or against climate change. Such confirmation bias in action can lead people who believe that climate change equals warmer temperatures to pay greater attention to supportive data, interpreting a heat wave in the Great Lakes region, for example, as evidence that their mental model is correct. Skeptics of climate change might pay more attention to news that announces close-to-normal levels of polar sea ice, a momentary finding but one that fits their mental model and enables them to disregard the more scientifically relevant trend of dramatic loss of sea ice in the Arctic and "debunk" climate change.[5] Both sides will either ignore facts that contradict their mental model of climate change or interpret them as exceptions to the rule.



Erich Nagler

Dr. Gavin Schmidt of NASA's Goddard Institute for Space Studies discussed the phenomenon of trying to fit new information into people's existing beliefs about climate change, providing communicators with great advice. As he explained to the *New York Times,* "there is this desire to explain everything that we see in terms of something you think you understand, whether that's the next ice age coming or climate change…When I get called by CNN to comment on a big summer storm or a drought or something, I give the same answer I give a guy who asks about a blizzard. 'It's all in the long-term trends. Weather isn't going to go away because of climate change.'"[6]

EXAMPLE

A Common Mental Model about the Ozone Layer and Greenhouse Gases

CRED researcher and director of the Yale Project on Climate Change Anthony Leiserowitz finds that people often confuse the hole in the ozone layer with climate change.[7] This is happening, in part and ironically, due to a science communication victory. Scientists and the media effectively and extensively covered the threat posed by the growing ozone hole, eventually resulting in international political action to phase out the main contributor, chlorofluorocarbons or CFCs.

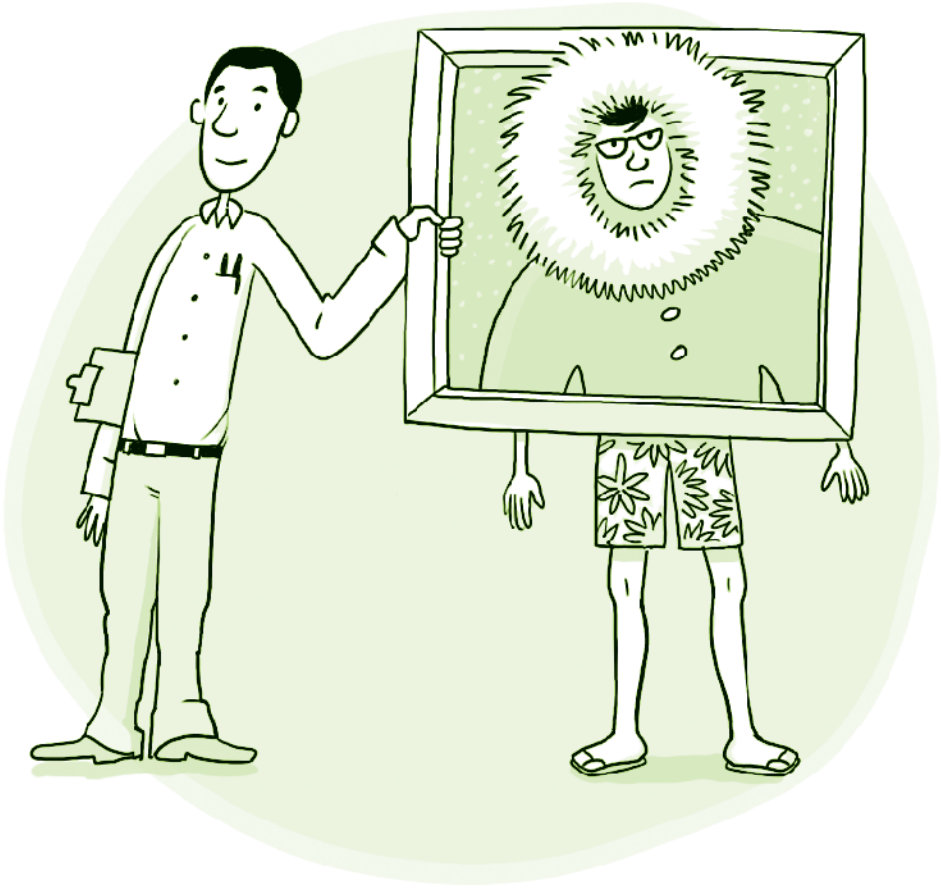
But now many people conflate their mental model of the ozone layer with how the atmosphere works, in particular with how greenhouse gases accumulate in the atmosphere. Dr. Leiserowitz has found it leads to some interesting misconceptions that require updating, such as: If there is a "hole" in the ozone layer, and there is a global "greenhouse" effect, then there must be a "hole" in the "greenhouse." Some Americans thus reason that this "hole" either allows more solar radiation into the biosphere—warming the planet—or, alternatively, allows heat to escape—cooling the planet.

Although logical, such reasoning has unfortunately led to construction of an inaccurate mental model about the causes of climate change that, in turn, causes many Americans to support inappropriate solutions, such as believing that the best way to solve global warming is to ban aerosol spray cans.[8] Climate change communicators should try to identify this commonly mistaken mental model and replace it with correct information.

2 Get Your Audience's Attention

WHAT IS FRAMING?

Framing is the setting of an issue within an appropriate context to achieve a desired interpretation or perspective. The intention is not to deceive or manipulate people, but to make credible climate science more accessible to the public. Indeed, since it is impossible **not** to frame an issue, climate change communicators need to ensure they consciously select a frame that will resonate with their audience.



WHY FRAME?

Below are just a few of the benefits derived from framing:[9]

- Frames organize central ideas on an issue. They endow certain dimensions of a complex topic with greater apparent relevance, more so than the same dimensions might appear to have under an alternative frame.
- Frames can help communicate why an issue might be a problem, who or what might be responsible, and, in some cases, what should be done.
- Frames can help condense a message into useful communication "short cuts" and symbols: catch-phrases, slogans, historical references, cartoons, and images.

THE SUBTLETIES OF FRAMING

Communicators should keep in mind both form and content when framing a climate change message. The first step, as explained in Section 1, is determining as much as possible about an audience's mental models of climate change.

The next step is to consider the audience's membership in specific subcultures (groups of people with distinct sets of beliefs, or based on race, ethnicity, class, age, gender, religion, occupation). Is there a majority represented in the audience? For instance, will college students concerned about the creation of green jobs comprise the audience? Or city officials interested in increasing energy efficiency standards in building codes? Consider the local perspective—an audience in Colorado may identify more strongly with the links between climate change and threats to the ski industry, whereas a group from Florida may care more about the links between climate change and sea level rise.

Communicators may find it useful to prepare numerous frames ahead of time, including climate change as a religious, youth, or economic issue. They should be

EXAMPLE

Framing and the Politics of Carbon

Although many top economists and climate scientists agree that a carbon tax would be the most streamlined step the US could take to reduce its contribution to climate change, support for a carbon tax among major politicians is extremely limited.[11] Yet, at the same time, many businesses and individuals voluntarily purchase "carbon offsets" (or "carbon credits"), which promise to balance out the greenhouse gases produced by a particular activity they are engaging in. How much of this support is a reflection of the framing power of the words *tax* and *offset*?

Martin Jacobsen, commons.wikimedia.org

CRED researchers polled a large national sample about a program that would raise the cost of certain products believed to contribute significantly to climate change (such as air travel and electricity) and use the money to fund alternative energy and carbon capture projects.[12] The identical program was described as a "carbon tax" to half the respondents, and as a "carbon offset" to the other half. This simple change in frame had a large impact on people's preferences.

When considering a pair of products, 52% of respondents said they would choose a more expensive product when the cost increase was labeled a "carbon offset," but only 39% when it was labeled a "tax." Support for regulation to make the cost increase mandatory was greater when it was labeled an "offset" than when it was labeled a "tax."

Strikingly, the framing effect interacted with respondents' political affiliations. More liberal individuals did not discriminate between the two frames (meaning, they were equally likely to support the program regardless of the label used), but more conservative individuals strongly preferred the carbon offset to the carbon tax. A follow-up study revealed that the tax label triggered many negative thoughts and associations among more conservative individuals, which in turn led them to reject the carbon tax.

careful when framing climate change, however, not to focus so intently on one particular aspect that the audience loses sight of the bigger picture.

When dealing with scientific communication and framing, research shows that an audience may be more receptive when they perceive the information being communicated as having salience, relevance, authority and legitimacy.[10] As the example on page 7 illustrates, framing can be a subtle art—even the choice of a single word can make the difference between winning and alienating an audience.

PROMOTION VS. PREVENTION FRAME

A powerful way of framing a message considers people's goals. Do they view their goal as making something good happen, or preventing something bad from happening?

People approach goals differently. People with a **promotion focus** see a goal as an ideal and are concerned with advancement. They prefer to act eagerly to maximize or increase gains. People with a **prevention focus**, however, see a goal as something they ought to do and are concerned with maintaining the status quo. They prefer to act vigilantly to minimize or decrease losses.[13]

Research shows that tailoring messages to people's natural promotion and prevention orientations increases the level of response for both groups, regardless of whether their response was positive or negative. These findings support the idea of framing messages from multiple perspectives to accomplish environmental goals. For example, if a local city wants people to increase their recycling, city officials should explain options in different ways, some with a promotion focus and some with a prevention focus. A promotion message would emphasize "going the extra mile" (e.g., going out of one's way to recycle, how recycling benefits the community). A prevention message would encourage "dotting the 'i' and crossing the 't'" (e.g., being careful to recycle, how not recycling hurts the community).

When communicators craft their climate change messages, they should remember that framing requires the careful selection of words that will resonate with the audience's orientations. The table to the left lists words that will help communicators frame messages that appeal to those who are promotion focused and/or prevention focused. In order to increase the chances of reaching a greater number of people in the audience, communicators should include both promotion- and

TABLE 1

Words That Appeal To Those with Either a Promotion or Prevention Focus[14]

PROMOTION	PREVENTION
ideal	ought
attain(ment)	maintenance
maximize gains	minimize losses
hope	responsibility
wish	necessity
advance(ment)	protect(ion)
eager(ness)	vigilant/vigilance
avoid missed opportunities	avoiding mistakes
promote	prevent
aspire/aspiration	duty
support	obligation
nurture	defend
add	safety
open	security
	must
	should
	cautious
	careful
	stop

prevention-oriented wording in their messages. People feel better and more positive about achieving their goals and are more likely to sustain their behavior when their goals are framed in a manner that feels naturally comfortable to them.

BRING THE MESSAGE CLOSE TO HOME: A LOCAL FRAME

Although the majority of US residents consider climate change a serious problem, they generally think of it in geographically and temporally distant terms. Most US residents do not personally experience effects that are drastic enough on a regular basis to alarm them about climate change.

In a July 2007 national survey, respondents believed that climate change was a "very serious threat" for "plants and animals" (52%), "people in other countries" (40%) and "people elsewhere in the United States" (30%). However, far fewer saw it as a "very serious threat" to "you and your family" (19%) and "your community" (18%).[15] In other words, people perceive climate change impacts as a threat to plants and animals and people in other parts of the world, but do not see it as a local issue affecting themselves, their family, and their community.

To counteract this problem, an effective communicator should highlight the current impacts of climate change on regions within the US. Research suggests that it may be more effective to frame climate change with local examples in addition to national examples. For example, references to droughts in the Southwest may resonate more with US audiences than talking about droughts in Africa. Similarly, climate change becomes a more personal threat to a New Yorker when hearing how New York City's subway system will suffer as the result of a rise in sea level compared to hearing about the effect of a sea level rise in Bangladesh.

Scientists have found trends in extreme weather events, such as heat waves and flooding, that are consistent with climate change, such as increasing precipitation extremes in some parts of the United States.[16] They project that climate change will increase the frequency and/or severity of extreme events, which may in turn cause significant damage to human health and infrastructure.

Because such extreme weather events are vivid, dramatic, and easily understood, especially to the locals who suffer through them, they provide effective frames

for the potential impacts of future climate change. The numerous examples of extreme events that may occur in a given year provide recurring "teachable moments" communicators can use to relate climate change to the experience of a local audience. For example, the long-lasting and severe drought, known as the "Big Dry," that has gripped some parts of Australia since 1995 has increased that public's awareness of climate change, resulting in greater support for measures to combat climate change.[17]

When discussing extreme events, however, communicators should bear in mind that while it is correct to say that climate change is increasing the odds of an extreme weather event, climate scientists cannot yet make the claim that climate change is **causing** such events. This important distinction often gets lost or is misunderstood, causing confusion and undue skepticism (see Section 5 for more about how to address scientific uncertainty).

For example, although scientists can link the severity of Hurricane Katrina to increased warming in the ocean, it is difficult to distinguish how much of that warming is due to human activity and how much is the result of a natural cycle.[18] Therefore, it is incorrect to say that climate change caused Katrina. Communicators should also be careful not to conflate cause and effect; a variety of factors conspired to make the aftermath of Hurricane Katrina so damaging and deadly. Katrina did, however, provide a powerful example of how costly extreme weather events can be, even if they aren't the direct result of climate change.

Communicators can also use local frames to effectively illustrate climate change solutions. In Montana's Glacier National Park, where climate change has led to the loss of numerous glaciers, the state government has begun investing in new "green" technologies like carbon sequestration and windmills.[19]

By framing climate change as a local issue, communicators not only increase their audience's sense of connection to and understanding of climate change, but also promote the development of local and regional solutions that could transfer well to the national and global arenas and, further, inspire future action everywhere.

MAKE THE MESSAGE MATTER NOW: THE NOW VS. FUTURE FRAME

People typically perceive immediate threats as more relevant and of greater urgency than future problems.[20] Yet communicators often portray the threat from climate change as a future rather than present risk.

The problem with this approach is that people tend to discount the importance of future events. Indeed, many social scientists believe that this is one of the top reasons that it is hard to motivate people to take action to prevent climate change. CRED research documents that many people count environmental and financial consequences as less important with every year they are delayed.[21] For example, the average person finds little difference between getting $250 now or $366 in one year (implying an interest rate of roughly 46%). The rates of discounting are similar for environmental consequences; the average person finds little difference in 21 days of clean air now over 35 days of clean air next year. Fortunately, communicators can make this predisposition (to heavily discount future larger losses) work to help people overcome a reluctance to take on immediate losses.

For example, if a communicator wants audience members to sign up for weatherizing their homes (which increases a home's energy efficiency), he or she may have more success by having them commit to an evaluation of their home's efficiency three or six months into the future rather than immediately. Because future consequences are discounted, people often think, "I'm busy now, but in the future I'll have more time and it won't be such a big deal." Of course, the key is to ensure audience members make a binding agreement so that the evaluation and subsequent weatherization really happen in the near future. In this case, a communicator might want to have a sign-up sheet that will enable audience members to sign up for a specific appointment with a local company that offers this service or for a time the local power company might contact them to schedule an appointment.

COMBINING THE NOW VS. FUTURE FRAME WITH A GAIN VS. LOSS FRAME

The negative feelings associated with losing $100 outweigh the positive feelings associated with gaining $100. Thus people have a natural tendency to avoid losses rather than to seek gains.[22] When a gain vs. loss frame is combined with a now vs. future frame, people discount future gains more than future losses.[23] For example, people may be more likely to adopt environmentally responsible behavior and support costly emissions reduction efforts related to climate change if they believe their way of life is threatened and that inaction will result in even greater loss. They are less likely to adopt these measures if they focus on the current situation which they see as acceptable and discount future improvement of it.

It may be possible to motivate environmentally responsible behavior by tapping into people's desire to avoid future losses rather than realize future gains. For instance, when communicators talk to homeowners, they could frame energy efficiency appliances as helping the homeowners to avoid losing money on higher energy bills in the future, instead of helping them save money in the future. Campaigns to encourage people to buy fuel-efficient vehicles could focus on how their use will avoid continuing and even increasing future losses in money to pay for gasoline instead of how such cars will save the consumer money.

To hold an audience's attention and encourage behavior change, communicators may want to present information in a way that makes the audience aware of potential current and future losses related to inaction on climate change instead of focusing on current and future gains. Audiences may be more likely to make changes to their behavior if climate change information is framed as 'losing less now instead of losing more in the future'. For example, during hot summer months, a smaller reduction in daily energy use can prevent having to deal with larger and prolonged energy blackouts.

BROADEN THE MESSAGE: THE INTERCONNECTED FRAME

"Our nation has both an obligation and self-interest in facing head-on the serious environmental, economic, and national security threats posed by climate change."
—Senator John McCain (R-Arizona)

Communicators sometimes frame climate change as if it is only an environmental problem, which enables some people to shrug it off as something only environmentalists need to worry about. But climate change is not a disconnected phenomenon that will only affect the weather and ecosystems, but a change that will have an impact on nearly every human system, including health, the economy, and national security. Vice President Al Gore hinted at the interconnected nature of climate change when he described it in his 2007 Nobel Peace Prize acceptance speech as "real, rising, imminent, and universal."[24]

Below and on page 13 are two examples of how communicators can broaden their messages to include such frames as national security and human health.

EXAMPLE

The National Security Frame

"We will pay for this [climate change] one way or another. We will pay to reduce greenhouse gas emissions today and we'll have to take an economic hit of some kind. Or we will pay the price later in military terms. And that will involve human lives."
—Gen. Anthony C. Zinni, retired Marine and former head of the Central Command

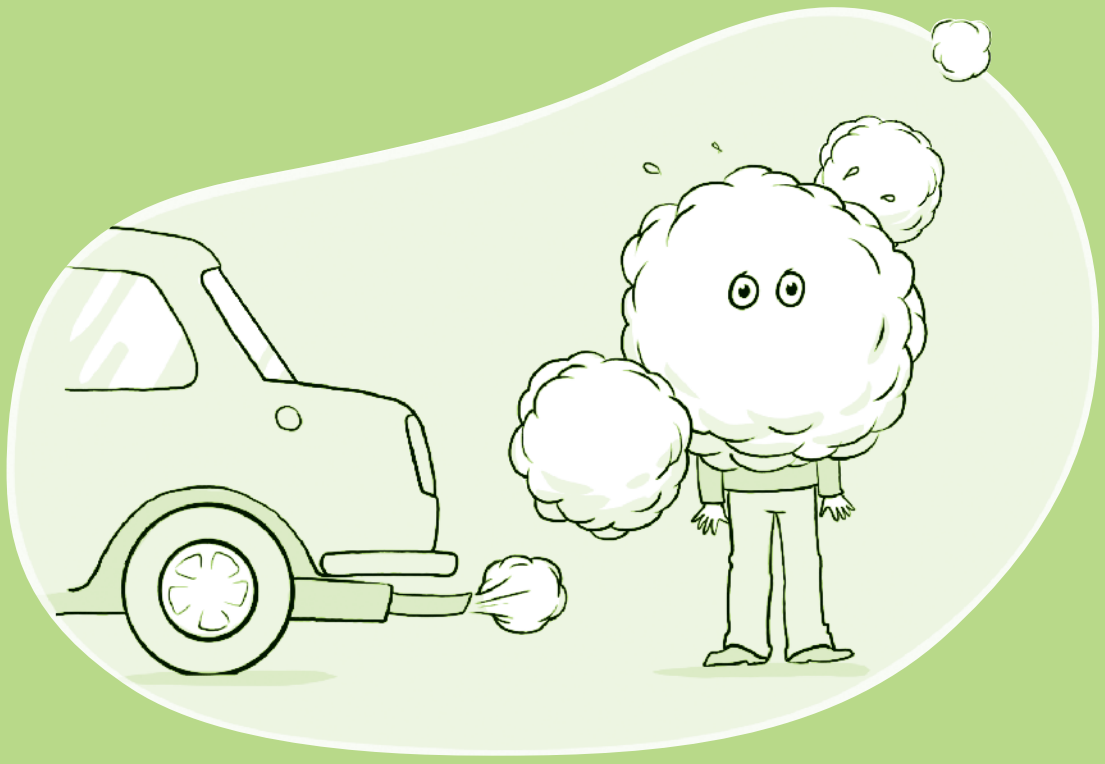
"The traditional triggers of conflict which exist out there are likely to be exacerbated by the effect of climate change."
—Emyr Jones Parry, Great Britain's ambassador to the United Nations

When it comes to national security threats, policymakers usually place terrorism as their main concern, with global climate change ranking far below, if at all. Recently, however, climate change has secured its place as a national security issue on both a national and global scale. In 2007, for example, the United Nations Security Council put climate change on its agenda for the first time, warning that it could serve as a catalyst for new conflicts around the world.[25] National security concerns deriving from climate change include the reduction of global food supplies, leading to large migrations of populations; increased risks for infectious disease, including pandemics that could destabilize economies and governments; and increased fighting over already limited resources like water and land.[26]

When talking about climate change, communicators should frame their messages to match what they think the audience may already relate to and worry about in terms of national security. For instance, when speaking to people in the military, communicators could highlight the connections between climate change and potential conflicts over natural resources, especially by so-called "failed states," a term often used to describe a state perceived as having failed at some of the basic conditions and responsibilities of a sovereign government. When speaking with a group of parents, communicators might want to describe what the world could be like when their children are adults—when issues like water wars, food shortages, and sheltering environmental refugees may become realities for people in the US.

EXAMPLE

The Human Health Frame



US residents may not perceive climate change as a threat to human health, either now or in the future. Some of the health implications related to climate change are relatively well understood (e.g., an increased likelihood of heatstroke), while others are less obvious (e.g., the rapidly rising rates of asthma and respiratory conditions). Drawing awareness to the connections between climate change and human health may be an effective method for elevating public concern about climate change in the US. By articulating its serious individual health consequences, communicators can help frame climate change as a concrete, personal concern for everyone.

Framing solutions, such as developing alternative energy, in terms of health and climate change also works well. The burning of fossil fuels like coal and oil creates "dirty energy" and emits large amounts of gases, such as carbon dioxide and nitrogen oxide. In addition to advancing climate change, these emissions directly pollute air and water by forming particulates like soot. It may be beneficial to highlight the multiple positive effects of reducing the burning of fossil fuels. Since direct or indirect exposure to these pollutants can cause cancer, breathing problems, birth defects, and mental impairment, reducing climate change-related pollution would also help reduce negative health outcomes.[27]

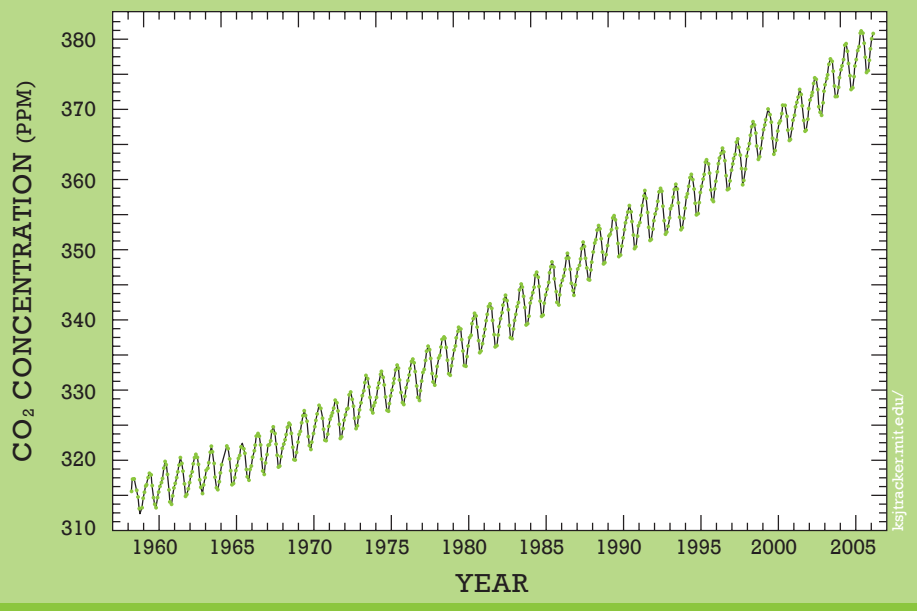
3 Translate Scientific Data into Concrete Experience

The famous "Keeling curve" graph, below, which shows the increasing amounts of carbon dioxide in the earth's atmosphere from 1958 to 2006, set off alarms in the scientific community that continue to ring loudly today. Yet somehow, this same graph does not communicate the immediacy of the climate change problem to lay audiences. Instead, it may actually convey the message that the buildup of carbon dioxide in the earth's atmosphere has been taking place over a long period, thereby erroneously implying that climate change is not an urgent issue.

Similarly, many people have difficulty grasping the importance of projections of higher carbon dioxide concentrations and surface temperatures several decades from now. Part of the problem may be the tendency to discount future events, as described in Section 2. But another part of the problem may be that a global average surface temperature increase of a few degrees does not seem like much to the general public, given the variability in temperature

THE "KEELING CURVE"

Mauna Loa Observatory, Hawaii
Monthly Average Carbon Dioxide Concentration



that most people experience on a regular basis.

But a few degrees do matter. As the 2007 United Nations Intergovernmental Panel on Climate Change (IPCC) report found, numerous effects of climate change are already observable throughout the earth system, and these impacts are likely to grow in coming years.[28] Yet polls taken during the past several years continue to show Americans ranking climate change near the bottom of their list of concerns or policy priorities.[29] Clearly attempts to convey the immediacy of the climate challenge have fallen short of translating climate change into a near-term (as well as a long-term) danger on par with other imminent societal and personal threats.

WHY THE "KEELING CURVE" ALONE DOESN'T MOTIVATE BEHAVIOR CHANGE

Many of the highly publicized graphs and charts showing global climate change data pose a problem for communicators because they fail to inspire a sense of urgency in many audiences. They do not help convey the deep concern scientists have that efforts to abate and adapt to climate change are a near-term necessity if humanity is to avert the worst effects. Despite making this point with increasing frequency and stronger data, the general public shows little concern.

Even when people understand the Keeling Curve, it does not always motivate them to take action. The reason for this disconnect may lie in how the brain works, which climate change communicators need to understand to create truly powerful messages that will inspire action.

HOW THE BRAIN PROCESSES INFORMATION

The human mind is not designed to immediately react to threats that seem to manifest themselves in the distant future, such as climate change. Distant risks do not set off the same alarms that immediate risks do. Human brains struggle to balance long-range worries with the demands of more immediate concerns.[30]

More specifically, the human brain has two different processing systems: the experiential processing system, which controls survival behavior and is the source of emotions and instincts (e.g., feeding, fighting, fleeing); and the analytical processing system, which controls analysis of scientific information. Table 2 on page 16 highlights the key differences between these two systems.

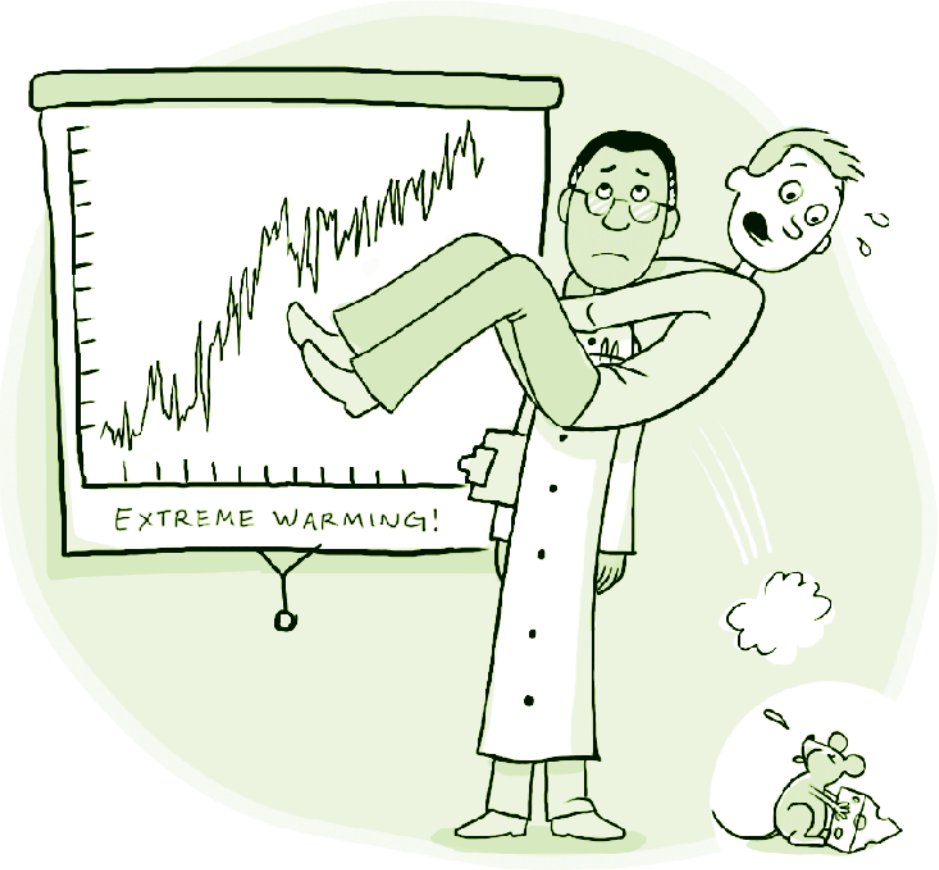


TABLE 2

Two Information Processing Systems of the Brain[31]

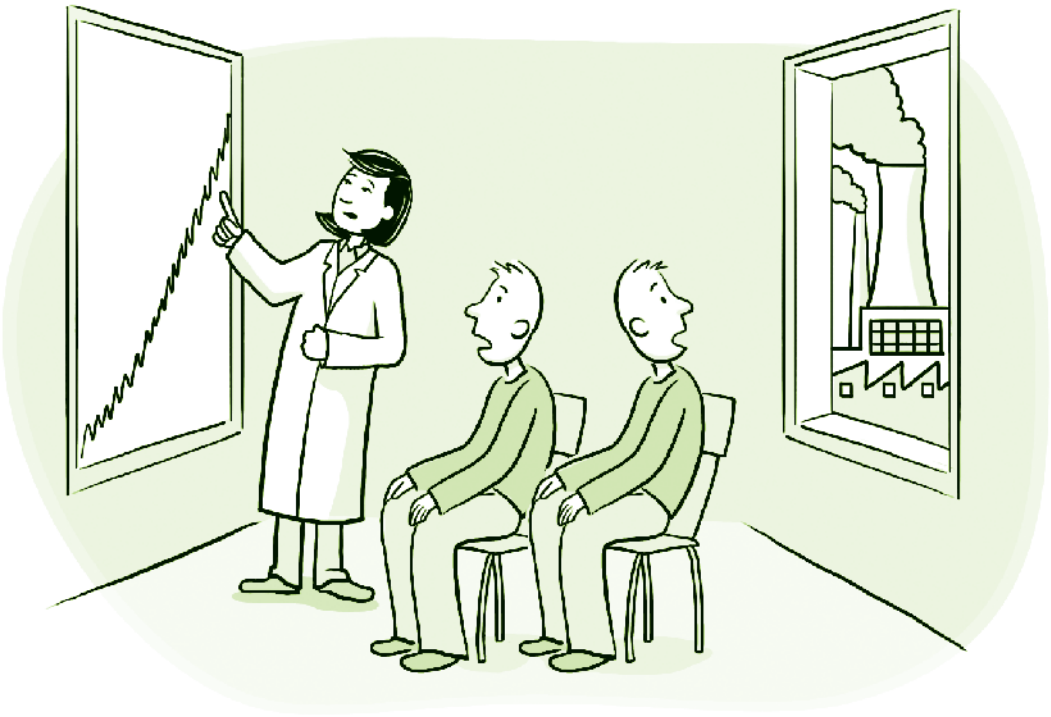
ANALYTIC PROCESSING SYSTEM	EXPERIENTIAL PROCESSING SYSTEM
Logical	Holistic
Deliberative	Intuitive
Analytic	Emotion-driven (fear, dread, anxiety)
Perceives reality in abstract symbols, words, numbers	Perceives reality in concrete images and narratives, linked in associations
Rules and algorithms need to be learned; system needs to be prompted; does not operate automatically	Operates automatically and without any training
Examples • numerical statistics in tables, figures, graphs, charts	**Examples** • images or stories • the experience of outcomes of repeated decisions over time, as in a simulation exercise • emotionally charged and vivid

SPEAK TO THE TWO PARTS OF THE BRAIN: HOW TO MAKE ANALYTIC DATA MEMORABLE AND IMPACTFUL

Traditional statistical presentations of climate change data rarely instill the sense that it is an immediate challenge as well as a future one; that there is a narrow window of opportunity within which effective action can avert potentially devastating future consequences. Many audiences leave such analytically focused presentations with a higher awareness that climate change is happening, but without the matching higher motivation to do anything about it.

Despite evidence from the social sciences that the experiential processing system is the stronger motivator for action, most climate change communication remains geared toward the analytical processing system. Personal or anecdotal accounts of negative climate change experiences, which could easily outweigh statistical evidence, are rarely put into play, despite evidence that even a stranger's past experiences can evoke strong feelings in people, making such communications memorable and therefore dominant in processing.[32]

Yet not all communication about climate change should be emotional, as there are downsides to bypassing analytical reasoning to make an appeal only to the experiential system (Section 4 will address these climate change communication pitfalls).



EXAMPLE

Shrinking Glaciers and the Retention of Facts

L. Chang, commons.wikimedia.org

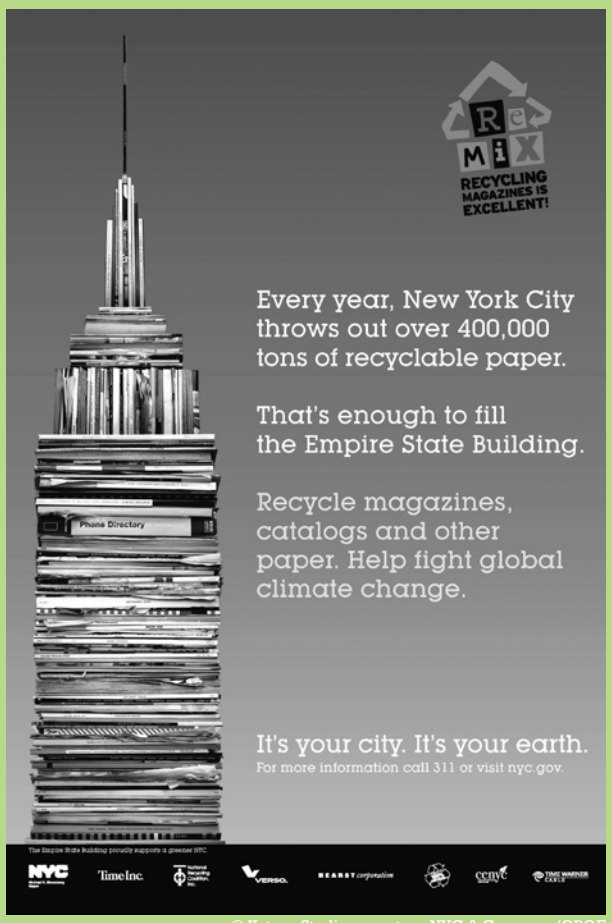
In 2007, CRED researchers developed an interactive computer presentation to show viewers the effect of climate change on the world's glaciers. One module presented information that would appeal to the analytical processing system, such as scientific analysis, statistics, and graphs, to describe the relationship between climate change and shrinking glaciers. Another module targeted the experiential processing system of the brain, using vivid imagery (photographs, videos showing reduced glacier size over time, local news footage) and personal accounts to convey the message. After randomly viewing either the analytic or experiential module on shrinking glaciers, students took a survey that measured their environmental attitudes, perceptions, and behaviors. The purpose was to test the module's effect on memory and the students' decision-making processes. The learning modules examined the extent to which experience-based vs. analytically framed information influenced feelings of worry, risk perception, and the willingness to take action about climate change.

The results showed that people retained more factual information about the presentation after viewing the experiential module as compared to the analytic format. CRED also found that when students viewed the experiential module, they reported both increased levels of worry and willingness to take action.[33]

Unfortunately, the resulting willingness to take action after an appeal to the experiential processing system alone can be short-lived. Section 4 will explore why emotional appeals about climate change can backfire and how to avoid this phenomenon.

EXAMPLE

The Effect of Vivid Imagery on Recycling in New York City



© Katvan Studios, courtesy NYC & Company/OROE

In 2008, the City of New York and partners launched an advertising campaign to promote recycling awareness in the city. Recognizing that the average American may have difficulty processing information if it is presented in a strictly technical format, the campaign used metaphor, analogy, vivid imagery, and comparison to communicate facts such as: "New York City residents discard 800 million pounds of recyclable paper annually." The ads powerfully illuminated how the huge amount of recyclable paper thrown away in New York City annually is enough to fill the entire Empire State Building by creating a picture of the iconic skyscraper composed entirely of discarded magazines and catalogs.

Unlike the more typical city-issued recycling advisory, this ad helped grab the viewer's attention and personalized the message in order to encourage people to change their behaviors.

The most effective communication targets both processing systems of the human brain. Communicators should make use of the following experiential tools in addition to the more common analytical ones when creating presentations on climate change:

- Vivid imagery, in the form of film footage, metaphors, personal accounts, real-world analogies, and concrete comparisons;
- Messages designed to create, recall, and highlight relevant personal experience and to elicit an emotional response.

Analytic products (such as trend analyses, forecast probabilities, and ranges of uncertainty) help people absorb facts and can be valuable tools when people need to make big decisions, but they alone will not compel people to take effective steps to address the climate change challenge, as the example on page 17 illustrates.

The example above shows how information balanced with both analytic and experiential materials may be more likely to have an effect on attitudes and behavior, creating a desire in people to act on their new knowledge.

USE UNDERSTANDABLE LANGUAGE

Another possible reason for the public's lack of responsiveness to climate change messages may be caused by low comprehension of or interest in communications laden with scientific language. When talking to the general public, research shows that communicators should, whenever possible, avoid using jargon, complicated scientific terms, and acronyms. Instead, use words that will make sense to the audience.

Table 3 below contains words or phrases that are commonly used when discussing climate change and alternative words that get the same idea across more simply.

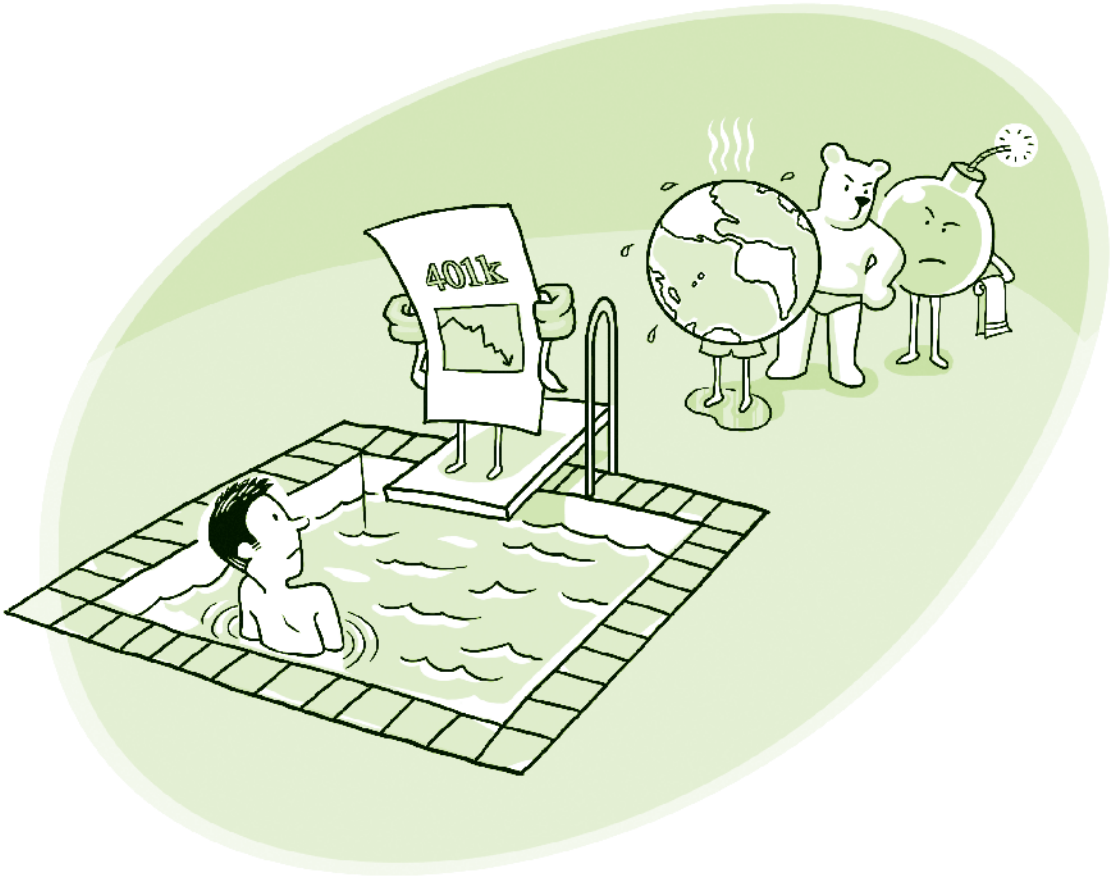
Sometimes only a scientific term is sufficient for getting a point across. In that case, it is important to thoroughly define the term for the audience. Communicators should remember, however, that stringing together too many scientific terms and acronyms may cause the audience to spend their time and mental energy deciphering vocabulary instead of absorbing the overall point.

TABLE 3

Examples of Simplified Scientific Terms

OBSCURE WORD	BETTER UNDERSTOOD WORD
Anthropogenic	Human induced, man-made
Mid-Pleistocene	1 million to 600,000 years ago
CH4	Methane
IPCC	The group of scientists who issue comprehensive assessments on climate science, and were awarded the 2007 Nobel Peace Prize for their work on climate change.
Forcing	Incoming and outgoing (radiation) energy
385 ppm	2008 level of carbon dioxide in the atmosphere
Bifurcation	To divide into two parts
Perturbation	Disturbance
Aerosol	Small atmospheric particle

4 Beware the Overuse of Emotional Appeals



It may be tempting to conclude that an effective way to communicate climate change information is to place a greater emphasis on its possible consequences. Some go even further, accentuating the risks by declining to mention the uncertainties involved. Such an approach evokes strong reactions in audiences, including fear of worst-case climate change scenarios and even heightened interest in what can be done to avoid them. But while an emotional appeal may make people more interested in a presentation on climate change in the short run, it may backfire down the road, causing negative consequences that often prove quite difficult to reverse.

WHAT IS THE FINITE POOL OF WORRY?

Researchers at CRED and elsewhere have discovered that people, even those who might be described as "worrywarts," have a limited capacity for worrying about issues. Scholars refer to this limited capacity as a ***finite pool of worry***,[34] and it has three main components that apply to the issue of climate change:

1. Because people have a limited capacity for how many issues they can worry about at once, as worry increases about one type of risk, concern about other risks may lessen. In other words, people tend to pay more attention to near-term threats, which loom larger than long-term ones.[35] For example, as anxiety mounted in 2008 and 2009 over the faltering economy, polls showed that many people realigned their list of concerns. The economy vaulted to the top of the list, while environmental issues and climate change fell to the bottom. A recent poll showed that climate change ranked last among the public's list of top policy priorities.[36]

In another example, farmers in Argentina were asked to rate how much they worried about political risks, weather and climatic risk, and economic risks. Then farmers were shown a climate forecast for the following spring, predicting less rain than normal. As expected, farmers perceived climate as a greater risk after they had been shown the forecast. Yet, as the concern about climatic risk increased, concern about political uncertainty diminished, even though the political risk had not changed.[37]

2. Studies show that appeals to the emotional system may work to get someone interested in an issue in the short term, but that it is hard to retain that level of interest. Unless they are given reasons to remain engaged, people's attention easily shifts to other issues.

3. Studies also show that the effects of worry can lead, paradoxically, to ***emotional numbing***. This occurs after repeated exposures to emotionally draining situations and is a commonly observed reaction in individuals living in war zones or dealing with repeated hurricane threats in a short period. The danger of overexposure to threatening issues is especially high given the modern media environment where people confront a bewildering number and diversity of emotional experiences every day, ranging from news stories to sensational movies.[38]

HOW TO AVOID NUMBING AN AUDIENCE TO CLIMATE CHANGE

Climate change communicators should:

- Decide what portfolio of risks they want to make the public more aware of and then demonstrate the connection between those risks, such as the relationship between climate change and disease.
- As described in Section 3, balance information that triggers an emotional response with more analytic information to leave a mark in more than one place in the brain.
- Acknowledge that the audience has other pressing issues. Create a balance between pre-existing concerns and the climate change issues to be discussed.
- Gauge an audience's degree of numbing (i.e., ask them questions about their levels of media exposure to climate change, show them well-known images associated with climate change and note their reaction), make them aware of the various effects of numbing, and encourage them to briefly consider their level of worry and potential numbness to climate change.

WHAT IS THE SINGLE ACTION BIAS?

In response to uncertain and risky situations, humans have a tendency to focus and simplify their decision making. Individuals responding to a threat are likely to rely on one action, even when it provides only incremental protection or risk reduction and may not be the most effective option. People often take no further action, presumably because the first one succeeded in reducing their feeling of worry or vulnerability. This phenomenon is called the ***single action bias***.[39]

For example, although recycling is important, it should be but one activity in a series of behavior changes aimed at reducing climate change. Switching to wind or other renewable energies, consuming less meat, conserving daily energy use, and eating locally grown food are other effective ways to mitigate climate change, to name but a few. However, if individuals and institutions participate in recycling programs, they may be prone to the single action bias and feel like they are already doing enough to protect the environment.

CRED research provides additional evidence of this phenomenon. One study found that, to adapt to climate variability, many farmers in Argentina engaged in only one activity to protect against the impact of drought on their livelihoods, despite having numerous options available to them. For instance, farmers who had the capacity to store grain on their farms were less likely to use irrigation or crop insurance although these measures would have added up to even greater protection against the impact of drought.[40]

Interestingly, recent polling may have found evidence of a mass single action bias—the election of President Barack Obama seems to have shifted Americans' attitudes about whether or not the state of the environment is improving. Nate Silver, of the polling blog FiveThirtyEight.com, argues that Democrats increasingly believe the environment is improving simply based on Obama's election, whereas the number of Republicans who say the environment is improving has remained about the same since 2008.

"Because of Barack Obama's election," Silver wrote, "many Americans assume that the environment is getting better, whether or not it actually is." Silver cited a Gallup poll from February 2009 that showed 41 percent of Americans think the environment is getting better, compared to just 26 percent in 2008. He argued that such perceptions could prove detrimental to legislative efforts to address global climate change and other environmental problems.[41]

HOW TO COUNTERACT THE SINGLE ACTION BIAS

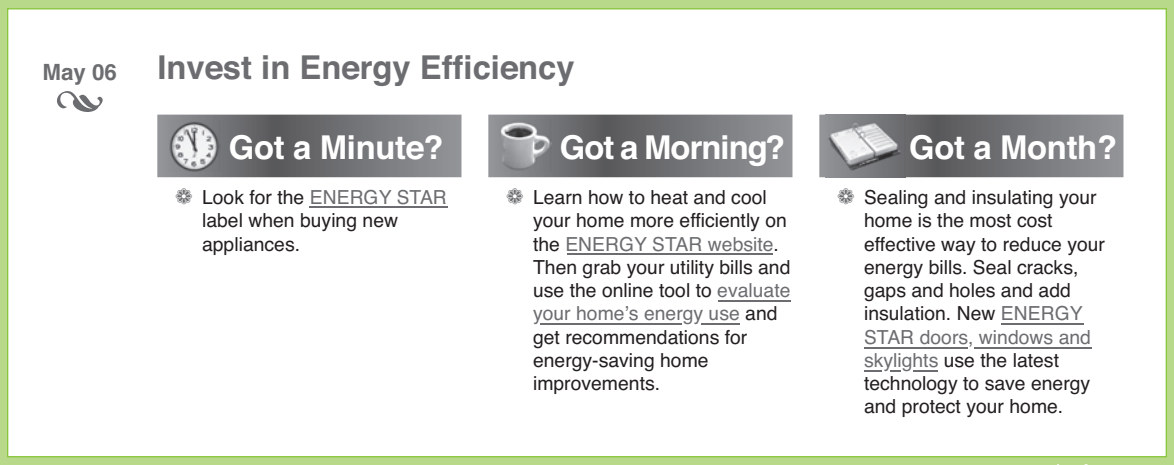
It is human nature to fall prey to it and it is difficult to avoid, but there are steps that communicators can take to counteract the single action bias:

- Make an audience aware of the phenomenon. To demonstrate the single action bias, try the following exercise: Ask your audience how many of them have replaced their light bulbs with compact fluorescent lights—typically a large amount of people raise their hands.
- Then ask how many of them turn off their computer at night—again, a fair number of people will likely raise their hands. But if you ask who does both, the count will go down dramatically. Feel free to insert a third, fourth, or even fifth action to create a portfolio of energy saving and climate change mitigation behaviors.
- Provide energy-saving checklists that people can place in a prominent spot in their home or office. The checklists will remind and encourage people to go beyond just one tip. More people should take a diversified approach as a result.

The example below highlights a different but equally effective approach to defeating the single action bias.

EXAMPLE

The Simple Steps Campaign and Tiered Environmental Action



The Natural Resources Defense Council launched Simple Steps, a how-to campaign that divides environmental advice into three tiers based on the commitment level of its audience. Those interested in participating can select information based on whether they want to invest a minute, a morning, or a month adopting a more environmentally responsible lifestyle.

This campaign inherently acknowledges the influence of the single action bias and other psychological phenomenona that prevent people from taking effective action to solve complex problems. The campaign sought to counteract the single action bias by encouraging participants to increase their commitments incrementally.

Address Scientific and Climate Uncertainties

WHY ARE THERE UNCERTAINTIES IN CLIMATE SCIENCE?

As with other branches of science, climate science involves scientific uncertainty. Beyond that, however, uncertainty in climate science derives from the many complex forces that govern the earth's climate, from the axis of the planet's rotation to the changing composition of the atmosphere. Although scientists have gained significant insight into how the climate system functions, they do not have 100% confidence in their climate change projections—and they never will. What they can do, however, is make predictions based on the best available data, quantifying the uncertainties associated with those predictions.

Several areas of uncertainty exist in climate change prediction. One is due to the lack of complete knowledge of how the climate works, which will lessen with further study. Other uncertainty is due to natural variability in the climate system, which will not go away. And an additional element of uncertainty is due to the inability to predict human behavior and its cumulative impact on the earth's climate.

Future climate predictions depend on a number of changing variables in much the same way future traffic predictions do. Both systems operate under a certain level of volatility and uncertainty, but that does not prevent either climate scientists or traffic analysts from making forecasts with the information on hand. Although traffic forecasts days into the future may seem hard to trust, as are future climate projections for some people, both are determined by algorithms based on mass data from varying sources. A unique, location-specific model can provide greater accuracy for both traffic and climate scenarios. But with both systems, full certainty comes when it is already too late and one is in a jam.

THE PROBLEM WITH SCIENTIFIC UNCERTAINTY: THE HUMAN NEED FOR PREDICTABILITY

Because humans have a great need for predictability, uncertainty can be uncomfortable. Predictability helps people feel safe and secure, whereas uncertainty can lead to anxiety.[42] Predictability offers survival value. It provides control, helps people avoid threats to their physical and material well-being, and frees them from fear and anxiety. Furthermore, it allows people to plan and budget for the future. However, the human capability to prepare can be impaired by uncertainty.

Particularly when talking about complex topics like global climate change, it is important to find effective ways to communicate inherently uncertain information.

Too often discussions of climate science uncertainty convey the mistaken impression that scientists are hopelessly confused about this complicated subject, when in fact the uncertainties about exactly how much warmer the planet will be in 100 years do not change the very high confidence scientists have that human-made emissions of greenhouse gases are warming the planet and are likely to continue doing so.

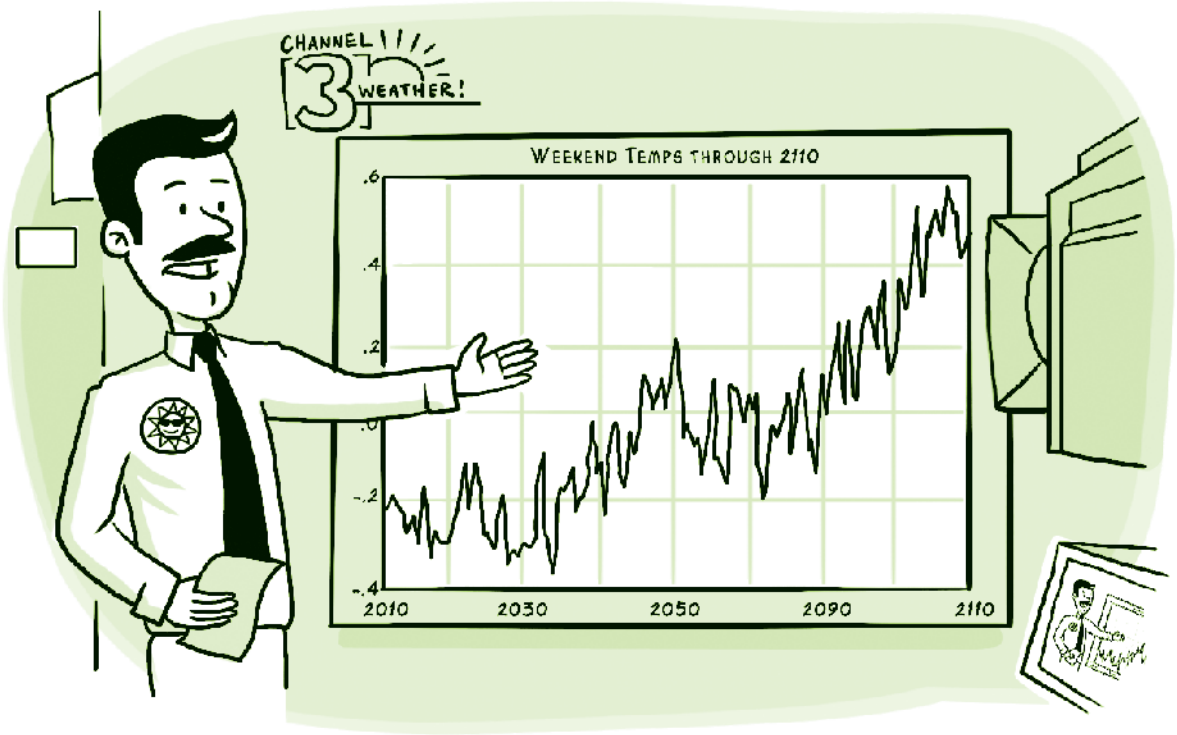
To address this problem, IPCC scientists developed a "confidence terminology" to communicate estimates of uncertainty via everyday language. For example, "very high confidence" was used to refer to a prediction that has at least a nine out of ten chance of being correct. Other such terms included "high," "medium," "low," and "very low" confidence. "Very low confidence" referred to a prediction that had less than a one out of ten chance of being correct.

In cases where probabilistic estimates could be made, the IPCC also used "likelihood terminology" to define the likelihood of an outcome or result. "Virtually certain" had the highest likelihood with a greater than 99 percent probability, while "likely" denoted only a 66 percent or more probability of occurrence.[43]

Although such terms have greatly permeated public discourse on climate change, there is evidence that suggests people interpret such probability descriptors more subjectively than scientists intend.

For example, in a recent report's Summary for Policymakers, the IPCC stated, "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG [greenhouse gas] concentrations."[44] From the use of the term "very likely" in this sentence, the IPCC meant that there is a 90 percent or greater likelihood that emissions of greenhouse gases from human activities have caused most of the global average temperature increase since the mid-20th century.

But in a study by researchers at the University of Illinois at Urbana-Champaign, people assigned lower likelihood values to the IPCC's descriptors compared



"So yes, Dan and Kathy, as you can see it looks like it'll be up and down until 2109, but you're certainly going to want to think about abandoning the planet after that…."

to what the IPCC actually meant. In other words, research subjects thought the scientific evidence of climate change was less conclusive, as conveyed by the IPCC's probability terms, than what the scientists had really reported. Among other recommendations, the researchers suggested that the IPCC consider including the associated range of probabilities whenever a probability descriptor is used, rather than only publishing a key to the terminology.[45]

HOW TO COMMUNICATE CLIMATE CHANGE UNCERTAINTY

Climate change uncertainties vary in type and significance, and they are difficult to convey without seeming to minimize the importance or understanding of the issue. One of the first key tasks for communicators is to put that uncertainty into context by helping audiences understand what is known with a high degree of confidence and what is relatively poorly understood.

In particular, scientists found that the general public interprets certain common words differently than do the scientists who used them.

THE NEED FOR PRECISION

Table 4 on page 27 shows a list of common words used to describe climate change that mean different things to scientists and the general public.[46]

Jargon filled explanations of uncertainty can easily undermine a scientist's message. For example, Senator Jim Inhofe asserted in a speech to the Senate that, "statements made by the National Academy of Sciences (NAS) cannot possibly be considered unequivocal affirmations that man-made global warming is a threat."[47] As evidence, he quoted the National Academy of Sciences 2001 report, dwelling on such phrases as "considerable uncertainty in current understanding," "estimates should be regarded as tentative and subject to future adjustments," "because of the large and still uncertain level of natural variability," "uncertainties in the time histories of various forcing agents," "cannot be unequivocally established."

Such phrases can easily translate as unreliable climate science to the greater public. Using the word *considerable* to describe uncertainty creates a disparity in meaning between common language and science. What quantity is "considerable"? This word is subject to varying interpretations. Similarly, the word *error* means *mistake* to most people, which is wholly different from the scientific definition of "error." Discussing uncertainty with unspecific language can lead to an unintentional overstatement and consequent criticisms.

Most critically, communicators should suggest neither more, nor less scientific certainty about climate change than actually exists. When significant uncertainty remains about a specific effect, they should explain why that uncertainty exists (e.g., the systems involved are so complex that science has yet to understand them sufficiently).

INVOKE THE "PRECAUTIONARY PRINCIPLE"

It is also important to recognize and emphasize that scientific uncertainty alone is not an adequate justification for inaction or business-as-usual policies and behaviors. Rather, it suggests that, at a minimum, it would be prudent to develop contingency plans and adopt adaptive management strategies. This would be in accordance with the "precautionary principle," which holds that action should be taken to reduce the risk of harm to the public from potential threats such as climate change, despite the absence of 100 percent scientific certainty about all aspects of the threat.

The precautionary principle has been considered internationally, including the 1992 United Nations Framework Convention on Climate Change, which states that countries should "take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures…"

Governor Arnold Schwarzenegger of California referred to the principle with a metaphor when he said: "If 98 doctors say my son is ill and needs medication

TABLE 4

Words with Different Meanings to Scientists and the General Public

SCIENTIFIC WORDS	NON-SCIENTIFIC MEANING	BETTER WORDS
Enhance	Improve	Intensify, increase
Uncertainty	Not knowing	Range
Risk	Low-probability event	Probability
Error	Wrong, incorrect	Uncertainty associated with a measuring device or model
Bias	Unfair and deliberate distortion	Offset from the observed value
Positive trend	A good trend	Upward trend
Positive feedback	Constructive criticism	Self-reinforcing cycle, vicious circle
Theory	A hunch, opinion, conjecture, speculation	Physical understanding of how this works
Hypothesis	Conjecture	Framework for physical understanding
Sign	Indication	Positive/negative value, plus/minus sign
Values	Ethics, money	Numbers, quantity
Manipulation	Exploitation	Changes in experimental or model conditions to study the impact of that condition
Scheme	Conspiracy	Blueprint
Productivity	Working hard	Photosynthesis
Anomaly	Abnormal occurrence	The deviation from a long term average

and two say 'No, he doesn't, he is fine,' I will go with the 98. It's common sense—the same with climate change. We go with the majority, the large majority....The key thing now is that since we know this industrial age has created it, let's get our act together and do everything we can to roll it back."[48] In this example, Schwarzenegger conveyed information about climate change risk and uncertainty in terms his audience could relate to.

The precautionary principle is a key consideration for making decisions under uncertainty, and it is useful to address potential harms that are outside of the environmental arena as well, as the following example illustrates.

THE BENEFITS OF TALKING ABOUT CLIMATE CHANGE INFORMATION IN GROUPS

Extensive anecdotal evidence from CRED's work with farmers in Africa and its laboratory studies suggest that people may understand probabilistic information better when it is presented to a group, where members have a chance to discuss it, rather than as individuals who have to try to understand it alone.[51]

Group processes allow individuals with a range of knowledge, skills, and personal experience to share diverse perspectives and work together on a problem.

EXAMPLE

Michigan Cherry Growers and Climate Uncertainty

Cherry blossoms have begun to appear seven to ten days earlier in Michigan than they did three decades ago, leaving them susceptible to potentially devastating spring frosts.[49] In 2002, a spring frost destroyed 99 percent of the crop, and cherry farmers wanted to know if these occurrences were likely to increase. They needed to make decisions about their $44 million-a-year-industry despite this climate uncertainty. And because a cherry tree can take up to a decade to bear fruit and typically has only a 20-30 year cycle of productivity, the farmers needed both extended and highly localized climate change information.

Simon Koopmann, commons.wikimedia.org

A group of agricultural experts, economists, climate scientists, and others began working to bring these cherry growers and other stakeholders information about climate change on a very local level. A single concrete climate prediction wasn't feasible. Instead these researchers needed to determine a wide range of climate scenarios for that region extending through the rest of the century. Further, they needed to communicate to the farmers their level of confidence per scenario. The farmers could then decide how to proceed, choosing to invest in wind machines or other frost protection, plant a hardier variety of cherry, switch to a different crop, or get out of farming altogether based on shifts in probability. Their livelihood depends on making sound decisions using the best available, yet still uncertain, scientific information.[50]

Group discussion provides a greater chance that multiple sources of information—both experiential and analytic—will be considered as part of the decision-making process. More energy is devoted to implementing solutions after group discussion. Furthermore, group context increases awareness of social support and activates social goals (see Section 6).

The example (below, left) illustrates how group discussion led to both better understanding of a probabilistic climate forecast and to generation (and eventual implementation) of more sound agricultural coping strategies.

As the example (below, right) shows, communicators should point out the probabilistic nature of climate science models and, when possible, engage and encourage group discussion about the uncertainties associated with climate change.

EXAMPLE

African Farmers and Climate Information

Carla Roncoli

Over the last decade, CRED researchers have been working with African farmers to interpret climate forecasts for use in agricultural decisions. In one study, farmers who attended climate discussion meetings had more ideas about potential adaptive responses to forecasts than those who did not attend. The study highlighted the importance of discussion as a way to understand and incorporate climate uncertainty into planning. The participatory process facilitated the understanding and use of climate information, allowing group members to pool their ideas and to plan coordinated responses. In several groups, the farmers commented that before they heard the forecast, they were uncertain about what course the seasonal rains would take and hence about what agricultural strategies to pursue. They remained unsure about what was coming and what to do as they heard different opinions voiced at the meetings, but once a consensus was reached, they trusted the forecast, and worked hard and effectively at the particular strategies the group had settled on.[52]

EXAMPLE

CRED Lab Experiment on Group Learning Processes

In order to study probabilistic learning CRED created a game in which students (either individually or in groups) learned about the probabilities for livestock to have a mosquito-borne illness called Rift Valley Fever (RVF). Students were then asked to play a game in which they bought and sold livestock that may or may not have RVF. In one option, which represented the optimal strategy, students could pay to test the animals before buying them. Students who learned about the probabilistic nature of the risk of RVF in a group were more likely to pay for the test, which maximized the joint outcome in the game, rather than try to achieve greater individual outcomes. The results strongly suggest that effective training requires both a cognitive and social component for people to recognize an optimal strategy.

The groups also showed a greater tendency to reframe information (from analytic to experiential and vice versa); provided additional opportunities to teach and learn from each other; and enabled the development of both social norms and shared goals.[53] Climate change communicators seeking to work with groups should set these as goals for their efforts as well.

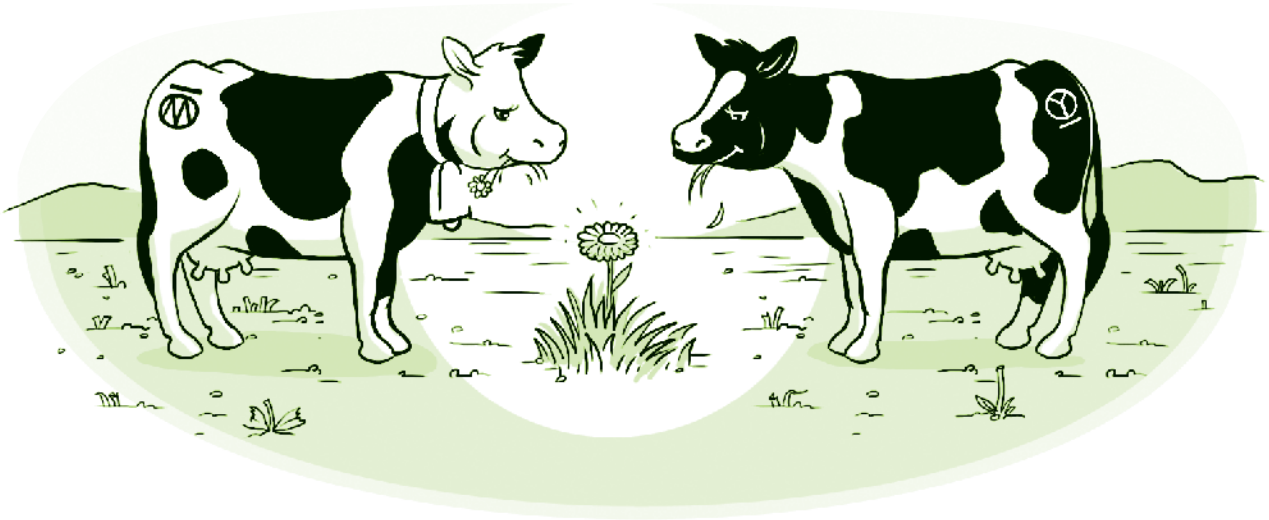
6 Tap into Social Identities and Affiliations

The Tragedy of the Commons theory is as old as Aristotle, who said: **"That which is common to the greatest number has the least care bestowed upon it."**

WHAT IS THE TRAGEDY OF THE COMMONS?

The tragedy of the commons presents a conflict over resources between individual interests and the common good. Commons dilemmas describe conflicts resulting from free access and unrestricted demand for a finite natural resource. This ultimately threatens the resource and leads to exploitation. The benefits of exploitation go to individuals, each of whom is motivated to maximize his or her use of the resource, while the costs of exploitation are distributed among all who share the resource.[54] Overfishing of the world's fish populations and pollution of the earth's atmosphere are modern day examples of a "tragedy of unmanaged commons."

Environmental decisions pose a similar dilemma to the tragedy of the commons scenarios, in that an individual's benefit may or may not be the same as what benefits society. In other words, deciding to engage in behaviors that help mitigate climate change, a benefit for society, may seem more of a cost than a benefit to the individuals who would engage in them, at least in the short term. Climate change communicators need to recognize this dichotomy and address it by tapping into



multiple identities in their audiences, creating a sense of affiliation with each other, the environment, and the society that enjoys the benefits of its natural resources.

HOW TO TAP INTO GROUP IDENTITY TO CREATE A SENSE OF AFFILIATION AND INCREASE COOPERATION

An individual comprises numerous roles and identities, each of which has its own set of goals. In any given situation, an individual may call into play multiple identities (household member, town resident, CEO, parent, member of religious organization), even when the goals of the various identities may conflict with each other. To resolve that conflict, an individual has to decide which identity is most relevant in a situation.[55] The strength of affiliation that someone feels toward other members of a group (or the people that may be affected by a decision) can determine which identity that person chooses to apply in a particular situation.

When people make decisions, they recognize the situation, their identity in that situation, and the rules that are most appropriate given the situation and their chosen identity.[56] CRED research suggests that group affiliation may influence whether an individual decides to cooperate in a group decision or not for several reasons:[57]

- Group affiliation can activate social goals (i.e., concern for others, maximizing the good of the group);
- Participating in a group allows group norms to exert a stronger influence on individuals;
- Participating in a group also leads to greater intrinsic reward for individuals when group goals are achieved.

People who feel an affiliation with a group are thus more likely to cooperate in environmental decisions, such as joining a town's efforts to reduce greenhouse gas emissions. Further, people may continue such behaviors due to the "reward" found in helping the group reach its climate change goals, as demonstrated in the example on the right. Although any appeal to group identity

EXAMPLE

CRED Lab Experiment on Group Affiliation and Cooperation

CRED researchers designed an experiment to measure the effect of social goals, in particular the effect of affiliation on cooperation.[59] Students were split randomly into four-person groups (analogous to four large greenhouse gas emitters). The researchers created different levels of affiliation among the group members (temporary, short-lived connections). Groups then played a game that rewarded those who chose to defect rather than cooperate. CRED researchers found the following: that as affiliation increased, so did cooperation; that affiliation made social goals (e.g., the concern for others) a greater priority; and that the added benefit of cooperation more than made up for the sacrifice (in this case: monetary sacrifice). Students reported that they felt good about cooperating. Communicators who want to promote cooperation should try to activate social goals by integrating social and economic goals and by emphasizing an affiliation among group participants.

CRED research also suggests that local "messengers" (both individuals and institutions) may be more likely to get a response for calls to action on climate change than emissaries from distant locales. People are more likely to take action when they feel a strong sense of affiliation with the individual or institution making the request. Communicators from "out of town" may want to enlist someone locally known to help create a connection with their audience.

can help trigger group goals and cooperation, affiliations with smaller groups, such as a sorority or house of worship, can be stronger than those with larger groups, such as a political party or country.[58] Communicators will find it effective to create a sense of group affiliation within an audience, and they should try to find the most common yet smallest affiliation that the audience can identify with.

The example (below, left) illustrates the power of a local organization tapping into area residents' identity with the city to motivate new behaviors to help mitigate climate change. It also shows the importance of rewarding individual actions taken toward a group goal to reinforce such behaviors. The example (below, right) illustrates the power of tapping into social identities and creating "green" social norms.

EXAMPLE

Knoxville, Tennessee, Greens Up

Zereshk, commons.wikimedia.org

Knoxville's "Make Downtown Green, Block by Block" campaign achieved great success by drawing on city identity. The Knoxville Utilities Board (KUB) and the city of Knoxville, along with their initiative partners, engaged downtown residents and businesses to purchase 400 blocks of green power, representing the 400 city blocks of downtown Knoxville. Through the Tennessee Valley Authority's Green Power Switch program, KUB now provides downtown Knoxville with energy created by renewable resources. The city celebrated in the spring of 2009 with comments from the mayor and recognition of the downtown residents and businesses that participated. KUB distributed 400 dogwood saplings during the event in honor of these environmentally-committed customers. This campaign emphasized people's identity with the city, utilized local messengers, and acknowledged the participating members of the community, providing a social incentive for others to act.[60]

EXAMPLE

The Energy Smackdown: Using Reality TV to Inspire Lower Energy Consumption

Erich Nagler

The Energy Smackdown, a reality television series, engages the greater public on the issue of climate change by showcasing what citizens of a community can do to reduce their own energy consumption. In season two, teams of households from three different communities in Massachusetts—Arlington, Cambridge, and Medford—competed to see which community could make the biggest energy reduction over 12 months. The "challenges" included biking to work, weatherizing their homes, eating locally grown food, and replacing shower fixtures and light bulbs with eco-friendly alternatives—all simple steps for the greater American audience to emulate. In addition, contestants were expected to talk to other community members about reducing carbon emissions. The first-place winners reduced their household consumption of energy by a whopping 73%. This contest simultaneously tapped into the contestants' identity within the household, the neighborhood, and the town and created new "green" social norms for all of the participating towns and possibly for viewers across America.

7 Encourage Group Participation

Sometimes climate change communicators need to go beyond presenting to a general audience to brokering an environmental decision within a group setting. Many environmental decisions are group decisions, so it is vitally important for communicators to understand how people participate in group settings, whether public or "closed door." Some of the variables include: the relationships that exist among the individuals and groups involved; the participants' individual and group goals; the different ways people participate in groups; and norms concerning how the meeting should be run.

EXAMPLE

Ugandan Farmers' Wives and Nonverbal Group Participation

Carla Roncoli

CRED research on farmer's decisions in the face of climate uncertainty in Uganda highlights that non-verbal behaviors during discussions are also forms of participation. Spatial arrangements reflect differences in social roles or power, which in turn affect how people participate. Ugandan men often sit close to the speakers, while the women sit on the margins of the group, tending children and other tasks. Although some women may directly address the group (particularly if called upon), they more often talk among themselves or communicate through non-verbal means, such as glances, clapping, or laughter. Gender and social position are important for how one participates and how others regard one's contributions. [61]

UNDERSTANDING THE MANY WAYS PEOPLE PARTICIPATE IN GROUPS

Norms about what happens in meetings are important because they determine who speaks when, how information is presented, and how people should disagree. Some people are more comfortable presenting from their experience, and this information should not be devalued because it is not "factual." There are also norms concerning language use: for instance, using technical language may seem rude when it makes the information being conveyed inaccessible to less-educated participants, essentially limiting their involvement in the discussion and, ultimately, the decision(s). There are similar norms concerning the meeting's end goal—in some cultural contexts, reaching group consensus may have a higher value than representing differences and allowing everyone to express their opinion.[62]

Eliciting participation from all of the various stakeholders is extremely important when trying to broker environmental decisions. Stakeholders who feel like they were part of the decision-making process are more likely to support the outcome. Early participation in the decision-making process is also a vital step in identifying the key problems that require solutions.

The example above indicates how understanding each audience member's particular form of participation can help communicators better judge if all members of the audience are taking part (in some form) in the discussion.

HOW TO SET THE STAGE FOR EFFECTIVE GROUP DISCUSSIONS OF CLIMATE CHANGE

Presentations on climate change are often filled with dense information that may leave group members with numerous questions and concerns. When organizing meetings with a diverse group of stakeholders, the most vital thing to remember is to allow ample time for discussion. Anecdotal evidence suggests that breaking large groups into smaller groups can help initiate discussion.

The example below shows the successful application of participatory processes to natural resource management in Florida. The box on page 36 provides tips for encouraging group participation.

EXAMPLE

Lobster Fishing in the Florida Keys

The management of the spiny lobster fishery in the Florida Keys provides a great example of how to resolve a potential "tragedy of the commons" by encouraging the participation of all the various stakeholders. Social scientists Michael Orbach and Jeffrey Johnson worked with the commercial fishing industry, recreational fishermen, environmentalists, and others to solve the problem of having too many traps in the water.

Hartmut Inerle, commons.wikimedia.org

With the input of fishermen and other stakeholder representatives, they gathered a wide range of opinions about the issue through participatory observation, mail surveys, and personal interviews. The researchers then held three series of workshops, each drawing up to 200 stakeholders and other interested members of the community.

The first series of workshops discussed whether there was a problem in the fishery and presented general information about limited entry systems (i.e., how many traps can be placed in the water), with specific examples. In the second series of workshops, participants developed a ranking system that they then applied to several possible alternatives to solve the problem according to specific criteria, which they also developed. In the third series the participants summed up the relative effects of their alternatives. The outcome of the third series of workshops was a recommendation to go with a transferable trap certificate program.

The program, which required Florida to implement new legislation, was actually lobbied for by the stakeholders—commercial and recreational fishermen and environmentalists! Through a participatory process, the group reached its main goals: to reduce the number of traps by over half while keeping the catch relatively constant. This successful shift increased the overall profitability of the fishery, reduced conflict, and made the fishery easier to manage.[63]

Ways To Encourage Group Participation

- Know your audience. Be aware of differences among participants (i.e., education, wealth, occupation, ethnicity, religious motivations, understanding of participation norms). Consider who has authority and who does not.

- Clarify expectations for the meeting and the role of the group in the decision(s) to be made. Will the group make the final decision, or are members only advising a decision-making body elsewhere? How will the final decision be made?

- Try to involve as many people, or representatives of as many groups, as possible. Be aware of how people were invited to attend and if anyone was overlooked.

- Think about how the group processes information. Will the individuals meet for the first time in a large group setting or will they meet ahead of time on a more informal basis to discuss issues? If so, communicators may want to distribute information ahead of time to give them time to review and prepare for the formal meeting.

- Recognize different forms of participating. Work to include all voices—give everyone a chance to speak, and respect different methods for making an argument.

- Make sure all viewpoints are represented. Solicit ideas from the different individuals involved in the discussion.

- Utilize pre-existing relationships within the group to communicate information since information passed through familiar channels is often most effective.

- Be conscious of verbal and non-verbal means of participation. Appreciate non-linguistic means of communication such as disruptive behavior, nods of approval, or applause.

- Acknowledge that participants will have other goals. Meetings are often a place for people to socialize, meet new people, and advance their own personal or political goals. These "social goals" are a necessary part of participation.

- Be aware that members of a group will interact outside of meetings. A meeting is only one part of the whole decision process.

- Use group discussion to generate solutions. People may be more willing to acknowledge a problem if they feel there are solutions to dealing with the problem. This can help keep messages positive, encourage optimism, and demonstrate how groups can be a powerful force in tackling the climate change challenges ahead.

Make Behavior Change Easier

Climate change communicators often end their presentations encouraging audiences to make changes in their behavior that will help mitigate the effects of climate change. This section addresses how policymakers, business leaders, and environmental organizations can make such behavior changes easier by taking advantage of ***default effects*** (the human tendency to stick with the option that is selected automatically instead of choosing an alternate option), including making environmentally responsible behaviors the default option as often as possible.

UNDERSTANDING DEFAULT EFFECTS ON DECISION MAKING

It is important to consider default effects when people make decisions over time. For example, when people have a choice between Option A, with benefits and costs in the present, and Option B, whose benefits and/or costs might not be realized until some point in the future, the default option can affect their preferences. Particularly when making decisions about consumption (to purchase something, to receive a reward, to make a sacrifice), people tend to be more patient when the default option is to wait versus when the default option is to receive something now.[64]

HOW TO OPTIMIZE THE DEFAULT OPTION

When presenting a choice with multiple options, it is important to pay attention to the default option. If option A is the default and a person wants A, it is already chosen. But if a person wants B, he or she will have to make an effort to switch from A to B. Because the default option requires no action, it is always easier, and so people tend to accept it whether or not they would have chosen it if it were not the default option. By making socially beneficial choices the default option, policymakers can positively influence individual decisions concerning natural resources like air or water.[65] Page 38 shows an example of this principle in action.

One German study showed that changing defaults could promote green sources of energy. The study also found that the way information is presented, specifically for the default option, can strongly affect people's choice of electricity, and that they tend to use the kind of electricity that is offered to them as the default. In the first laboratory experiment, more participants chose the green utility when it was the default than when the "grey" utility was the default. In the second laboratory experiment, participants displayed an attachment to their default, asking for more money to give up green electricity than the amount they would have paid for it.[66]

EXAMPLE

How Rutgers University Saved 1,280 Trees in One Academic Year

Erich Nagler

After deciding that the university computer labs were wasting too much paper, Rutgers University simply made double-sided printing the default option on its lab printers. This tiny act saved 7,391,065 sheets of paper in the first semester, or roughly 620 trees for the semester, and 1,280 trees for the academic year. Students, who frequently have no preference, must now manually select the option to print on only one side of the page. The option to conserve is made that much easier by becoming the default option.[67]

PROVIDE NEAR-TERM INCENTIVES

Giving people an immediate incentive, if possible, also makes behavior change easier. For instance, the prospect of saving money over the next 20 years by weatherizing one's home may make economic sense, but may not effectively motivate action. In contrast, giving an immediate incentive can serve as an effective driver. For example, when presenting to a church, school, or community center group, climate change communicators can publicize the names of those who sign up for weatherization, thus providing an immediate social incentive to supplement the delayed economic incentive.

By using an economic incentive, the Japanese government significantly increased the demand for green vehicles. The government provided "scrap incentives," either tax breaks or rebates, for consumers to scrap their old cars and buy ecological vehicles. The average consumer may discount the long-term savings of driving a hybrid, but will readily appreciate such immediately tangible (in this case, financial) benefits.[68]

Conclusion

Gaining public support for climate change policies and encouraging environmentally responsible behavior depends on a clear understanding of how people process information and make decisions. Social science research provides an essential part of this puzzle but, as the guide makes clear, there is no "one-size-fits-all" approach to the challenges of communicating about climate change. Rather, each of the many barriers presents a new opportunity to improve the way we present information about climate change and the behaviors required to mitigate it.

It is our hope that readers will use the information in this guide—paired with the latest advances in climate science, engineering, economics, and environmental policy—to communicate climate change in a way that resonates with their audience. Ensuring that people feel both a personal connection with climate change and a desire to take action to mitigate its impact, without becoming overwhelmed by the scale of the problem, is key. Whereas it goes beyond the expertise of the authors of this social-science–based guide to provide specific policy recommendations and other climate change solutions, climate change policies are an essential component about which the public needs to be informed and for which political support needs to be generated. With an issue as complex as climate change, people need to know there are solutions to dealing with it, and that they can be part of those solutions.

Social science research provides compelling evidence for an optimist's view that climate change communicators can reach both policymakers and the public, informing and inspiring them to address climate change.

Following is a brief summary of the principles discussed in detail in the guide. We encourage readers to use the summary as a reference and to refer back to the guide for more in-depth information about topics that interest them.

The Principles of Climate Change Communication in Brief

1 KNOW YOUR AUDIENCE

- ***Mental models*** represent a person's thought process for how something works. They help shape risk perceptions, actions, and behavior; influence what people pay attention to in complicated situations; and define how people approach and solve problems. Mental models serve as the framework into which people fit new information.
- A ***confirmation bias*** makes people look for information that is consistent with what they already think, want, or feel, leading them to avoid, dismiss, or forget information that will require them to change their minds and their behavior.
- People often exhibit a strong preference for their existing mental models about climate change, making them susceptible to confirmation biases that lead them to misinterpret or even refute scientific data.
- Mental models are not static—people can update them by correcting misinformation, inserting new building blocks, and/or making new connections with existing knowledge.

Tip:
- *Discover what misconceptions the audience may have in their mental models about climate change. "Disconnect" the erroneous climate change information from other parts of the model and replace it with new facts.*

2 GET YOUR AUDIENCE'S ATTENTION

- ***Framing*** is setting an issue within an appropriate context to achieve a desired interpretation or perspective.
- Framing is not intended to deceive or manipulate people, but to make credible climate change information more accessible to the public.
- Framing can be a subtle art—even the choice of a single word can make the difference between winning and alienating an audience.
- People feel better and more positive about achieving their goals and are more likely to sustain their behavior when their goals are framed in a manner that feels naturally comfortable to them.
- People with a ***promotion focus*** see a goal as an ideal and are concerned with advancement. They prefer to maximize or increase gains.
- People with a ***prevention focus*** see a goal as something they ought to do and are concerned with maintaining the status quo. They prefer to minimize or decrease losses.
- People tend to discount the importance of future events. Many people count environmental and financial consequences as less important with every year they are delayed.
- People have a natural tendency to avoid losses rather than to seek gains. They tend to discount future gains more than future losses.

Tips:
- *Consider the audience's membership in specific subcultures (groups of people with distinct sets of beliefs, or based on race, ethnicity, class, age, gender, religion, occupation, etc.).*
- *Select a frame/frames that will resonate with your audience.*
- *Prepare numerous frames ahead of time (i.e., climate change as a religious, youth, or economic issue).*
- *When framing climate change, be careful not to focus so intently on one particular aspect that the audience loses sight of the bigger picture.*
- *Consider people's goals when framing a message. Tailoring messages to people's natural promotion and prevention orientations increases the level of response for both groups.*
- *See Words That Appeal to Those With Either a Promotion or Prevention Focus on page 8 and include both types of wording when crafting messages.*
- *Bring the message close to home. Highlight the current and potential impacts of climate change not only globally, but also locally to increase the audience's sense of connection with the issue.*
- *Leverage local extreme weather events, using them as "teachable moments" during which to relate climate change to the experience of your audience. (However, keep in mind that although climate change may increase the chance that a particular event will occur, it does not cause an event to take place.)*
- *Tap into people's desire to avoid future losses rather than realize future gains.*
- *Present information in a way that makes the audience aware of potential current and future losses related to inaction on climate change instead of focusing on current and future gains.*
- *Remember that audiences may be more likely to make changes to their behavior if climate change information is framed as "losing a little bit now instead of losing much more in the future."*

3 TRANSLATE SCIENTIFIC DATA INTO CONCRETE EXPERIENCE

- Attempts to convey the immediacy of the climate change challenge have fallen short of translating climate change into a near-term (as well as a long-term) danger on par with other imminent societal and personal threats.
- Many of the highly publicized graphs and charts showing global climate change data fail to inspire a sense of urgency in many audiences.
- Psychologically, distant risks do not set off the same alarms that immediate risks do. Human minds are not designed to immediately react to threats like climate change that seem to manifest themselves in the distant future.
- The human brain has two different processing systems: the experiential processing system, which controls survival behavior and is the source of emotions and instincts, and the analytical processing system, which controls analysis of scientific information (see Table 2 on page 16).
- Despite evidence that the experiential processing system is the stronger motivator for action, most climate change communication remains geared towards the analytical processing system. Personal or anecdotal accounts of negative climate change experiences, which could easily outweigh statistical evidence, are rarely put into play.
- Low comprehension of or interest in communications laden with scientific language may also contribute to the public's lack of response to climate change messages.

Tips:
- *When creating presentations on climate change, use experiential tools such as:*
  - *Vivid imagery, in the form of film footage, metaphors, personal accounts, real-world analogies, and concrete comparisons and*
  - *Messages designed to create, recall, and highlight relevant personal experience and to elicit an emotional response.*
- *A message that combines elements that appeal to both the analytic and experiential processing systems will best reach and resonate with an audience.*
- *Avoid using jargon, complicated scientific terms, and acronyms when talking to the general public. Instead, use words that will make sense to the audience (see Examples of Simplified Scientific Terms on page 19).*
- *Sometimes only a scientific term is sufficient for getting a point across. In that case, thoroughly define the term for the audience. Remember that stringing together too many scientific terms and acronyms, even if well-defined, may cause the audience to spend their time and mental energy deciphering vocabulary instead of absorbing the overall point.*

4 BEWARE THE OVERUSE OF EMOTIONAL APPEALS

- Although an emotional appeal may increase an audience's interest in a climate change presentation in the short run, it may backfire down the road, producing negative consequences that often prove quite difficult to reverse.
- The ***finite pool of worry*** refers to the limited capacity people have for worrying. As worry increases about one type of risk, concern about other risks may lessen. People have a limited capacity for how many issues they can worry about at once.
- Appeals to the emotional system may work in the short term, but it is hard for people to retain that level of emotional intensity. People's attention can easily shift to other issues unless they are given additional reasons to remain engaged.
- The effects of worry can lead to ***emotional numbing***, which occurs after repeated exposures to an emotionally draining situation.
- Individuals reacting to a threat are likely to employ only one response, even when it provides only incremental protection or risk reduction and may not be the most effective option. People often take no further action, presumably because their first response succeeded in reducing their feeling of worry or vulnerability. This is called the ***single action bias***.

Tips:
- *See How to Avoid Numbing an Audience to Climate Change on page 21.*
- *See How To Counteract the Single Action Bias on page 23.*

5 ADDRESS SCIENTIFIC AND CLIMATE UNCERTAINTIES

- Although scientists have gained significant insight into how the climate system functions, they do not have 100% confidence in their climate change projections—and they never will. What they can do is make predictions based on the best available data, quantifying the uncertainties associated with those predictions.
- Because humans have a great need for predictability, uncertainty can be uncomfortable.
- Climate science uncertainty often conveys the mistaken impression that scientists are hopelessly confused about this complicated subject, when in fact scientific uncertainties about exactly how much warmer the planet will be in 100 years does not change the very high confidence scientists have that human-made greenhouse gas emissions are warming the planet and are likely to continue doing so.
- Climate change uncertainties vary in type and significance and are difficult to convey without seeming to minimize the importance or understanding of the issue.
- People may understand probabilistic information better when it is presented to a group, where members have a chance to discuss it, rather than as individuals who have to try to understand it alone.
- Group processes allow individuals with a range of knowledge, skills, and personal experience to share diverse perspectives and work together to solve a problem.
- Group discussion provides a greater chance that multiple sources of information—both experiential and analytic—will be considered as part of a climate-change related decision-making process.
- People devote more energy to implementing solutions after participating in a group discussion.
- Group context increases awareness of social support and activates social goals (see Section 6 for more about the dynamics of group information processing and decision making).

Tips:
- *Put uncertainty into context and help an audience understand what scientists know with a high degree of confidence and what they have a relatively poor understanding of.*
  - *Overstated uncertainty or poorly worded explanations of uncertainty can easily undermine a message.*
  - *Suggesting either more or less scientific certainty than actually exists can confuse an audience.*
- *See Words with Different Meanings to Scientists and the General Public on page 27 to ensure your words are precise and convey what you intended.*
- *Invoke the precautionary principle by addressing the potential harms of climate change that lack full scientific certainty.*
- *Whenever possible, present climate change information to informal groups where people are free to ask questions and discuss issues with the speaker and each other.*

6 TAP INTO SOCIAL IDENTITIES AND AFFILIATIONS

- ***Commons dilemmas*** describe conflicts resulting from free access to and unrestricted demand for a finite natural resource. This ultimately threatens the resource and leads to exploitation. The benefits of exploitation go to individuals, each of whom is motivated to maximize his or her use of the resource, while the costs of exploitation are distributed among all who share the resource.
- In environmental decisions, an individual's benefit may or may not be the same as what benefits society.
- In any given situation, an individual may call into play multiple identities (parent, CEO, etc.), even when the goals of the various identities may conflict with each other. To resolve that conflict, an individual has to decide which identity is most relevant in a situation.
- The strength of affiliation that someone feels toward other members of a group can determine which identity that person chooses to apply in a particular situation.
- Affiliations with smaller groups can be stronger than those with larger groups.
- Local messengers may get a stronger response to calls for action on climate change than emissaries from more distant locales. People are more likely to take action when they feel a sense of affiliation with the individual or institution making the request.

Tips:
- *Tap into the multiple identities represented by your audience; bolster audience members' sense of affiliation with each other, the environment, and the society that enjoys the benefits of its natural resources.*
- *If communicating as an "outsider," enlist the aid of someone locally known to introduce you.*

7 ENCOURAGE GROUP PARTICIPATION

- Many environmental decisions are group decisions, so it is important for communicators to understand how people participate in group settings.
- Norms about what happens in meetings are important because they determine who speaks when, how information is presented, and how people should disagree.

Tips:
- *Eliciting participation from various stakeholders is important when trying to broker environmental decisions. Stakeholders who feel like they were part of the decision-making process are more likely to support the outcome.*
- *Encourage early participation in the decision-making process to ensure the group identifies the key problems that require solutions.*
- *Presentations on climate change are often filled with dense information that may leave audience members with numerous questions and concerns. When organizing meetings with a diverse group of stakeholders, leave ample time for discussion.*
- *Breaking large groups into smaller groups can help initiate discussion.*
- *See Ways To Encourage Group Participation on page 36.*

8 MAKE BEHAVIOR CHANGE EASIER

- Taking advantage of ***default effects*** (the human tendency to stick with the option that is selected automatically instead of choosing an alternate option) can encourage audiences to make changes in their behavior that will help mitigate the effects of climate change.
- When making decisions about consumption, people tend to be more patient when the default option is to wait vs. when the default option is to receive something now.
- Because the default option requires no action, it is always easier, and so people tend to accept it whether or not they would have chosen it if it were not the default option.

Tips:
- *By making socially beneficial choices the default option, policymakers can positively influence individual decisions concerning natural resources.*
- *Giving people an immediate incentive, if possible, makes behavior change easier.*

FURTHER READINGS

AAAS's Communicating Science: Tools for Scientists and Engineers

The American Association for the Advancement of Science's Center for Public Engagement provides resources for researchers wishing to improve communication with the greater public, offering online webinars, how-to tips for media interviews, and strategies for identifying public outreach opportunities, in addition to in-person workshops.

http://communicatingscience.aaas.org/Pages/newmain.aspx

Communicating on Climate Change: An Essential Resource for Journalists, Scientists, and Educators

This resource guide for editors, reporters, scientists, and academics, compiled by Bud Ward, is based on Metcalf Institute workshops dealing with communication between journalists and climate scientists. It provides tips and tools for covering climate change.

http://metcalfinstitute.org/Communicating_ClimateChange.htm

Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change

With contributors from diverse professional backgrounds, this book looks at communication and social change specifically targeted to climate change. It provides practical suggestions on how to communicate climate change and how to approach related social change more effectively. This volume is of interest to academic researchers and professionals in climate change, environmental policy, science communication, psychology, sociology, and geography.

Moser, S. and Dilling, L., eds. (2007). Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change, Cambridge: Cambridge University Press.

Futerra's Communications Tactics for Climate Change

This communications agency, working on corporate responsibility and sustainability, offers easy to understand communications techniques to prompt behavior change affecting climate change.

http://www.futerra.co.uk/downloads/NewRules:NewGame.pdf

Global Warming's "Six Americas"

A national study by the Yale Project on Climate Change and the George Mason University Center for Climate Change Communication identifies six distinct climate change groups within the American public, ranging from "the alarmed" to "the dismissive." This report profiles these six different audiences and suggests ways to improve education and communication efforts to engage them.

http://www.climatechangecommunication.org/images/files/Global_Warming's_Six_Americas_2009r.pdf

ICLEI's Outreach and Communications Guide

This online guide is designed to help local governments effectively communicate climate information to their constituencies. It contains an array of steps and methodologies for communication and outreach efforts, as well as a compilation of best practices from around the United States.

http://www.icleiusa.org/action-center/engaging-your-community/outreach-and-communications-guide

Making Climate Hot: Communicating the Urgency and Challenge of Global Climate Change

The article explains how to increase public understanding of, and civic engagement with, climate change, providing context for obstacles and seven strategies that applied together can increase wider public concern and build momentum for social and policy change.

Moser, S., Dilling, L. (2004). Making the Climate Hot: Communicating the Urgency and Challenge of Global Climate Change. Environment, Volume 26, Number 10, pp.32–46.

Nudge: Improving Decisions about Health, Wealth, and Happiness

This book, applicable to individuals and governments alike, describes how choice architecture, based on the understanding of how people think, can nudge us to make better choices about better health, sounder investments, and cleaner environments without limiting freedom of choice.

Thaler, R. H. and Sunstein C.R. (2008). Nudge: Improving Decisions about Health, Wealth, and Happiness, Yale University Press.

Psychology and Global Climate Change: Addressing a Multi-faceted Phenomenon and Set of Challenges: A Report by the American Psychological Association's Task Force on the Interface Between Psychology and Global Climate Change

For this report, APA's task force examined decades of psychological research and practice that have been specifically applied and tested in the arena of climate change. The report offers a detailed look at the connection between psychology and global climate change and makes policy recommendations for psychological science.

http://www.apa.org/releases/climate-change.pdf

The Scientist's Guide to Talking with the Media

This book teaches researchers how to deliver an accurate message to a broader audience through the media, providing tips on how to turn abstract concepts into concrete metaphors, form sound bites, prepare for interviews, and even become a reporter's go-to scientist.

Hayes, R. & Grossman, D. (2006). The Scientist's Guide to Talking with the Media: Practical Advice from the Union of Concerned Scientists. Rutgers: Rutgers University Press.

For a complete list of CRED publications, visit cred.columbia.edu/decisionpolicymakers/publications/.

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