

Climate change

English settlers to the New World believed that the climate of Newfoundland would be moderate, New England would be warm, and Virginia would be like southern Spain. They based these beliefs on the seemingly commonsense view that climate is much the same at any given latitude around the globe.

What is striking is that these views persisted despite mounting evidence to the contrary. As late as 1620, after 13 years in the settlement, residents in Jamestown, Virginia, were still trying to import olive trees and other tropical plants, perhaps inspired by Father

land were anomalously cold, including the absence of people with good character. “He is wretched that believes himself wretched,” scoffed one writer (quoted in Kupperman 1982, 1283).

Eventually, the English settlers did adjust their mental models about North American climate. The accumulation of scientific data, combined with personal experience, was undeniable. But the adjustment was slow and costly, both in money and in lives lost. Mental models about climate do not change easily.

Responding to climate change is one of the defining challenges of our time. There is massive scientific evidence that human activity is changing the earth’s climate, with consequences that may be disruptive—potentially even catastrophic.¹ Evidence on climate change and its risks are reported in the technical summary from the 2014 *Assessment Report of the Intergovernmental Panel on Climate Change* (Stocker and others 2013; Field and others 2014). This material is widely considered to be the most authoritative review of scientific knowledge on climate change. To briefly paraphrase, in the history of modern civilization, the earth’s surface has never been so hot. Glaciers are already disappearing, and the ice masses of Greenland are melting. Depending on how much carbon is released into the air, sea levels will rise significantly in this century, potentially flooding coastal cities and submerging low-lying islands. Temperatures will rise and likely become more variable. Rainfall patterns also will change, with more and heavier rains in some areas and more intense and longer droughts in others.

The causes of climate change are clear. Greenhouse gases trap heat from the sun that would otherwise escape Earth. The levels of greenhouse gases (such as carbon dioxide, methane, and nitrous oxide) are too high. Carbon dioxide is released largely from

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Andrew White, who had assured them that it was “probable that the soil will prove to be adapted to all the fruits of Italy, figs, pomegranates, oranges, olives, etc.” Captain John Smith, whose books and maps helped encourage English colonization of the Americas, predicted that the crops of all the richest parts of the world would be grown in New England. Settlers continued to arrive in Newfoundland despite early failures. Investors and settlers resorted to ever more complex explanations for why winters in Newfound-

burning fossil fuels and deforestation, while methane and nitrous oxide—which are more powerful greenhouse gases than carbon dioxide—are released from agriculture (growing crops and raising grass-eating and grain-eating livestock). Never in the past 800,000 years have concentrations of greenhouse gases in the atmosphere been so high. These phenomena explain changes in weather patterns, ice melts, the already visible rise in sea levels, and many other factors, such as increases in seawater acidity.

Changes in climate create a variety of risks affecting human well-being (Stocker and others 2013; Field and others 2014). The likelihood and severity of these risks will depend on the amount of additional greenhouse gases added to the atmosphere and on the extent to which individuals and organizations take steps to mitigate and adapt to the risks. While climate change is a global threat, it is of most danger to developing countries, which are both more exposed to its impact and less well equipped to deal with it (World Bank 2012).

The *World Development Report 2010* (World Bank 2009) describes three sources of inertia that make responding to climate change such a pressing and difficult challenge. The first is inertia in the environment itself. Even if greenhouse gas emissions are stabilized over the next 100 years, biological and geophysical feedback loops will cause increases in temperatures and sea levels and other climatic changes to continue for centuries—in some cases even millennia. Second, inertia embodied in physical capital, as well as in current research and development streams, dramatically affects the cost of reducing emissions. Retiring, retrofitting, and replacing power plants and other machinery using high-carbon energy sources the world over will require significant investments and substantial social and technological coordination.

Finally, there is inertia in the behavior of individuals and organizations. In the industrialized world, people have grown accustomed to driving particular kinds of automobiles, living and working in comfortable indoor temperatures, and raising and eating methane-emitting animals. Many people in developing countries also engage in “high-carbon behaviors,” or they aspire to do so. In addition, farmers around the world grow crops that may be unsuited to a changing climate, households settle in vulnerable zones, and builders use construction methods not designed to optimize energy efficiency. Finally, political parties in many countries depend on fuel subsidies to garner support, and governments fear the implications, for the economy or tax revenues, of changes in energy policies.

This chapter presents ideas related to that last category of inertia—the behavior of individuals and organizations. For the most part, it focuses on how automatic

thinking, cognitive illusions, mental models, and social norms contribute to behavior. It is clear that taxes on carbon emissions, property rights in carbon abatement, redistributive transfers, or other changes in economic incentives will be required to address climate change adequately. This chapter argues, however, that economic incentives are not the whole story and that inertia in behavior arises from psychological and ideological sources as well. At the same time, the chapter examines the prospects for invoking social norms and other communication strategies both to change behavior and to generate support for various policies—such as carbon prices, cap-and-trade systems, and financial transfers for lower emissions—that would be needed to overcome the inertia embodied in physical capital. In other words, an important role for psychological and social insights is to identify ways to convince populations to support, and governments to adopt, what are known to be effective economic tools, such as carbon pricing, to curb greenhouse gas emissions.

Cognitive obstacles inhibit action on climate change

Biases affect how people process complex information

Climate is usually understood as the weather conditions prevailing in an area over a long period. It is a long-term pattern of variations among meteorological variables, including average temperature and variability across time in rainfall. Grasping climate change and its socioeconomic impacts requires a shift from automatic and associative to deliberative and analytic thinking. The paradigmatic time period for identifying variations in climate—a 30-year window—is much more easily examined with long-term data sets and computer modeling techniques than with personal memories and conversations. Because analytic thinking is hard and attention is costly, people tend to use mental shortcuts to evaluate the evidence on climate change and its risks.

Typically, how people think about climate change is subject to the *availability heuristic* (Marx and Weber 2012). The term refers to the human tendency to judge an event by the ease with which examples of the event can be retrieved from memory or constructed anew. A number of studies present strong evidence that a recent pattern of warm weather affects beliefs in climate change. For each 3.1 degrees Fahrenheit increase in local temperatures above normal in the week before being surveyed, Americans become one percentage point more likely to agree that there is “solid evidence” that the earth is getting warmer—an effect size comparable to that of age and education but less than the

influence of political party identification and ideology on assessments of scientific evidence (Egan and Mullin 2012). People typically do not systematically update their views over months and years but rather express views based on what they have experienced recently. Eventually, memories of personal experiences could become a reliable indicator that the climate has changed, but this adjustment may be slow, given the inertia of the climate system and the nature of people's beliefs. Assuming that adjusting a mental model of climate requires three consecutive years in which the maximum temperature is a full standard deviation or more above the historical high, Szafran, Williams, and Roth (2013) calculate, using a simulation based on U.S. weather station data from 1946 to 2005, that it will take the majority of people up to 86 years to adjust their mental models—too late for policies aiming to forestall climate disruption.

Generally speaking, grasping climate change is challenging because it requires understanding complex aspects of both mathematics and atmospheric chemistry, including probabilities, recognizing the difference between the flow of greenhouse gases and the existing stock in the air, and appreciating feedback loops and time lags. As in preventive health, the immediate and direct effects of risky behaviors are often invisible. In light of this, literature reviews in science communication emphasize that “mere transmission of information in reports and presentations is not enough” and that interactive, transparent simulations of the climate may be more valuable (Sterman 2011, 821).

Cultural worldviews and social networks inform opinions

Crucially, however, people interpret scientific information in light of their cultural worldviews, obtain information through social networks and favored media channels, and rely on trusted messengers to make sense of complex information. A number of studies show that many people interpret evidence of climate change in the light of their worldviews and social networks. An individual's level of support for social hierarchy and equality is a better predictor of his or her perceptions of changes in temperature over the past few years than actual temperature changes, as Goebbert and others (2012) demonstrate, drawing on an account developed by Douglas and Wildavsky (1983) of how worldviews affect risk perceptions.

It may be that people use their rational faculties not primarily to understand the world but to express solidarity with their group, Kahan, Jenkins-Smith, and Braman (2011) and Kahan and others (2012) argue, putting forward an account of

“expressive rationality.” One explanation for inaction on climate change is that it is a complex problem and that more information better explained will raise concern and trigger action. On that view, which the authors call the Scientific Communication Thesis, perceptions of risk should increase as numeracy and scientific literacy increase. Figure 9.1, panel a, presents this prediction visually. Risk perceptions are based on responses to the question, How much risk do you believe climate change poses to human health, safety, or prosperity? The study uses a battery of standard questions to measure numeracy and scientific literacy. The authors assess political worldviews along two standard dimensions: individualism (a belief that government should avoid affecting individual choice) and egalitarianism (support for equality and nondiscrimination).

What they find is that perceptions of climate change risk actually decline as scientific literacy and numeracy increase (figure 9.1, panel b). That decline is attributable to the decline in risk perceptions among a subset of people who support individualism and oppose egalitarianism (whom the authors call “hierarchical individualists”). The authors argue that people may use their scientific knowledge defensively, identifying and resisting efforts to convince them to go against their allegiances.

The way people respond to scientific communication about climate change seems to depend on whether, and how, messages trigger group identities and use charged language. For instance, the use of the word “tax” leads more individuals to focus on cheap options with lower environmental benefits, but the term “offset” does not have that effect. Moreover, when people choose between otherwise identical products or services, whether a surcharge for emitted carbon dioxide is framed as a tax or as an offset changes preferences for some political groups but not for others (Hardisty, Johnson, and Weber 2010).

This means that even more information, however beautifully presented, might fail to move climate change opinion in a politicized environment. Indeed—in a related fashion but on another topic—a recent survey experiment found that presenting information, scientifically ratified data, images, and personal narratives all failed to convince people that the measles, mumps, and rubella vaccine is safe. Parents who were already anxious about vaccine safety became less likely to have their children vaccinated after receiving any of those four modes of intervention (Nyhan and others 2014). Similarly, a recent study observed that in the United States, politically conservative individuals were less likely to purchase a more expensive

energy-efficient lightbulb labeled as environmentally friendly than to buy the identical product when it was unlabeled (Gromet, Kunreuther, and Larrick 2013). In general, scientific communication needs to be mindful of a potential *boomerang effect*, in which arguments trigger antagonistic responses by threatening the attachment of individuals to their social groups (Dillard and Shen 2005) or lead to unexpected and worse outcomes by highlighting low levels of support for what people believed to be a common social behavior (Schultz and others 2007).

How the media portray a social problem can also have powerful effects. Assessing how frames affect support for altruistic policies in another domain, Iyengar (1990) shows that media presentations influence support for antipoverty policies. For example, episodic coverage of poverty, usually focused on specific individuals, led people to blame individuals for being poor, but thematic coverage of antipoverty policies led people to think that the government was primarily responsible for poverty. Similarly, stating that human activity is responsible for climate change dramatically increases support for actions that address it (Pew Research Center 2009). Again, although this line of work is suggestive, it is preliminary, and more work is needed to understand how normative frames affect support for action on climate change.² It is also likely to be the case that frames need to be tailored to specific audiences. For example, while students respond to messages about energy consumption presented in terms of carbon emissions (Spence and others 2014), middle-class families are more attuned to messages emphasizing the financial cost of energy consumption (Simcock and others 2014).

Communication about climate change can draw on local narratives. In parts of Brazil, India, Melanesia, and the Sahel, some residents believe that weather is a reward for good human behavior or a punishment for bad human behavior. While these rewards and punishments are believed to be channeled through a deity, other groups, like the Kalahari San, the Inuit, and the indigenous Siberian, share similar beliefs without a religious connection. These narratives of human influence on the weather may provide foundations for presenting contemporary accounts of anthropogenic climate change and informing dialogues among citizens and scientists in different settings (Rudiak-Gould 2013).

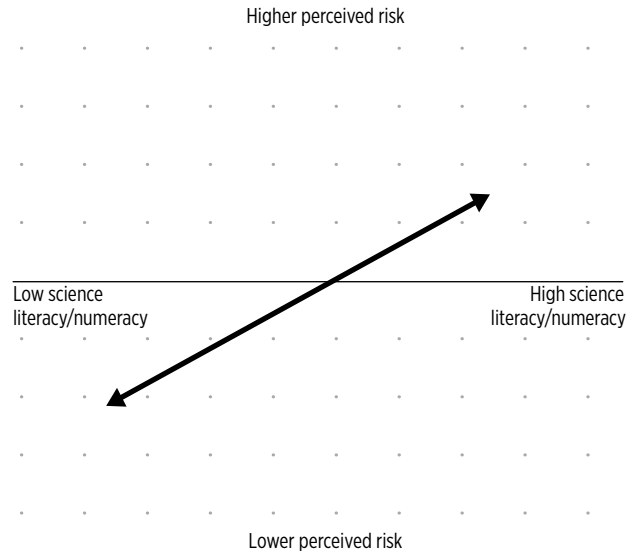
Automatic cognitive processes affect how people interpret probabilities

Sometimes strong ties to specific places or landscapes, and incentives to pay attention, may help people assess changes in climate. For example, elders and subsistence

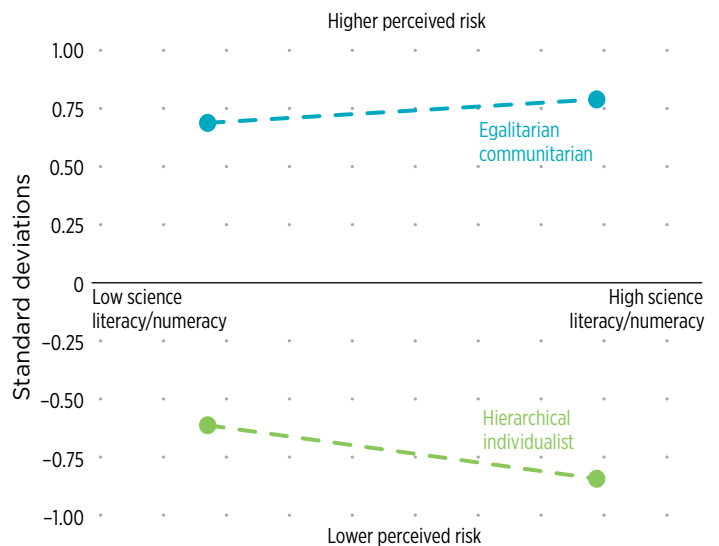
Figure 9.1 Worldviews can affect perceptions of the risk posed by climate change

While the Scientific Communication Thesis (panel a) predicts that perceptions of climate change risks increase as scientific literacy and numeracy improve, in actuality risk perceptions remain unchanged or even decline (panel b), especially for people with particular cultural worldviews. *Individualism* refers to a belief that government should avoid affecting individual choice; *communitarianism* is its opposite. *Egalitarianism* refers to support for equality and nondiscrimination; *hierarchy* is the opposite.

a. Prediction according to the Scientific Communication Thesis



b. Actual response



Source: Kahan and others 2012.

farmers in the Central Plateau of Burkina Faso correctly perceived that “big rains” in their region have become less frequent and dry years more common over the past 20 years. As one elderly man said,

Now is not like before. It is the drought. Before Independence, we could count on rain until October and grow long-cycle millet that we would harvest and leave in granaries out in our fields. Since then, there is not enough rain and we can't grow that kind of millet anymore. It has vanished from here. There is less rain now and we grow different crops. (West, Roncoli, and Ouattara 2008, 296)

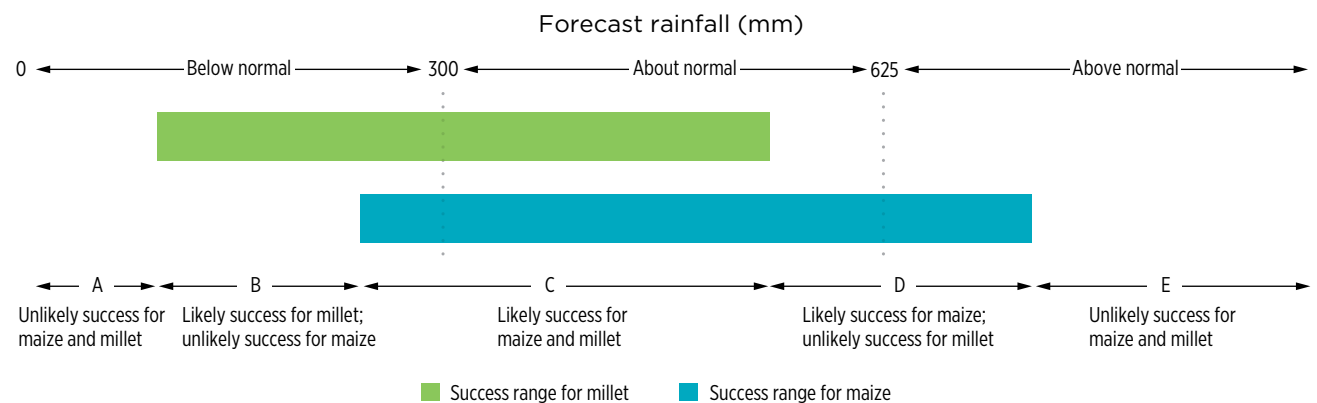
In that instance and locale, farmers were able, after training, to adapt to variation in climate. But this response is far from uniform. In a study of whether farmers in Zimbabwe shifted from maize to millet when seasonal rain forecasts changed, Grothmann and Patt (2005) found that farmers typically ignored rainfall forecasts unless they were at the extremes—rainfall far above normal or far below normal. Figure 9.2 depicts this tendency graphically. In particular, farmers' forecasts of seasonal rainfall in the D range were indistinguishable from their forecasts of rainfall in the B range. Farmers focused on the fact that in both instances both maize and millet harvests could be grown. They did not focus on the fact that millet could be grown successfully under nearly all rainfall amounts in the B range but under only a portion of those in the D range, and vice versa for maize. Some farmers also felt that the B and D ranges were equal because the forecasts expressed estimates using terms such as *might* or *likely*, rather than certainties.

As chapter 1 discussed, there are two distinct “systems” involved in cognitive processing: the automatic system and the deliberative system. Human beings rely on both when processing probabilities. Tversky and Kahneman (1982) showed that although most people neglect information about background frequencies, such as the fact that “15% of the taxis in a city are operated by the Blue Cab company,” they notice information that is case specific and information that is part of a narrative, such as the fact that “15% of the taxi accidents in a city involve the Blue Cab company.” The reason is that the automatic system (System 1) is highly attuned to situations of cause and effect; it is deployed when processing information about taxi accidents but not for unadorned statements concerning relative frequencies.

Researchers have used this insight to help individuals make sense of forecasts about climate change. Analogies to how an injury to a star player would affect the odds of winning a football match between Argentina and Zimbabwe helped Zimbabwean farmers grasp how the El Niño phenomenon might affect the odds of a rainy season (Suarez and Patt 2004). Comparisons to the familiar task of predicting the gender of an unborn child helped Ugandan farmers understand the probability distribution that underlies government-issued weather forecasts (Orlove and Kabugo 2005). Concrete images and comparisons to familiar experiences help make concepts such as relative frequencies and conditional probabilities easier to absorb.

Figure 9.2 Predicting the effect of rainfall forecasts on the success of growing familiar crops was difficult for farmers in Zimbabwe

In a series of workshops, subsistence farmers in Zimbabwe were asked what crops they grew, given seasonal rainfall forecasts. Farmers said they grew maize when forecasts were in the D range, and they did not switch to millet when the forecast was in the B range, even though millet was more likely to be successful.



Source: Grothmann and Patt 2005.

Note: mm = millimeters.

The future is far off, and risk is emotional

A key obstacle to action on climate change is the fact that human beings focus intensely on the present and discount concerns perceived to be in the far-off future, such as climate change risks (see the discussions of present bias and psychological “distance” in chapter 6). But research indicates that the extent to which people undertake future-oriented actions depends not only on cognitive processes but also on emotional ones; furthermore, risk is not constant across activities but rather is contextual. People process risk as a feeling rather than as a probability (Loewenstein and others 2001). Because perception of risk and support for policy are strongly influenced by experiences, emotions, imagery, and values (Leiserowitz 2006), climate change messaging might be more effective if it tugged at the emotions more often.

However, too much doom and gloom may lower an individual’s sense of self-efficacy and reduce the motivation to act. People may have a “finite pool of worry” available to handle problems. For example, the proportion of Americans who viewed climate change as a “very serious” problem dropped from a two-year steady level of 47 percent to 35 percent during the global financial crisis (Pew Research Center 2009). In the domain of adaptation, a study of Argentine farmers showed that steps to cue more worry about global warming decreased concern about the political situation in Argentina (Hansen, Marx, and Weber 2004). Relatedly, Argentine farmers who were worried about global warming were more likely to change some aspect of their production practices (such as insurance or irrigation) but hardly ever undertook more than one change. It was as if the farmers were eager to dismiss climate change worries in their own minds, believing that with one action they had addressed their problems (Weber 1997).

The ambiguous, difficult-to-quantify risks surrounding climate change may also pose challenges. It has been argued that when people face risks of unknown magnitude (ambiguous risks), they tend to avoid making decisions (Ellsberg 1961; Shogren 2012). However, for some individuals, ambiguity can increase the likelihood of taking precautionary measures. A recent framed field experiment documented high levels of risk aversion among coffee farmers in Costa Rica. The study also found that, among farmers with clearly identifiable preferences regarding ambiguity, twice as many chose to adapt to the risk than not to adapt when confronting ambiguous climate change risks (Alpizar, Carlsson, and Naranjo 2011). In other words, the fact that the risk was unknown induced more adaptation than the corresponding situation with known risk.

The common framing of climate change as an unsolvable global tragedy may also be contributing to a sense of uncertainty and a lack of self-efficacy that together disempower local action. Ostrom (2014, 107) argues that “the ‘problem’ has been framed so often as a global issue that local politicians and citizens sometimes cannot see that there are things that can be done at a local level that are important steps in the right direction.” While admittedly many such steps are needed to deal with the truly global-scale challenge of mitigating greenhouse gas emissions, local action has considerable potential for reducing vulnerability to climate change risks.

Communication strategies can draw on local mental models. The presentation of climate forecasts can be more intuitive. Institutions can take advantage of cooperative tendencies and social networks among policy makers and firms.

Film and entertainment education can change opinions, but the effects may not last long

Hoping for traction with busy people on a seemingly remote and global topic, some climate change campaigners have turned to art and imagery. This may be useful. An experiment was done to coincide with the release of a movie called *The Day after Tomorrow*, which depicts the impact and aftermath of catastrophic storms hitting major U.S. cities, including Los Angeles and New York—storms caused by a climate shift that ultimately brings on an ice age. The film had a significant impact on people’s belief in climate change, despite the fact that the climate shift shown in the movie is scientifically fallacious. Forty-nine percent of viewers surveyed said that seeing the movie increased their worry about global warming, while only 1 percent said it made them less worried (Leiserowitz 2004).

More generally, narrative communication structures may also play a key role in influencing an individual’s perception of risk and policy preferences, especially through the vehicle of a “hero” character. In a 2013 study, respondents exposed to climate change information presented in a narrative structure—complete with

a setting, characters (heroes and villains), a plot, and a moral—were more inclined to view the hero and the hero's preferred policy solution favorably (Jones 2014). Three carefully tailored narratives were each designed to appeal to one particular worldview—egalitarian, hierarchical, and individualist—with a control group receiving objective climate facts in a bulleted list. Those exposed to narrative structures were found to have retained more information from the story and were better able to draw emotional conclusions about groups portrayed as either heroes or villains than the respondents in the control group. These results suggest that overt value statements, cultural symbolism, and strong connections to individual or group “heroes” may be more effective forms of climate messaging than objective scientific communication strategies currently used in the mainstream media.

Social norms and comparisons can be used to reduce energy consumption. Information campaigns can be made more effective and clear. Default settings can be used more widely.

It is unclear, however, how long the effect of watching such a movie persists and whether people's increased concern translates into action. A recent study of U.K. viewers of the climate change movie *The Age of Stupid* found that people reported increased concern about climate change after viewing the movie, as well as a greater sense of agency and motivation to act. When the moviegoers were surveyed again several weeks later, however, these effects had disappeared (Howell 2014).

One problem with movies and media campaigns is that people often experience them individually, not as political actors or in social groups. Only “organizationally mobilized public opinion matters,” as Skocpol's political history of climate change legislation suggests (2013, 118). What is needed is not messaging with “subliminal” appeal but a focus on networks and organizations, which are the “real stuff” of politics, Skocpol argues.

People understand fairness in self-serving ways

International negotiations on climate are hampered by well-known problems related to collective action

(these are nicely summarized in Bernauer 2013). Every country might want a global agreement to reduce carbon emissions, but what it might desire even more is for every other country to comply with the agreement and make the requisite economic sacrifices, while it does not. Recognizing this, some countries may decide to focus just on adapting to climate change, rather than also taking steps to mitigate it; resources spent on adaptation will benefit the country, whereas resources spent on mitigation may provide little gain if other countries do not live up to their end of the bargain. A second barrier to an international agreement is that the costs and benefits of reducing carbon emissions are not distributed equally. Poor countries and communities are generally more vulnerable to the effects of climate disruption and also bear significant costs during a transition to a low-carbon economy. Finally, just as countries cannot easily coordinate with one another, different political generations cannot coordinate effectively. Even if people made sacrifices today, future political leaders might reverse course.

In addition, nations need to converge on a working agreement, or at least an overlapping consensus, regarding fairness. Principles of fairness are the subject of intense competition and controversy among nations and social groups. There are many ways to distribute the burdens of mitigating and adapting to climate change; and there are several principles of distributive justice underlying those distributions, from the idea that the people and countries with the most emissions should contribute the most to abating greenhouse gases (“polluter pays”), to strict egalitarianism of emissions rights on a per capita basis, to contributions linked to income levels, to equal percentage reductions for each country. Thus finding a shared view of fairness that promotes climate action is a major obstacle (see, for instance, Gardiner and others 2010).

Moreover, efforts to identify an international standard of fairness are complicated by the widespread human tendency to select principles of fairness that happen to coincide with one's interests (*self-serving bias*). Drawing on a survey of participants in workshops sponsored by the Intergovernmental Panel on Climate Change (IPCC), Lange and others (2010) show that there is a strong correlation between the principles of distributive justice that negotiators endorse and their national self-interests. Taking this a step further, Kriss and others (2011) show that Chinese and U.S. students can agree how burdens for environmental challenges should be distributed between two anonymous countries but stake out very different views as soon as the countries are named as China and the United States. In other words, people may be able to agree on a fairness

principle, but their social allegiances and mental models affect their moral reasoning. What psychological and social factors underlie individuals' allegiances to fellow nationals, most of whom they will never meet? This is an intriguing topic on which more research is needed. One possibility is that prioritizing the interests of fellow nationals is a social norm; in other words, people prioritize conationals not from reasoned choice but because that is what most people around them do and believe they should do (Baron, Ritov, and Greene 2013).

Democratic rules and laws can promote conditional cooperation

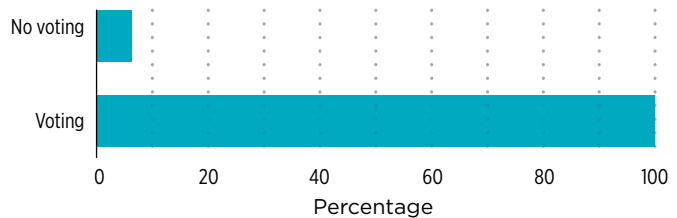
Chapter 2 argued that most individuals are conditional cooperators. In the context of global warming, this means that people would be more willing to take action to address climate change if they could be assured that others will do the same. Hauser and others (2014) conduct a laboratory experiment in which individuals make contributions to combat climate change on behalf of “future generations” of players. They find, pessimistically, that even if most people are prepared to conserve public resources on behalf of future generations, those resources can nevertheless be ruined by a small minority of people within a population who do not conserve resources. More optimistically, they find that *conditional cooperation*, in the form of binding democratic votes, can make a difference: by introducing democratic principles, the contributing majority can force the “selfish” minority to conserve. And even more interestingly, players increase contributions to shared resources when they are assured that their good behavior is being reciprocated by others; in other words, contributions increase because democratic voting brings conditional cooperators on board. As figure 9.3 shows, voting measures dramatically increased the sustainability of resource pools in the laboratory experiment. The implications are that many individuals are indeed ready to sacrifice for the greater good if institutions can be crafted to take advantage of conditional cooperation.

Conditional cooperation can also be promoted by international law and international organizations. Even if a body of law has weak enforcement mechanisms, as is the case in various domains of international law, it can affect behavior when it expresses and concentrates social meanings (Sunstein 1996). If international climate agreements were entirely ineffective, countries would not hesitate to sign them; that many countries do avoid signing indicates that countries regard noncompliance as potentially costly (Bernauer 2013). International multilateral and bilateral agreements can serve as a focal point for mobilizing domes-

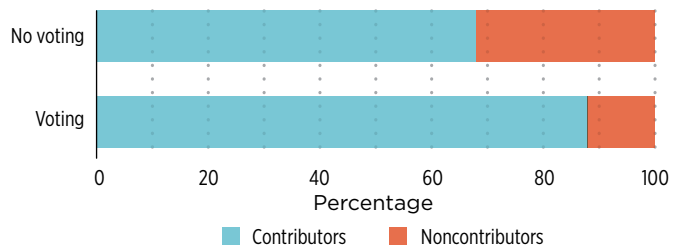
Figure 9.3 Democratic rules can achieve high levels of resource sustainability

In a laboratory experiment, individuals made contributions to shared resources on behalf of future generations of players. Decisions of a small minority resulted in very few pools being sustained. When binding votes were used to make decisions, all resource pools were sustained (panel a). Voting rules led more individuals to contribute because the rules reassured conditional cooperators that others also would have contributed (panel b).

a. Resource pools sustained



b. Individuals who contributed



Source: Hauser and others 2014.

tic actors, such as civil society and courts, which then may impose costs on the state (Simmons 2009; Gauri 2011; Bernauer 2013). Participation may itself affect choices. According to Spilker's findings (2012), developing countries with higher levels of membership in international organizations have lower levels of greenhouse gas emissions, controlling for time trends and a range of economic and political variables, although issues of selection and causality remain to be worked out in such analyses. The research in this area is preliminary and suggestive, but intriguing.

Psychological and social insights for motivating conservation

Invoking social norms can reduce consumption

There have been several pioneering efforts to use social norms to cut energy consumption and encourage adoption of energy-conserving practices and technologies. In a series of large-scale programs run in the United States in partnership with the energy company Opower, “home energy reports” were mailed to residential utility customers, providing them with feedback on

how their own energy use compared to that of their neighbors (as well as providing simple information about energy consumption). On average, this intervention reduced energy consumption by 2 percent—equivalent to the effect of a short-run increase in electricity prices of about 11–20 percent (Allcott 2011). Numerous other projects have found similar effects (see, for example, Ayres, Raseman, and Shih 2013; Dolan and Metcalfe 2013).

While these interventions elicit immediate energy conservation and behavior change in the short term, consumers' initial efforts to conserve tend to decrease over time. The longest-running study sites of the Opower energy conservation program, for example, showed that consumers' initial efforts began to decline in less than two weeks (Allcott and Rogers 2014). However, as the interventions have been repeated and more reports have been delivered, customers seem to develop new consumption habits or acquire a new stock of physical capital (purchasing more energy-efficient lightbulbs, for example). Long-term impacts persist. Overall, the intervention costs between 1.4 and 1.8 cents per kilowatt hour of electricity saved. Commonly used energy conservation programs typically cost between 1.6 and 3.3 cents per kilowatt hour (Allcott and Rogers 2014). A similar intervention found that impacts of an intervention centered on changing social norms on residential water use could be detected more than two years after residents received a message (Ferraro, Miranda, and Price 2011). Spotlight 5 documents how the city of Bogotá drew on social norms to reduce consumption during a water supply crisis.

Social norms might also be used to motivate individuals to adapt to environmental risks. In a laboratory simulation, individuals were asked to make improvements to homes to reduce their exposure to the risk of earthquakes. At the end of the experiment, each person was paid the difference between the value of his or her home and the amount of interest earned on money they did not invest in home improvements minus the cost of repairs and the cost of damage. No one knew whether home repairs to reduce earthquake risk were cost effective or not, but each person could observe the choices others made. Half the subjects were placed in a world where repairs were cost effective and half were not. The major driver of individual decisions was the average level of investment made by neighbors. Even players who were told that investments were 100 percent effective started copying their neighbors and investing less—probably because, as mentioned, unadorned probabilities may mean less to people than narratives, and the behavior of neighbors

readily lends itself to a story line (Kunreuther, Meyer, and Michel-Kerjan 2013). This suggests that opinion leaders might be used to push individuals toward more adaptive behaviors.

While it appears that social norm-based policy interventions can be cost effective and have a lasting impact, careful attention to their design is critical. First, it is necessary to identify the relevant social norm. Evidence from a study of the participation of hotel guests in an environmental conservation program suggests that messages appealing to social norms (such as “The majority of guests reuse their towels”) are more effective in encouraging conservation behavior than messages focusing on environmental protection. The most effective messages (resulting in 49 percent reuse) are those that refer to circumstances that are most closely related to the current situation (such as “The majority of guests in this room reuse their towels”) (Goldstein, Cialdini, and Griskevicius 2008).

Messages about social norms can also have unintended consequences; they can normalize undesirable as well as desirable behaviors. Information campaigns aimed at reducing undesirable behavior sometimes unwittingly draw attention to the fact that a specific undesirable behavior is actually widespread (Cialdini 2003). In an environmental context, it has been shown that visitors to Arizona's Petrified Forest National Park who receive empirical information (“Many past visitors have removed the petrified wood from the park, changing the state of the Petrified Forest”) were likely to steal more petrified wood, whereas normative messages (“Please don't remove the petrified wood from the park”) helped reduce theft (Cialdini and others 2006).

The use of messages expressing certain social norms has also been shown to have a boomerang effect: messages about average neighborhood energy use have led to energy savings among households with high levels of energy consumption but have increased consumption among those households already consuming at low rates. Adding a message about normative expectations was found to eliminate this boomerang effect (Schultz and others 2007). Furthermore, there may be important complementarities between social norms and financial incentives; social comparison messages related to water consumption were found to be most effective in reducing consumption among the least price-sensitive users, such as those consuming large amounts of water before the intervention (Ferraro and Price 2013).

To be most effective, interventions such as these also benefit from careful targeting. Peer comparisons targeting energy conservation through the means

of home electricity reports, for example, are two to four times more effective when sent to political liberals than to conservatives (Costa and Kahn 2013). In contexts where environmental social norms are ineffective, focusing on health-based messages related to the dangers of climate change could provide a useful alternative.

Depending on the context, it may be useful to complement private information with public information, if feasible. Providing college students in residence halls in the United States with private information on their real-time energy use for appliances compared to their peers was ineffective in reducing energy consumption. However, students who also received an individual conservation rating that was publicly available significantly reduced their use of heating and cooling, leading to a 20 percent drop in electricity consumption (Delmas and Lessem 2012).

Finally, behavioral “barriers” to investments in energy-saving technologies apply to firms as well as to individuals. A systematic literature review found that business investments in energy efficiency in countries in the Organisation for Economic Co-operation and Development (OECD) require very high rates of return—higher than for other investments with comparable risks (Centre for Sustainable Energy 2012). The review attributes this finding to organizational norms and to the lack of salience, for many firms, of energy efficiency. To motivate firms, it advocates reframing energy efficiency and climate policy as a strategic benefit, rather than as a short-term cost decision.

Psychological and social insights can make information campaigns and indicators more effective

Disclosing information is often viewed as a useful policy tool in many different areas, including finance, health, and the environment. A recent meta-analysis of information-based energy conservation experiments quantifies the effectiveness of interventions, evaluating evidence from 156 published field trials and 525,479 study subjects between 1975 and 2012 (Delmas, Fischlein, and Asensio 2013). It finds that average electricity consumption is reduced by 7.4 percent in the studies but also finds that this effect decreases with increasing rigor of the study. A recent study of energy-efficiency labeling attempts to disentangle the relative importance of different kinds of information. Simple information on the economic value of saving energy was found to be most important in guiding investments in energy-efficient technology, with addi-

tional but smaller impacts from information about energy use or carbon emissions (Newell and Siikamäki 2013). However, evidence on the effectiveness of such interventions is mixed (Kallbekken, Sælen, and Hermansen 2013).

While disclosing information can have a significant impact on people's behavior, it is important to consider how that information is conveyed. If information is too abstract or vague, too detailed and complex, or poorly framed, disclosing that information may be ineffective in bringing about behavior change. As people's attention is a scarce resource, vivid and novel ways of presenting information can capture the attention in ways that abstract or familiar ones cannot (Sunstein 2013). Without careful design, information disclosure can be not only ineffective and confusing but also potentially misleading and counterproductive. The widely used measure of fuel efficiency, “miles per gallon,” for example, is generally not well understood and leads people to undervalue the fuel and cost savings of replacing the most inefficient vehicles (Larrick and Soll 2008).

People often struggle to make decisions in situations of risk and uncertainty. Even when people do understand the risks and benefits of different actions, they are more likely to act on the basis of this information if they are also provided with information about how to proceed (Nickerson and Rogers 2010; Milkman and others 2011). Identifying a specific plan of action can thus have a significant impact on bringing about social outcomes, as complex or vague information can lead to inaction, even when people understand the risks and benefits associated with different choices.

In practice, some informational campaigns may be framed around climate change only indirectly. A recent large-scale randomized controlled trial found that messages emphasizing the health-related impacts of energy consumption were more effective in motivating energy conservation than similar messages focusing on potential cost savings (Asensio and Delmas 2014). Given the fact that both social norms and the extent to which people try to conform differ according to social context, both the effectiveness and the particular features of such policies will vary. Similarly, efforts to replace fuel subsidies with social transfers, often couched as reforms for efficiency or equity, would have significant effects on greenhouse gas emissions as well (Stocker and others 2013; Field and others 2014). The IPCC Working Group 3 on Mitigation notes the political importance of emphasizing policies to “integrate multiple objectives” and produce “co-benefits.”

Policies requiring carbon disclosure for companies, and then benchmarking company emissions, can

capitalize on social motivations. The Carbon Disclosure Project (CDP) and the associated Climate Performance Leadership Index work in that manner. These kinds of public pressure may be effective: combined with shareholder activism, participation in the CDP can increase shareholder value if the external business environment is climate conscious (Kim and Lyon 2011).

Why a firm may choose to join a carbon disclosure initiative is an intriguing area of study and one closely related to the establishment and emergence of social norms. One recent analysis of 394 European and Latin American corporations that chose to join the United Nations Global Compact looked at three behavioral influences on their institutions and stakeholders: *coercive*, *normative*, and *mimetic behaviors*. Coercive behavior—in this case, government regulation—exerted little effective pressure on firm participation. Rather, it was the normative pressure from academia, as well as the mimetic pressure to imitate peer corporations listed on the New York Stock Exchange, that had

missioned by the French government, Stiglitz, Sen, and Fitoussi (2009) examined a wider variety of possible economic indicators, with the goal of developing indicators that better incorporate well-being metrics and environmental sustainability. These are much more likely to be widely adopted if major economies make a collective decision, perhaps through a body such as the OECD, to begin reporting them as part of their standard economic statistics. Once statistics like these become more readily available, peer comparison will follow.

Setting the default

Default rules can help overcome procrastination and inertia, promoting social goals while preserving people's freedom of choice. "Green defaults" have been tested for a number of policy interventions, including choosing an electricity provider, conserving energy, and reducing food waste. Three related mechanisms appear to contribute to the effectiveness of default rules: people's inertia and tendency to procrastinate, a perceived implicit endorsement of the default rule, and the establishment of a reference point relative to which changes may be evaluated (Sunstein and Reisch 2013).

In southern Germany, for example, the power company Energiedienst GmbH offered three separate tariffs: a default "green" tariff (which was also 8 percent cheaper than the previous tariff), a cheaper but less green tariff, and a greener but more expensive tariff. Almost everyone (94 percent of consumers) remained with the default tariff; only 4.3 percent switched to the cheaper option, less than 1 percent switched to the greener tariff, and the remainder switched to a different supplier (Pichert and Katsikopoulos 2008). While many people in Germany stated a preference for green energy, the national average percentage of consumers actually choosing this kind of energy provider, under circumstances in which the "green" tariff was not the default, was less than 1 percent for a long time. Defaults thus appear to have a powerful effect on social choices.

Similar results have been reported in the United States, where more customers enroll in time-based rate programs (designed to encourage smarter energy use) when these are offered on an opt-out rather than on an opt-in basis. Participation rates among customers recruited using an opt-out approach were 84 percent, while only 11 percent of customers joined the program when recruitment was done on an opt-in basis (U.S. Department of Energy 2013).

In developing such policy interventions, the question arises, Which default should be chosen? Choosing an overly ambitious default might lead to greater opt-out rates. A randomized controlled experiment of thermostat default settings for heating found that

Climate change is such a large problem that multiple, coordinated approaches will be needed to address it. Psychological, social, and cultural insights can make significant contributions.

the strongest effects (Perez-Batres, Miller, and Pisani 2011). These types of pressure may already be driving new norms for social sustainability.

Social norms also operate on policy makers themselves, who appear responsive not just to their constituents but also to one another. What neighboring jurisdictions do influences policy choice, as shown in a number of policy domains, including the adoption of vaccines, Washington Consensus policies, and carbon taxes (Gauri and Khaleghian 2002; Dobbin, Simmons, and Garrett 2007; Krause 2011). The insight that countries, companies, and localities care about their relative performance can be leveraged to generate political support. This is an instance of what has become known as "governance by indicators"—using metrics to create new forms of peer pressure to induce better governance policies.³ At the macro level, alternatives to the measure of gross domestic product can offer countries clearer economic indicators of their stewardship of core resource stocks. In a wide-ranging report com-

relatively small decreases in the default setting (1°C) led to a greater reduction in the average setting chosen than did large decreases in the default setting (2°C) (Brown and others 2013).

Defaults can be used to improve outcomes when people faced with certain decisions choose not to make an active choice. The power of defaults arises from the fact that people's behavior may not be determined by active choice most of the time. Evidence from a study of an eight-month period of compulsory electricity rationing in Brazil shows that the policy led to a persistent reduction of electricity use, with consumption 14 percent lower even 10 years after the period of rationing. Household data on ownership of appliances and consumption habits indicate that habits have been the main source of the persistent reduction in electricity consumption (Costa 2013).

Conclusion

Dan Ariely (2010, 251) notes that “if we tried to manufacture an exemplary problem that would inspire general indifference,” it would probably be climate change. This is because climate change implicates several cognitive illusions. Climate changes slowly, whereas individuals' judgments about the climate are based on what they have perceived recently. Ideological and social allegiances affect how communication about climate change is received. People tend to ignore or underappreciate information presented in probabilities, such as forecasts for seasonal rainfall and other climate-related variables. Human beings are far more concerned with the present than with the future, whereas many of the worst impacts of climate change could take place many years from now. Some of those risks remain ambiguous, and some people avoid action in the face of the unknown. When deciding how to share the burdens of responding to climate change, individuals and organizations usually adopt principles of fairness that serve their own interests.

At the same time, promising approaches to action on climate change also draw on psychological and social insights. Communication strategies can incorporate local mental models and narratives. The presentation of climate forecasts can be more intuitive. Institutions can be crafted to take advantage of conditional cooperation and social networks. Social norms and comparisons can be used to reduce energy consumption. Information campaigns can be made more effective and clear. Default settings can be used more widely. Climate change is such a large problem that multiple, coordinated approaches will be needed to address it. Psychological, social, and cultural insights can make significant contributions.

Notes

1. A 2013 study on the evolution of the scientific consensus on man-made (anthropogenic) climate change (ACC) analyzed 11,944 peer-reviewed papers studying “global climate change” or “global warming” from 2001 to 2011. Of the abstracts that took a stance on ACC, more than 97 percent agreed with the scientific consensus, including more than 97 percent of authors when asked. The authors concluded that “the number of papers rejecting [ACC] is a minuscule proportion of the published research, with the percentage slightly decreasing over time” (Cook and others 2013, 1). Clearly, for misperceptions about the occurrence of climate change and its potential threats to persist in light of the body of evidence, there is more at work here; psychological, cultural, and political factors are likely at play (Norgaard 2009).
2. Indeed, a number of studies (notably Small, Loewenstein, and Slovic 2005) find that when people are shown that specific individuals are suffering, they are more likely to be generous, seemingly contradicting the findings by Iyengar (1990). The frames that motivate personal generosity may be distinct from those that motivate support for public action.
3. For more on the concept, see Davis and others 2012.

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Promoting water conservation in Colombia

Behind every intervention lies an assumption about human motivation and behavior. When a tunnel providing water to the city of Bogotá, Colombia, partially collapsed in 1997, triggering a water shortage, the city government declared a public emergency and initiated a communication program to warn inhabitants of the threat of a crisis: 70 percent of the city would be left without water if current water use was not reduced.

The city's strategy was based on the assumption that if individuals were informed of the situation, they would adjust their behavior and reduce usage—after all, no one wants to be without water. But the assumption was wrong. In fact, the city's strategy *increased* water consumption. Many people did not change their behavior because they did not think they could make a difference and did not know which steps were most important. Some people even started to stockpile water.

Recognizing the mistake in its assumptions, the city government changed its strategy (Guillot 2014). First, the government reminded people to take action by conserving water at times when they were most likely to overuse it. Stickers featuring a picture of a statue of San Rafael—which was the name of the emergency reservoir the city was relying on after the tunnel collapse—were distributed throughout the city. People were asked to place a sticker by the faucet that a particular household, office, or school used most frequently. The stickers made the need to conserve water at all times salient. Daily reports of the city's water consumption were prominently published in the country's major newspapers. The reports became a part of public discussions about the emergency.

Second, the city government launched engaging and entertaining campaigns to teach individuals the most effective techniques for household water conservation. The campaigns contained memorable slogans and organized 4,000 youth volunteers to go throughout the city to inform people about the emergency and teach them effective strategies to reduce consumption (*Formar Ciudad* [city development plan], 1995–97). The mayor himself appeared in a TV ad taking a shower with his wife, explaining how the tap could be turned off while soaping and suggesting taking showers in pairs. Catholic priests were explicitly asked to invite their communities to join the cooperative efforts, which, in a religious country, proved to be particularly effective.

A change in strategy, building on conditional cooperation, helped create a new social norm to conserve.

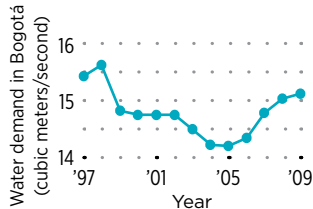
Third, the city government publicized information about who was cooperating and who was not. The chief executive officer of the water company personally awarded households with exceptional water savings a poster of San Rafael with the legend, "Here we follow a rational plan for using the precious liquid." These awards were made visible in the media. Three months later, when a second tunnel collapsed in the reservoir, the city imposed sanctions for *despilfarradores* (squanderers), those with the highest levels of overconsumption. While

Figure S5.1 The story of Bogotá's 1997 water supply crisis

In January 1997, a tunnel connecting Bogotá, the capital of Colombia, to its main supply of fresh water partially collapsed, leaving the city dependent on a small emergency reservoir.

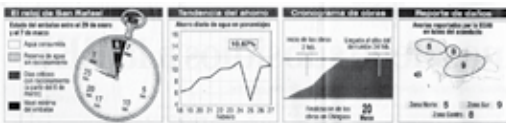
An emergency was declared.

Water consumption at first increased as citizens stockpiled water. Eventually, the city's strategy led to a decrease in water consumption. Water consumption then stayed low for several years.



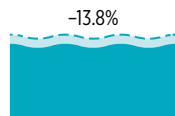
Mayor Antanas Mockus launched measures to change conservation norms among citizens.

Daily reports in newspapers became references for public discussion and featured personal experiences of citizens' conservation efforts. The mayor even showered with his wife in a TV ad to demonstrate a water-reduction strategy.

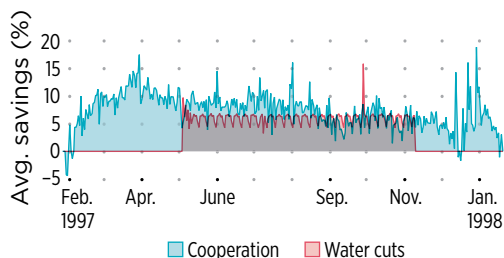


Source: *El Espectador* (Bogotá), February 28, 1997, A6.

Citywide water savings peaked at 13.8% after 8 weeks.



Per capita water usage remained lower than precrisis levels for more than a decade even when water cuts were implemented after a second tunnel collapsed. This suggests that the new social norms around conservation persisted over time.



the sanctions were minor—squanderers had to participate in a water-saving workshop and were subject to an extra day of water cuts—they were nevertheless effective because they targeted highly visible actors. Car-washing businesses, although collectively not a major source of water waste, were the primary targets.

The assumption underlying the new strategy was that conservation would improve if the city created a greater scope for social rewards and punishments that helped to reassure people that achieving the public good—continued access to water—was likely (see chapter 2 for a fuller discussion of the dynamic of conditional cooperation, which may have undergirded the success of the city's revised strategy). This time, the assumption was correct. The change in strategy helped to create a social norm of water conservation. By the eighth week of the campaign, citywide water savings had significantly exceeded even the most optimistic technical predictions. Moreover, the reductions in water use persisted long after the tunnel was repaired and the emergency had been addressed (see figure S5.1).

This case study from Bogotá provides a real-world example of how interventions that take into account conditional cooperation may be useful for achieving policy goals.

Reference

Guillot, Javier. 2014. "Achieving Long-Term Citywide Cooperation in Water Consumption Reduction: The Story of Bogotá's 1997 Water Supply Crisis." Background note prepared for the *World Development Report 2015*.