PURDUE CLIMATE CHANGE RESEARCH CENTER

PUBLIC ATTITUDES AND BEHAVIOR ABOUT CLIMATE CHANGE

What Shapes Them and How to Influence Them

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SUMMARY

If our society is to slow, and perhaps even reverse, the slide toward calamitous climate change, we must mobilize the widest possible public support for effective action. To do this effectively, we need to understand the bases of public attitudes and behavior that bear on the problem. This report reviews research findings concerning attitudes and behavior relevant to climate change. It then presents some of the possible implications of this research for strategies to engage more people to care about and to act to mitigate undesirable climate change.

Research findings show that people are more likely to act to preserve the environment – and specifically to combat climate change: a) the more they see such actions as bringing net benefits to themselves, society, and the natural world; and b) the more they get more emotionally aroused – feeling fear, anger, etc. – at the present reality and future dangers of environmental threats. People form such judgments and emotions in the context of their values – for example, whether they give priority to moral or to utilitarian outcomes. Thus, messages providing information about the consequences of climate change need to be framed in the context of those values that are central to particular audiences.

Providing people with information that arouses their concern about the dangers of climate change is not likely, in itself, to stimulate effective action. For concern to translate into action, people must see themselves as sharing personal responsibility for the problem and must be informed about specific actions that they can take and support to counter climate change.

Organizations and communities can encourage positive initiatives by creating opportunities and incentives for individual action. They also can make individual efforts a part of broader social efforts of the community, work organizations, religious groups, etc. so that individuals have the support and encouragement of neighbors and friends as they attempt to preserve their environment.

INTRODUCTION

Scientists around the world overwhelmingly agree that recent human activities that release large volumes of several gases (especially carbon dioxide) into the atmosphere have been causing changes in the earth's climate. Climate changes include warmer air and sea temperatures, changed patterns of precipitation, and more intense weather events (such as storms and hurricanes).[1]

Some of these climate changes are already having, or are likely to have, effects that can cause serious harm to humans and to the planet – including rising seas that can flood low-lying areas, droughts, increased disease, and extinction of many animal species. [2]

That climate change is occurring as a result of our actions, and that it is bringing serious dangers, urgently calls for us, as a society, to change our behavior. Many people in this country and around the world – scientists, environmental activists, some political leaders, and many ordinary citizens – are, in fact, trying to bring about relevant changes in policy and in behavior. However, a great many people seem to be little concerned about climate change and little inclined to take personal actions, or to support policies, that can counter such change.

To have the greatest chance to slow and perhaps even reverse the slide toward calamitous climate change, we need to mobilize the widest possible public support for effective actions. And to do this effectively, we need to understand the bases of public attitudes and behavior.

Why do some people show concern about climate changes, support public actions to counter undesirable climate changes, and even take personal actions to try to counter such changes? Why do many others have little concern about and take or support little action on this matter?

Since climate change has become a topic of public discussion in the last few decades, a considerable number of studies have examined the influences on people's attitudes and behavior relevant to climate change. Personal pro-environmental behavior (such as reducing energy use in the home) and support for "green" policies (such as higher fuel standards for cars) have been shown to be affected by a variety of factors. These include: worldviews, such as those about the relation of humans to nature; perceptions of personal and social risks; political philosophy; knowledge; the personal discomfort of given actions; the perceived efficacy of one's actions; perception of personal responsibility; social norms; and many other influences.[3]

While these studies are very useful in helping to build our knowledge base, some limitations remain to our understanding of attitudes and behaviors concerning climate change. As Bamberg and Schmidt note with respect to the broader literature on determinants of environmental behavior, "often it remained unclear how these factors relate to each other".[4] They note, too, the desirability of using theoretical frameworks to organize and relate specific research findings.

In this report, I review research findings concerning attitudes and behavior relevant to climate change within a social psychological framework. My review has been extensive but it is limited to materials in English and is not necessarily exhaustive of all work in the area.[5] Although most of the research is recent, the reader should keep in mind that the distribution of opinions on a specific issue (e.g., the percentage who favor higher mileage standards for cars), may change over time. However, the influence of various determinants of attitudes and behaviors (e.g., the influence of values and of social norms) may be expected to be more constant over time.

Following the review of research findings, I present some of the possible implications of this overview for strategies to engage more people to care and to act about undesirable climate change.

THEORETICAL FRAMEWORK

Models Used to Explain Environmental Behavior

Several theoretical frameworks drawn from social-psychological work on the relationship of attitudes to behavior have been applied to behavior that affects the environment.

These theoretical approaches emphasize one or more of the following:
- The person weighs the consequences of her behavior and acts so as to get the best outcomes. [6]
- The person appraises the situation, which leads to emotional reactions and then to actions appropriate to those emotions. [7]
- Feelings of moral obligation (personal norms) that a person holds for herself shape her behavior. [8]
- A person's well-established habits usually determine her behavior. [9]
- Environmental awareness, personal values, emotions, and perceived control combine to determine behavior. [10]

One or more of these theoretical approaches has been used, with some success, to explain participation in recycling and waste management programs; the use of cars versus

public transportation; the voluntary use of catalytic converters by drivers; and other environmentally-relevant behaviors. [11]

Some researchers have pointed out the similarity and compatibility of concepts used in separate models. They have drawn on several social-psychological frameworks in their own work on environmental behavior and have advocated the use of "comprehensive and integrated" models. [12]

Model Used Here

In this review I use a broad theoretical model as a framework within which to present and interrelate research findings concerning people's attitudes and behaviors bearing on climate change. The model includes a variety of possible determinants of behavior and shows also how these determinants relate to each other. Figure 1 presents the model.

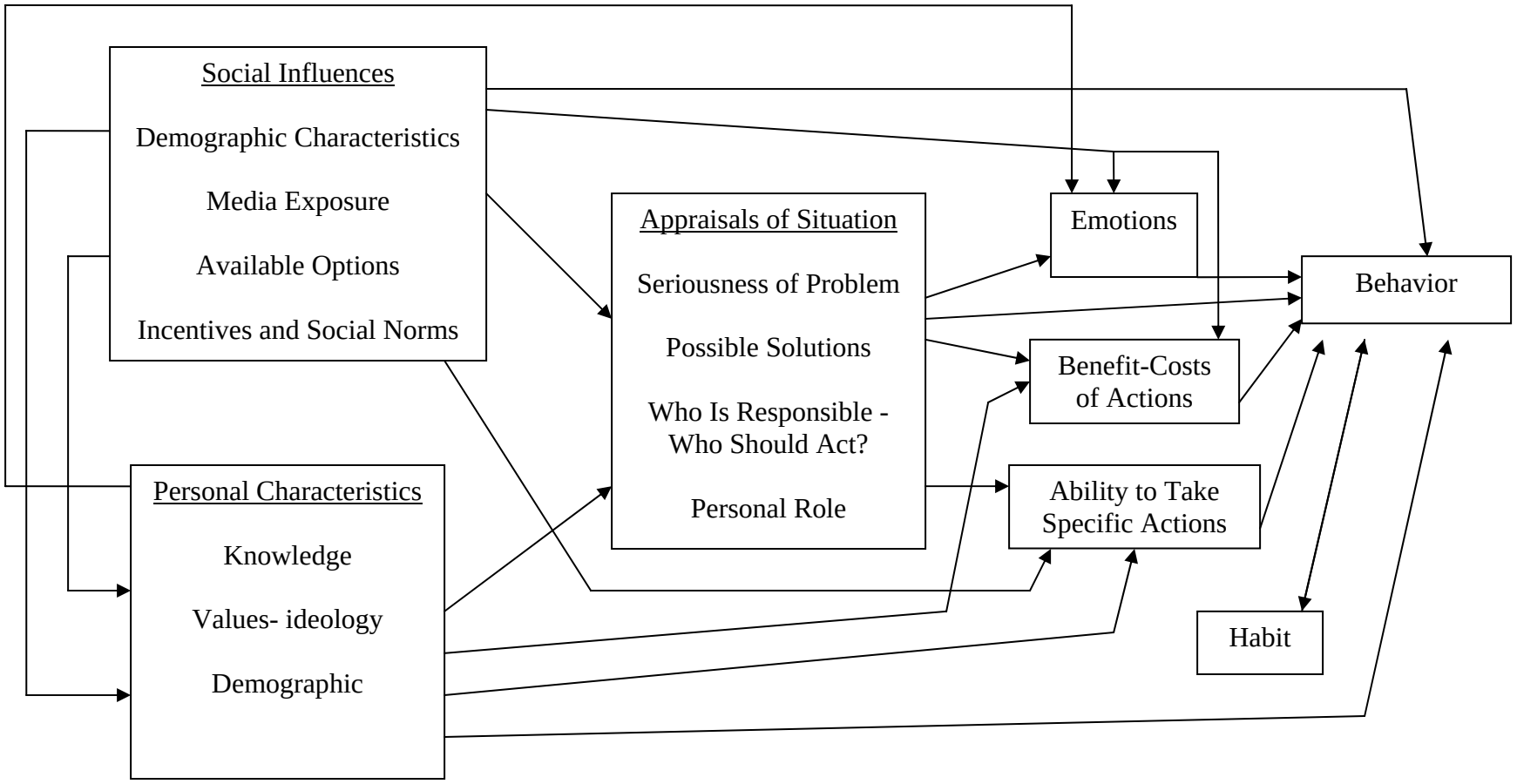
Figure 1 indicates that a person's environmentally-relevant behavior at a given time is affected most directly by: a) his emotions (concern, anger, shame, etc.) about the conditions of the environment; b) the expected benefits and/or costs of specific actions; c) his perceived ability to take specific types of actions; and d) his habits with respect to various actions.

These variables are likely to be affected, in turn, by his appraisals of the situation (the seriousness of environmental problems, what others are doing, the effectiveness of alternative actions, etc.). For example, a person who believes that climate change will bring flooding to his coastal city is likely to be fearful about this prospect. Appraisals of the situation may also affect behavior directly. For example, a person who believes that reducing the use of oil is a good way to fight global warming is more likely to buy a hybrid car than someone who (mistakenly) thinks that equipping industry with more pollution controls is the best answer to this problem.

A person's appraisals of the situation are likely to be influenced by her personal characteristics and by the social influences to which she is exposed. For example, her knowledge about the environment may affect her view of the seriousness of environmental problems and the norms of people with whom she associates may influence her appraisal of her own responsibility for helping to solve such problems.

Personal and social influences also may affect the person's emotions, expected benefits and costs, and perceived ability to take specific actions. For example,

Figure 1. A Model of the Determinants of Behavior Relevant to Climate Change



geographic location may affect the availability of social channels for action; age may affect one's ability to take certain actions (e.g., to bicycle rather than ride to work); economic position may affect the tax benefits of getting a solar heating system.

A person's personal characteristics and the social influences to which he is exposed also may have some direct effects on his behavior. For example, a person whose city provides a convenient recycling procedure and whose neighbors express their approval of this program is more likely to recycle than someone for whom recycling is inconvenient and whose neighbors ignore the matter.

Figure 1 also shows that a person's behavior relevant to climate change, like her other behavior, is affected directly by habit. For example, despite having heard that riding a bus to work is cheaper and less stressful than driving, a person who always drives her car to work may tend to repeat this behavior, almost without thinking. Habits are formed by repetition of the same behavior. Therefore, the same factors (emotions, appraisals, etc.) that affect behavior will, in the long run, affect habits.

In the following sections, I will discuss research concerning attitudes and behavior relevant to climate change, using the model of Figure 1 as a guide. I will start with the variables on the right side (emotion, expected benefits, etc.) and then move progressively to variables further to the left of the diagram (i.e., to partly indirect influences on behavior). In each case, I will present evidence relevant to that variable, as it relates to environmental behavior and to related variables. My aim is not to try to test the model. Rather, the model is used as a way to organize research findings on this topic in a meaningful way.

BENEFITS AND COSTS OF ACTIONS

Like almost all behaviors, behavior that impacts the environment is directly affected by the actor's perception of the rewards and costs that may result. Possible outcomes may benefit (or harm) the individual, those close to him (such as his family), or a wider social group (his city, region, country, the world). Benefits and costs may be material (e.g., money), social (e.g., approval), or psychological (e.g., satisfaction from living up to one's values).

There is consistent evidence that people's willingness to take specific environmentally-helpful actions or support specific pro-environmental policies declines as the amount of sacrifice connected to the action or policy increases. One national study of Americans found that large majorities said they would be likely to take actions (such as "choose a car that gets good mileage" or "install more insulation and weatherize" home and apartments) that were likely to save them money, while most said they were not likely to take actions (such as "car pool and drive less by using trains and buses more

often") that would be personally inconvenient or cause discomfort.[13] This same study found that the more that Americans believed that measures to protect the environment will threaten their jobs or personal freedom, the less likely they were to take voluntary pro-environmental actions or to support pro-environmental policies.

Another study of Americans also found that people were much more likely to support policies that had no clear costs to them personally. For example, while 77% of respondents supported regulating CO_2 as a pollutant, only 17% supported a 60 cent tax on gas[14]. The impact of personal costs also is apparent in a Detroit Edison program, in which users paid a price premium to have part or all of their electricity supplied through non-polluting sources. Higher income and smaller household size were significant predictors of program participation.[15] Clearly the extra cost was a greater burden to those with smaller income and/or larger families.

Members of focus groups in Switzerland generally saw a world of low energy use as being more attractive than one of high energy use.[16] However, almost no one in these groups was prepared to take the kinds of personal actions (e.g., using public transportation) needed to achieve a large (30-50%) reduction in society's energy use. Among the reasons for this reluctance was unwillingness to abandon their present level of consumption and comfort. "You have to give up quite a bit of your comfort," one group member said. The researchers comment: "Participants found it too difficult to accept that any personal sacrifices would be worth the social gain."[17]

An in-depth study of selected groups of Americans and of a group drawn from the general public found that most Americans believed that we should follow a less materialistic way of life and that a reduction in consumption is necessary in order to prevent global climate change. However, large majorities were opposed to drastic measures that would "shut down" society.[18] The researchers also found that high taxes on gas were seen by many as unfair and that energy efficiency was usually seen as involving sacrifice. They urge that advocates of energy reduction should make clear that increasing energy efficiency does not necessarily involve making sacrifices but, rather, may have economic environmental benefits for both individuals and society.

The perceived benefits and costs that influence individuals' actions may be social as well as personal. People who volunteered to participate in a Detroit "green electricity" program (at increased personal cost) were asked to rank order a number of possible reasons for their actions. Social benefits ("improve the health of natural ecosystems" and "benefit residents of southeastern Michigan") ranked first and second, respectively, while positive effects of the program on individuals ("my health and the health of my family") ranked third, among five reasons listed.[19] However, as other research has found, most people must see social benefits as larger than their personal sacrifices in order for such social benefits to influence their actions.[20]

EMOTIONS

How people behave with respect to the environment is determined by more than a rational assessment of the benefits and costs of their actions. As with many other behaviors, what people do often is affected by their feelings or emotions. Knowing what damage is being done, or threat created, to the air, water, climate, etc. or perhaps, on the other hand, perceiving damage or threat to them from "treehuggers" or "environmental extremists", may lead to fear, anger, sadness, shame, guilt, or other strong emotions that help to motivate people's actions. In a recent national poll, over one in three Americans said that they worry "a great deal" about climate change.[21] To the extent that such responses reflect genuine emotions, these persons may take some actions to combat climate change.

There is evidence that emotions about environmental issues do affect behavior. From among a random sample of the residents of Berne, Switzerland, three hundred ninety-eight people completed a questionnaire in which they indicated whether they had taken each of twenty-one environmentally helpful actions. They also were asked a series of questions that assessed: 1) the amount of discrepancy between their own specific behaviors and the behavior they considered appropriate or ideal; and 2) their emotional reactions to environmental damage (e.g., "I am upset that people are destroying the earth's climate"). The index of environmental behaviors was related significantly to their emotional reactions (affect) and to the perceived discrepancy between their real and ideal actions (that presumably aroused some feelings of guilt). When other factors affecting behavior were included in a larger empirical model, people's emotions about environmental issues had one of the largest effects on behavior.[22]

A laboratory experiment conducted among adults in the Netherlands showed participants alternative videos about the effects of climate change that provided the same information but that differed in vividness and use of dramatic images, thus inducing either moderate fear or low fear among the adults who viewed them. Participants then read a message recommending use of a new type of energy-efficient light bulb as one way to preserve the environment. Those who saw the moderate fear-inducing video – and thus became more fearful about the effects of climate change – were more likely than those who viewed the low-fear video to form a favorable attitude about using energy-efficient bulbs and to say that they would buy such bulbs immediately if possible. These differences in the effects of fear-level were especially marked among those whose initial level of concern about climate change was low.[23]

In Los Angeles, researchers asked a group of college students, members of an environmental organization, and a group of adult residents with limited education, a series of questions about their behavior on environmental issues (e.g., "I have switched products for ecological reasons."). They also asked respondents about their feelings on

environmental issues (e.g., "It frightens me to think that much of the food I eat is contaminated with pesticides"; "When I think of the ways industries are polluting, I get frustrated and angry"). Scores on an index of affect (for all respondents combined) were correlated fairly strongly with their scores on the index of environmental behavior.[24]

A researcher in Germany found that emotions elicited by a series of environmental risks clustered into four factors. In order of their intensity, these are: 1) prospective consequence-based emotions of fear, hopelessness, hope, and worry; 2) ethics-based, other-related emotions, including disgust, contempt, outrage, anger, and disappointment; 3) retrospective consequence-based emotions – especially regret, sadness, and sympathy; 4) ethics-based self-related emotions of guilt and shame. The researcher found that the type of emotion evoked is related to cognitive judgments about each risk (personal responsibility and control, moral blame for the risk, threat to humans and how soon the consequences will occur). Risks that resemble each other in terms of such characteristics evoke similar types of emotions. For example, industrial pollution of water and air tends to evoke anger while risks brought about by the activities of individuals, such as air pollution from cars, tend to evoke guilt or shame.[25]

The kinds of emotions that particular environmental risks evoke influence the kinds of relevant actions that people may take. Nerb and his colleagues found that when a risk is controllable, it induces more anger and willingness to boycott the responsible agent. Sadness is more likely to lead to helping those impacted by environmental events.[26] Fear often leads to actions intended to ward off the threat. However, it is important that messages that arouse fear also convey specific effective actions that may be taken to counter the danger. Otherwise, fear may lead to denial and/or avoidance of thoughts about the subject.[27]

APPRAISALS OF THE SITUATION

The emotions that a person experiences with respect to a given situation, as well as the benefits and costs that he expects to follow certain actions, are strongly influenced by his appraisals of the situation (as Figure 1 indicates). The most important appraisals of a possible environmental problem are those that bear on the following questions: 1) How serious a problem is this? 2) What actions are possible to deal with the problem and how feasible are these actions as solutions? 3) What are other people and societal institutions doing? 4) Who bears responsibility for creating the problem and for dealing with it? 5) Do I (and other actors) have the ability to take relevant actions? 6) To what extent are my actions (and those of others) likely to be effective?

Let us consider how these appraisals are related to behavior that affects the environment.

How Serious the Problem Is

Disturbing emotions about an environmental situation, and the expectation that relevant actions will bring more benefits than costs, depend first on the assessment that a serious problem exists. Stoll-Kleeman and his colleagues, writing about many people's reluctance to take action to mitigate climate change, note that "denial in the face of political and moral exhortations to change behavior" may be fostered, in part, by "a lack of acceptance that the climate problem is as serious as made out…"[28]

How aware are people about the occurrence of global climate change and how serious do they think this matter is?

Most Americans, as well as people in other countries surveyed, do think that global warming has begun. A recent national poll found that 56 per cent of Americans believed that global warming is occurring.[29]

However, 40 per cent remained unconvinced. And despite the existence of a strong consensus among scientists on the reality of global warming, a substantial proportion of Americans (39%) in another recent survey agreed with the statement "scientists are divided on the existence of global warming" rather than with a statement that indicated consensus among the great majority of scientists.[30]

A majority of people in most countries, including the United States, thinks that climate change is an environmental problem that needs to be addressed. Among Americans, 29 per cent in a recent survey endorsed the statement "climate change has been established as a serious problem and immediate attention is necessary"; another 30 percent agreed that "there is enough evidence that climate change is taking place and some action should be taken".[31]

Moreover, recognition that global warming is a very serious problem has risen recently around the world. In sixteen countries survey respondents rated the seriousness of global warming as a problem in 2003 and again in 2006. In fourteen of the sixteen countries, including the United States, a higher percentage of people judged the problem as "very serious" in the latter year.[32]

But while most Americans recognize climate change as a significant problem, the issue has not been among the top concerns of most. Asked to rate the importance of various issues, 44 per cent of Americans rated global warming as "very important". However, this amount of concern was lower than that for seventeen of the other issues listed, including education, the economy, health care, abortion, the inheritance tax, and flag burning. (Only the issue of gay marriage aroused less concern.)[33]

Nor has the issue of climate change been seen by most Americans as having great personal relevance. While most Americans see global warming as a serious problem, only one in five said that they were personally concerned "a great deal" about this problem. (Another one-third said they had "a fair amount" of concern.)[34]

Americans express less concern about global warming than do those in other countries. People in thirty countries around the world were asked in 2003 and again in 2006 how serious a problem they judged climate change to be. While the proportion of Americans who judged the matter as "very serious" rose to about half in recent years, concern in the U.S. was less than that in twenty-four of the twenty-nine other countries. Americans had the highest percentage of people in any nation (more than one in five) who thought that the problem of climate change was not serious.[35] In another recent survey conducted in fifteen countries, Americans expressed least personal concern about global warming.[36]

Following the major hurricanes of 2005, only a minority of Americans (39%) thought that climate change was to blame.[37] Earlier surveys found that some Americans thought that global warming was likely to lead to starvation and food shortages in much of the world, higher rates of serious disease, and richer nations having to donate money to poorer nations. But only a minority of Americans expected each of these negative effects. And about one in four Americans thought that global warming would cause their area to experience <u>better</u> weather.[38]

Substantial percentages of Americans did think that negative societal effects (food shortages, disease, etc.) were likely elsewhere in the world. Bord and his colleagues have commented: "One striking finding…is the degree to which negative outcomes for others are judged as more likely than negative outcomes for the respondents."[39]

Why have most people <u>not</u> seen climate change as a more serious threat than they have actually seen it to be? Judgments of risk are based on three elements: potential losses; the significance of those losses; and the probability that such losses will occur. Judgments of potential losses and their significance (which in combination may be called their magnitude) rise as the losses involve more people and greater suffering; are longer-lasting and less reversible; are more personally relevant; are morally reprehensible; and any accompanying benefits are fewer.[40]

The potential losses will be judged to be more probable when people receive more supporting information that they trust, when the problem is seen as less controllable, and when they experience (directly or indirectly) memorable events, such as a long interruption of electricity or strong hurricanes, that they interpret as a visible forerunner of further potential losses.[41]

Does the phenomenon of global climate change have characteristics that, for most people, would make it appear to pose a substantial threat? In some ways, yes, in other ways, no. Climate change may lead to substantial suffering to a large number of people around the world (from drought, flooding, storms, disease, etc.). Its negative effects are likely to be long-lasting and difficult, if not impossible, to reverse. To some people, permitting environmental changes that damage society and the natural world is a moral as well as a practical evil.

On the other hand, climate change is a somewhat abstract phenomenon that is not directly observed; leads to few dramatic or memorable experiences (direct or vicarious) that are clearly tied to climate change; involves losses that may be fairly distant in time and/or may not be personally relevant; and may bring some benefits (e.g., a longer growing season in cold climates) as well as losses.[42]

Even when people recognize that environmental changes may have serious risks, the potential losses may be considerably delayed in time while the harmful individual behaviors that contribute to these threats are likely to bring immediate benefits (personal or social). Thus, it often is easy for people to ignore or "discount" these future consequences.[43]

Judgments of Seriousness and Behavior

Do people who recognize the seriousness of environmental problems behave in a more environmentally responsible way? Certainly, this is not always the case. For example, despite the fact that a large majority of people in Britain say that climate change is a serious problem, only a tiny minority of the British have bought fuel-efficient cars or say they try to use their cars less than before.[44] The same is undoubtedly true in the U.S. and many other countries.

However, there is evidence from studies in several countries that the more that people view environmental problems (including climate change) as serious, the more likely they are to take appropriate actions. For example, Nordlund and Garvill asked a sample of 2500 registered car owners in five Swedish cities several questions about their willingness to reduce car use to help reduce environmental problems. Respondents also were asked to what extent they believed car traffic caused air pollution, noise, and high energy consumption and to rate how serious these problems are. Among a number of possible predictors of willingness to reduce car use, respondents' overall judgments of the seriousness of environmental problems caused by traffic had the strongest impact.[45]

Grob compared the perceptions and attitudes of a group of drivers in Berne, Switzerland, who had equipped their cars with catalytic converters with those of a group of drivers who had not done so (during a period where such action was optional). While

the two groups did not differ in factual knowledge about the environment, the "green" drivers were significantly higher in their recognition of environmental problems.[46]

Adults in Virginia, chosen from a random sample, answered a series of questions that assessed their beliefs about possible negative consequences that environmental pollution, or other environmental changes, might have for the respondents themselves, for people in general, and for non-human species and the biosphere. They also were asked about their willingness to take a variety of actions to protect the environment. The more that people saw negative consequences of environmental changes, the more willing they were to act to improve the environment (e.g., boycott products of a company that pollutes, pay higher taxes).[47]

A random national sample of Americans was asked about their willingness to take a number of voluntary actions to combat global warming (e.g., drive less and use less heat and air-conditioning) and also to vote for a number of relevant measures (e.g., a 60¢ rise in gas taxes, a mandatory increase in auto fuel efficiency). They also were asked their opinions on seven possible consequences of a rise of 3 degrees Fahrenheit in average annual temperature over the next 50 years (e.g., that starvation and food shortages will occur in much of the world; that rates of serious disease will increase). The more that people saw bad consequences as resulting from global warming, the more willing they were to take voluntary action and to support legislation to counter climate change.[48]

People may be willing to act to counter the negative consequences of environmental changes that affect them personally, affect a larger social unit, or affect the biosphere. Perceptions of greater personal risk or threat (e.g., to the health of oneself or one's family) have been shown to increase people's willingness to take pro-environmental actions.[49] So, too, may perceived threats to society or to the biosphere influence action. For example, Swedes were more willing to reduce their personal car use when they saw pollution and high energy consumption as a threat to humankind and to the biosphere.[50]

Concern about threats to other people and to the biosphere may sometimes have a greater impact on behavior than concern about one's own personal welfare. For example, one study found that pro-environmental behaviors of college students (e.g., recycling newspapers, buying products in reusable or recyclable containers) were related much more strongly to their biospheric concerns (i.e., for birds, marine life, etc.) than to egoistic concerns (e.g., my lifestyle, my health, etc.)[51]

Overall, then, people tend to take some action to avoid threats of negative environmental events that they believe to be serious and probable. And people around the world, including those in the United States, generally see some threat from global warming. However, their concern about this problem appears to have been less than their

concern for other environmental problems and much less than for other societal problems. Bord and his colleagues comment that "global warming's relative standing [in judgments of "seriousness"] must raise further questions about how deep public fears really go."[52]

Ways of Dealing with Climate Change

For people's concern about climate change to result in useful action, they must be able to identify some actions that may help to alleviate the threat. Bohm and Pfister comment: "…research has shown that pro-environmental behavior requires that [people] see behavioral options that they assume to be efficient."[53]

Waiting for More Evidence

While some people have questioned the need for action now, pending more evidence of serious effects from climate change, the option of waiting for more evidence seems to be rejected by most of the public in the U.S. and elsewhere. In their interviews with members of environmental organizations, people in industries (dry cleaners and sawmill workers) affected by environmental regulations, and the general public in the U.S., Kempton and his colleagues found that few environmentalists, and only small proportions of the other groups, endorsed "wait for more evidence" strategies. For example, no environmentalists and only 20% of dry cleaners, 22% of sawmill workers, and 21% of the public agreed with the statement: "Scientists are just speculating about global climate change. We shouldn't take actions until they have proof." Large majorities in all of these groups agreed that "we should have started dealing with the problem of global climate change years ago."[54]

However, a sizeable minority of Americans prefers to delay any action. In a recent national poll about climate change, 28 per cent of Americans surveyed agreed that "More research is necessary before we take any actions".[55]

Technological Fix

Some people have hoped that new or future technology will rescue us from climate change effects. Proposals of this type have been and continue to be made. [55A]

The study by Kempton and his colleagues found that most people in all of the groups he studied rejected the idea that we can rely on technology to solve problems of climate change. Only 10% of their public sample, 13% of the dry cleaners, 15% of sawmill workers and 4% or less in two environmental groups agreed that "…Technology is developing so fast that, in the future, people will be able to repair most of the environmental damage that has been done."[56] Asked in a recent national survey whether technology can solve the problem of global warming without major sacrifices, only a

minority of Americans – though a fairly sizable minority (23 per cent) – thought that it could.[57]

Other studies have found that a belief in technological solutions to environmental problems tends to make people behave in less environmentally helpful ways. The study of a random sample of people in Berne, Switzerland found that a greater belief that technological progress will solve environmental problems contributed to less environmentally appropriate behavior in a wide range of domains (e.g., amount of energy used, separation of household refuse, using public transport).[58] Another study by the same researchers found (ironically) that Swiss drivers who chose not to use catalytic converters to reduce pollution emitted by their cars were more likely than "green drivers" (those using the converters) to believe that technology will solve environmental problems.[59] Another researcher also has stated that the belief in technological solutions contributes to behavior that is careless of the environment.[60] Such beliefs may be genuine and/or they may be a rationalization that absolves the individual of responsibility for the consequences of his actions.

Changing Lifestyles

Many environmentalists believe that, in order to avoid or at least reduce climate change, we need to change our lifestyles – to drive less, use less electric power, and generally live more simply. Are most people willing to do this? The answer seems to be yes, but only to a modest extent. For example, the study by Kempton and his colleagues found that most people (among sawmill workers, dry cleaners, and the general public, as well as environmentalists) agreed that "Americans are going to have to drastically reduce their level of consumption over the next few years." On the other hand, majorities in most of these groups (including those in the Sierra Club) said that, "We don't have to reduce our standard of living to solve global climate change or other environmental problems." Apparently most people thought that we can reduce our consumption without changing our standard of living.[61]

A recent national survey found that, among Americans who believe there is solid evidence of global warming, only a minority – though a substantial minority (29%) – think that we will have to make major sacrifices to solve the problem.[62] Actually, most Americans think that taking steps to combat climate change will bring positive benefits eventually. In another recent survey, 71 per cent endorsed a statement that steps to reduce greenhouse gas emissions will help the U.S. economy to "become more competitive…in the long run".[63]

Some recent surveys in the U.S. and in Britain indicate that most people are willing to make some small financial sacrifices in order to reduce greenhouse gas emissions – such as paying slightly more for energy (U.S.)[64] or paying several hundred

dollars o make their homes more energy efficient, even if this brought them no cost saving (Britain)[65].

But after reviewing surveys in the United States and other countries, Bord and his colleagues state, "Although surveys…almost overwhelmingly indicate willingness to pay and sacrifice for environmental goals, this support has limits."[66] They point, for example, to the reluctance of most people to reduce their driving or to pay higher costs for gasoline. They conclude, "Our interpretation of existing data is that, all things being equal, a majority of citizens in most countries will support national and international initiatives designed to cope with global warming as long as these initiatives do not demand a significant alteration of lifestyle."[67]

Support for Policies to Limit Global Warming

Most people endorse policies that they are told will reduce global warming. In a recent national survey, Americans were asked, "Do you think the United States should reduce its emissions of the greenhouse gases (carbon dioxide, methane, etc.) that are said to cause global warming?" Ninety per cent said, "Yes." Similarly, when told that carbon dioxide is said to be causing global warming and that it is not regulated as a pollutant, 77% supported such regulation. However, when reacting to proposals that may have a more direct personal effect, support declines. A much smaller majority (54%) approved of a 5% "gas guzzler" tax on cars, trucks and sport utility vehicles that get less than 25 miles per gallon. Over three quarters (78%) opposed a 60-cent per gallon added gasoline tax "to encourage people to drive less and thus reduce carbon dioxide emission."[68] Other recent U.S. surveys also show strong support for more regulatory action, including stronger fuel efficiency standards for vehicles, but much less support for measures that would be personally costly.[69]

Among Europeans, as well, public support is greater for measures that do not directly require personal sacrifice. A recent survey of opinion on environmental problems in fifteen European countries asked people to choose up to three policies that "would make it possible to most effectively solve environmental problems". The most popular solutions were: 1) "making national/European Union regulations stricter, with heavy fines for offenders"; 2) "raising general environmental awareness"; 3) "better enforcement of existing environmental regulation"; and 4) "…taxing those who cause environmental problems".[70]

While many Europeans are willing to endorse penalties for and tax those who cause environmental problems, they are much more reluctant to shoulder the burden of environmental problems themselves. While 36% endorsed taxing "those who cause environmental problems," only 6% agreed with "making everyone pay more in taxes, prices, etc. to cover environmental costs."[71]

The fact that most people are willing to express an opinion when asked whether they approve or disapprove of certain policies to mitigate climate change does not mean that they have thought much, if at all, about possible solutions. Researchers asked a random sample of Seattle residents whether they had heard the terms "global warming" or "greenhouse effect"; how concerned they were about this matter; whether they had thought seriously about solutions to the problem; and whether they felt fairly sure about what actions should be taken. While 88% were aware of the phenomenon of global warming, only 18% had gone through the other stages of thinking this is a serious problem, thinking of solutions, and identifying effective solutions.[72]

A recent survey of Europeans indicates that they too are generally unclear about effective solutions. People in fifteen European countries were asked, "Do you feel that you know more about environmental problems or environmental solutions?" Only 7% overall said "solutions". (Seventy-three per cent said "problems".)[73]

Even when people offer solutions, these may be vague. A study of the views of a sample of Germans about global environmental risks found that "Many of the suggested remedies are remarkably unspecific. Respondents often merely state that a cause should be undone, e.g., reduction of ozone depletion…, without specifying how this could be accomplished."[74]

Relevance of Solutions Proposed

When people do offer, or endorse, solutions to problems of climate change, often they do not focus on the most appropriate or effective actions. Several studies have found that many people think that stopping the use of aerosol sprays is a good way to mitigate global warming. For example, 45% of respondents in the Seattle area thought that stopping the use of aerosol sprays would be very helpful in combating global warming.[75] Aerosol sprays emit CFCs, which have been a major cause of 'ozone holes' in the upper atmosphere but are a relatively minor cause of global warming. Many people seem to have confused these two effects. The public also seems to over-emphasize the importance of planting more trees in countering climate change.[76] (Although more trees help, their impact is much less than that of the amount of fossil fuel burned.)

Most significantly, perhaps, much of the public appears to apply a traditional "pollution model" to the problem of climate change, thinking that reducing pollution – in the sense of removing unwanted substances from emissions -- will combat global warming. For example, in a survey of Pittsburgh residents, most of whom were college graduates, one of the most frequently volunteered policies for mitigating global warming (31%) was "stop or limit pollution".[77] Most of those who have this idea do not realize that, while many industrial pollutants (e.g., those that cause acid rain) can be removed in

industrial processes, there is no current practical technology for removing the principal gas that causes global warming – i.e., carbon dioxide.

On the other hand, the public – in the United States at least – seems to pay insufficient attention to those solutions to climate change that experts say would be most effective – especially energy conservation and energy efficiency. In semi-structured interviews with a small sample of the public, Kempton and his colleagues found that only two of twenty respondents cited any type of energy solution – energy conservation, energy efficiency, etc. – as a way to avoid global warming. The researchers comment: "Laypeople had a positive attitude toward energy efficiency and supported the one specific efficiency policy in the interviews—doubling of automobile MPG standards. However, energy efficiency was very poorly understood, and was rarely mentioned as a solution to global warming.[78]

They go on to comment that efficiency advocates need to link energy efficiency with environmental benefits and explain why, to counter global warming, energy efficiency is more effective than the usual type of pollution controls.

While most Americans may not spontaneously emphasize improving energy efficiency, they do appear favorable to such policies. A recent national survey found that, when given a choice of alternatives "to meet America's energy needs", a large majority (73%) chose to "expand the use of renewable energy sources like wind and solar power, strengthen energy efficiency standards for air conditioners, and build cars, minivans, and SUVs that get better gas mileage". Only a small minority (19%) favored "tax breaks to energy companies and utilities to build more coal-fired and nuclear power plants and increase drilling for oil and natural gas".[79]

To summarize this section, most people think that action is needed now to arrest climate change. They are, however, reluctant to make major changes in their lifestyles. Much of the public has only vague or mistaken ideas about the best ways to slow climate change and is not clear that greater energy conservation and efficiency (as well as the use of energy sources that do not emit CO_2) are keys to reaching this goal. But given a choice of ways to solve our energy problems, they are favorable to options that increase efficiency.

Who Is Responsible? Who Should Act?

If climate change is a serious problem, who do people think is responsible for it happening? And who do they think can and should take action to deal with this problem?

Government and Other Institutions

Several studies indicate that people often blame societal institutions, especially government, for climate change, and tend not to blame themselves. Members of focus groups discussing climate change in Norwich, United Kingdom, and Rome, Italy, commonly laid primary blame for inaction on politicians. Many in both countries also blamed business and the general public.[80]

In the United States respondents in a national survey saw a variety of actors as doing little to deal with climate change. Only 11 per cent of Americans surveyed thought that the U.S. government was doing "a great deal" or "quite a bit", while 4 per cent said this regarding foreign governments, 7 per cent regarding U.S. businesses and 5 per cent regarding average people.[81]

Most people think that governments and businesses should do more to help solve environmental problems like climate change. Asked "who you feel is responsible for doing something to deal with global warming," close to three-fifths of Americans questioned in a national survey thought the U.S. government, governments of other countries, and U.S. businesses all should do "a great deal" or "quite a bit", while 43 per cent said the same about "average people". Nearly half of Americans questioned in another more recent national survey thought the government should take immediate action to address global climate change.[82]

While most people would welcome effective action by governments and industry, there is a fairly widespread lack of confidence in these institutions. Britons discussing climate change in Norwich generally were cynical about the motives of public officials while Italians in Rome were especially concerned about government corruption.[83]

Most Americans interviewed in one study doubted that industry will voluntarily do much to help the environment because of their primary concern with profits. Further, most respondents thought that politicians often fail to act on the environment because of the power of industry lobbies.[84] Other, more broadly-based surveys in the U.S. also have shown low levels of trust by the public in both government and business.[85] Only scientists appear to have the confidence of the majority of the American public.[86]

Among Europeans, too, trust in government and business on environmental issues is low compared to trust in environmental protection groups and scientists. Citizens in fifteen European countries were recently asked, "Who do you trust when it comes to environmental issues?" and were given sixteen choices, with a maximum of three answers possible. Thirteen per cent chose the European Union, 12 per cent the national government, and 11 per cent the local government. Only 1 per cent chose "companies". But 48 per cent chose "environmental protection associations" and 35 per cent chose "scientists". (Various media and other groups received generally small support.)[87]

People's view of government influences their support, or lack of support, of possible public actions to protect against climate change. A national study of Americans' willingness to address climate change included several questions regarding how well government generally works (its efficiency, whether regulation of business does more good than harm, whether elected officials care what "people like me" think). The more that people viewed government as working well, the greater was their support of public policies to counter global warming (based on seven items, such as increasing fuel efficiency requirements and requiring thermostats to be set at energy-efficient levels). Positive views of government had a significant impact on support for public policies intended to counter global warming even with other perceptions and beliefs (e.g., knowledge and concern about climate change) held constant.[88]

While many people are suspicious of government regulation, viewing it as leading to bureaucracy and inefficiency, most of those questioned in one study in the U.S. did not believe that there "are too many environmental regulations right now" or that "regulation of business by government usually does more harm than good". In summarizing these results, Kempton and his colleagues comment that "government is seen as the only institution powerful enough to control industry".[89]

Political leaders in the U.S. sometimes may underestimate the extent of public support for government action to combat climate change. In a recent national poll, 71 per cent of Americans favored U.S. participation in the Kyoto Treaty to limit CO_2 emissions. However, although federal government leaders (executive branch officials and Congressional staff members) gave almost the identical amount of support to the treaty, only 38 per cent of the leaders recognized that the majority of the public also gave their support. Reviewing these and other data, Thomas Weaver comments: "There is evidence that many U.S. leaders remain unaware of the extent of public support for more action, and of public opposition to key U.S. government policies [on climate change] during 2001-2004."[90]

In at least some nations, substantial numbers of people look to organizations beyond their own borders, as well as to local and national governments, to protect the environment. A recent survey asked citizens in fifteen European countries which government level they think is the best for making decisions about protecting the environment. While 27 per cent chose "local government" and 30 per cent chose "national government", 33 per cent selected the European Union, 21 per cent chose the United Nations and 18 per cent chose "regional government".[91] In another study conducted in Norwich, UK and Rome, which focused on climate change, many respondents suggested that reliable information should be provided by a neutral, authoritative and independent body, which would also carry out needed measures.[92] Most of these respondents apparently were not aware that a body of scientists from many

nations (The Intergovernmental Panel on Climate Change) was established by the United Nations to reach consensus on relevant scientific findings.

Personal Role

Besides placing responsibility on government and other institutions, do people accept any personal responsibility for problems such as global climate change?

There is some evidence that people often feel uneasy that they have not taken any actions to deal with such problems. For example, participants in focus groups in Switzerland often indicated discomfort at the gap between their preference for a low-energy-use future and their own lack of personal action to help achieve this result.[93] One of the ways in which they often reduced their discomfort, the researchers in this study conclude, was to emphasize their own lack of blame or their own insignificance with respect to the problem. Similarly, a survey of Germans concerning global environmental risks found that "People either blame somebody else or feel there is nothing they can do. They do not assume personal responsibility…"[94]

While many people deny any personal responsibility for environmental problems like climate change, there appears to be a fairly widespread recognition that individuals do contribute to creating such problems. Asked whether there were any activities in either their personal behavior or in the community that contributed to climate change, almost two-thirds of respondents in Newcastle, Australia, mentioned community contributions, such as those from industry, traffic and power generation. About half of the respondents also acknowledged their part in these activities, such as participating in traffic, burning fossil fuel, and using electricity.[95]

Perception of Control. Taking action requires not only acceptance of the idea that one is contributing to a problem but also that one can do something about it.[96] A number of analysts have asserted that for people to be motivated to cooperate to deal with social problems, they must believe that their cooperation is relevant to the solution of these problems.[97]

People's perceptions about their ability to help solve environmental problems vary widely. Several studies have found that many people feel fatalistic about climate change and helpless to do anything about it.[98] Among the large majority of Americans who believe that global warming is occurring, over one in five (22 per cent) said in a recent survey that it is not possible to reduce the effects of global warming at all.[99] When Europeans were given a choice between two opposing statements concerning their own potential effect on the environment, almost half (43 per cent) of Europeans who were surveyed endorsed the statement "The environment is an issue beyond my control as an individual". However, an equal percentage of respondents chose the alternative response, "My actions can make a real difference to the environment."[100]

As we might suspect, people's judgments about their own ability to impact an environmental problem varies with the kind of risk involved. Thus, German respondents in one study rated "how much [they] can personally do about…" such risks as forest fires and radioactive contamination as low, while seeing themselves as having more personal control over air pollution from cars and consumption of fossil energy. They were more likely to feel guilt or shame about their actions (or inactions) with respect to risks over which they felt more personal control.[101]

Thinking that one's own behavior can make a difference tends to influence people's behavior that may affect the environment. Researchers asked high school students in three West Coast American cities about a variety of actions that may affect the environment (e.g., choosing household products that are better for the environment) and also about their perceptions of personal efficacy (on a variety of matters, including the environment). The more students had a sense of efficacy, the more likely they were to engage in positive environmental behaviors. For females, having positive attitudes about environmental protection affected behavior much more when students saw themselves as being able to affect outcomes.[102]

Personal or Moral Obligation. A person who recognizes that she is contributing to climate change may not be motivated to change her behavior unless she believes that it is her obligation to do so. Such beliefs may derive from two related factors: 1) personal views of what is right and wrong; 2) social norms concerning proper behavior. Researchers in Sweden obtained responses from over 1500 car owners in five cities concerning their use of different methods of transport and their views on environmental and other issues. They found that drivers' willingness to reduce their personal car use was related most directly to the extent to which they perceived less car use to be a personal moral obligation.[103]

The importance of social norms is illustrated in a study of German university students. Students were told that they could get a free booklet containing information about the use of "green" electricity (i.e., products using electricity produced from renewable energy sources). They were asked to fill out a questionnaire concerning their attitudes toward using this brochure. The questionnaire contained a detachable, post-ready card that could be used to obtain the brochure. Whether students detached the card from the returned questionnaire and whether they mailed it back were the behaviors of interest. Analysis of the results showed that students' beliefs that "people who are important to me" would think they should use this brochure was one of the strongest determinants of their expressed intention to use the information which, in turn, was a strong predictor of their behavior.[104]

Society and Personal Responsibility. In addition to the impact of social norms, other aspects of the social situation also affect people's feelings of personal responsibility and

their personal actions with respect to the environment. Particularly relevant are what the majority of other people are doing, what the government is doing, and what opportunities for action exist.

Many people are cynical about the readiness of most other people to change their behavior to be more helpful to the environment. For example, majorities of Americans sampled in one study agreed that "Americans are too spoiled to change their lifestyle."[105] Similarly, a study of public views on climate change in Newcastle, Australia, found that some people were deterred from taking helpful actions themselves by the perception that others were not doing the same. This perception was connected to the view that their individual actions "wouldn't be much good unless a majority followed suit."[106]

In their study of views about climate change in Britain and in Italy, the researchers concluded that people are less willing to translate their concern about this problem into personal action because they perceive "unwillingness of others to take action because of ignorance or lack of concern [and] the failure of institutions to provide leadership and effective legislation."[107] Those who believe that, in acting to help the environment, they would be relatively isolated rather than part of a large public effort, are likely to feel that they lack social support and that their lone efforts won't really matter.

Writing about Australians' views about possible personal actions to combat climate change, Harriet Bulkeley comments: "On the one hand the individual was seen to have a responsibility for morally sanctioned pro-environmental behavior, while on the other hand, such actions remained isolated from any community or institutional context… The problem appears to be not one of knowledge, but of belief in the efficacy of action and of trust in the willingness of others, in particular government and industry, to take their share of the responsibility."[108]

To sum up: While many people recognize that they, as individuals, make some contribution to climate change, denial of personal responsibility is widespread. Many feel that their own actions have no real effect on the problem. The more effective people think they can be, the more likely they are to act in environmentally helpful ways. Feelings of moral obligation also help impel actions intended to counter climate change. Feelings of personal responsibility and related actions are more likely when people perceive that their efforts are part of a broader effort in society.

PERSONAL CHARACTERISTICS

The evidence reviewed so far indicates that behavior that contributes to, or counters, climate change is affected by people's emotions and by the benefits they expect from their behavior, which are, in turn, affected by their appraisals of the situation. As Figure 1 indicates, all of these factors—behavior, emotions, expected benefits of

behavior, and appraisals of the situation—may be influenced by people's personal characteristics and by the social influences to which they are subject. This section focuses on the role of some key personal characteristics, specifically: 1) knowledge about the environment, especially climate change and 2) values and political philosophy.

Knowledge

How much do people know about climate change? And how, if at all, does knowledge affect their attitudes and behavior?

A number of surveys show that most people in the United States, in Europe, and elsewhere, are aware of the phenomenon of global warming. In a recent national survey, Americans were asked, "Have you ever heard of global warming?" Ninety-two per cent said that they had.[109]

Of course, amount of knowledge about the subject varies. When representative samples of Europeans in fifteen countries were asked how well they were informed about a number of environmental issues, 53 per cent said they felt "very well" or "fairly well" informed about climate change. A large minority thought that they were "fairly badly" or "very badly" informed.[110] Surveys in the United States and in other countries also found that large proportions of the public express little understanding of global warming[111] and little knowledge about relevant facts. For example, only a minority of Americans questioned in a recent national survey (43%) were aware that President Bush opposes U.S. participation in the Kyoto Treaty aimed at reducing global warming. [112]

How much do most people know about the causes of global climate change, its probable consequences, and possible remedies to counter such change?

The causes of climate change have not been well understood by a large part of the public. Adequate understanding of global climate change is made more difficult by particular characteristics of this phenomenon – e.g., its complexity, the invisibility of some factors (such as CO_2 in the air), its uncertainties, and the long time span of its greatest effects.[113]

While Americans generally agree that the earth is getting warmer, only about four in ten (41%) contacted in a recent survey thought that human activity such as burning fossil fuels is causing global warming to occur. (The rest said that warming is due to natural patterns, or that there's no solid evidence of warming, or that they don't know.)[114]

Global warming is caused by the release of several gases (including carbon dioxide, methane, and nitrous oxide) into the atmosphere. The largest impact comes from emissions of carbon dioxide. Carbon dioxide is released mostly through the burning of fossil fuels, such as oil, coal, and gas. Roughly half of people questioned in other U.S.

surveys knew that "fossil fuel use," "people driving their cars," and "the use of coal and oil by electric companies" are important causes of global warming.[115] However, both among those who do and those who do not recognize the significance of fossil fuel use, there has been a good deal of misunderstanding and confusion. Few people (only 13 per cent in one study)[116] have realized that heating and cooling of homes is an important contributor to global warming. Many erroneously have believed that "pollution" (in the form of visible substances) and/or depletion of ozone in the upper atmosphere are important contributors to global warming. And while deforestation is a contributor to global warming, its relative importance has been exaggerated by many.[117] In general, then, a large part of the public has not fully understood that global climate change is being caused primarily by the release of an invisible gas – carbon dioxide – into the atmosphere through the burning of coal, oil and gas.

Because they frequently lack accurate information about the causes of global climate change, often people offer only vague solutions to this problem or endorse solutions that are ineffective. Because many people do not know that energy conservation and energy efficiency (in the use of oil, coal, and natural gas) are the best ways to reduce the gases that produce climate change, they do not focus on these strategies as the best means to reach this goal.

How important is knowledge about the environment – and about climate change specifically – in producing environmental-friendly behaviors? A number of writers, who subscribed to "the information deficit model",[118] emphasized that the public needs to be given more information about environmental issues in order to ensure that they take appropriate action. More general analysts of behavior have pointed out that, without adequate knowledge, a person may not be confident enough to act or may not know how to achieve a goal.[119]

With respect to behavior intended to counter global climate change, there is some evidence that greater knowledge may help to produce appropriate behaviors.[120] One notable example of such evidence is found in a national survey of Americans. Each respondent's knowledge about climate change was measured by the number of accurate causes of climate change minus the number of inaccurate causes that he or she was able to identify. The greater people's knowledge about climate change, the more likely they were to say they were willing to take a number of positive actions (e.g., choose a car that gets good gas mileage). Also, the more knowledge people had, the more likely they were to vote in favor of a number of hypothetical referenda relevant to climate change (e.g., a higher tax on gasoline). The positive effect of greater knowledge on behavioral intentions occurred in this study even after a number of background factors (including education) and various perceptions and beliefs about the environment were held constant.[121]

While more knowledge sometimes has been found to contribute to positive environmental actions, evidence of such a link is far from consistent.[122] Harriet Bulkeley states that recent research "challenges the assumption that public confusion and an apparent gap between stated beliefs and action, arises from a 'deficit in public knowledge and understanding of environment issues'…"[123]

Bulkeley argues, on the basis of her own research in Australia, that knowledge is less important than social norms and social arrangements as a determinant of environmentally relevant behavior. Other researchers have pointed out that people interpret relevant facts in the light of their beliefs, other information (correct or not) they have, their worldviews (e.g., of the relation between nature and society) and the views of those in their social circles.[124] Thus, knowledge of the same facts may result in different levels of concern and different behavioral inclinations.

Overall, available evidence indicates that while knowledge about climate change may lead people to take action to counter such change, this result does not necessarily occur. The effect of information on behavior depends on the way in which it is understood and interpreted and the social context in which the individual is embedded.

Values

The perceptions, attitudes, and behavior of people with regard to the environment are affected also by their values – that is, by what goals or outcomes they value most.

The type of outcomes that a person values highly may be based on a general view of the world, often rooted in religion or religious philosophy. Historically, the dominant religions in the Western world have contained contrasting threads relevant to preservation of environment. One stems from the biblical direction from God that mankind shall "have dominion over" every living things on earth; thus man has been seen as having the right to exploit the natural world for his own benefit. Other Judeo-Christian doctrines emphasize our duties to love our neighbors and to be stewards of God's creation. These different perspectives continue to influence the views of both religious leaders and laymen concerning the environment generally and climate change in particular.[125]

Egoistic, Societal, and Biospheric Outcomes

Many studies have distinguished between three general types of values relevant to environmental issues and specifically to global climate change. People may give greatest importance to: 1) egoistic outcomes – ones that concern their own personal interests (and perhaps those of close kin), such as individual wealth and health; 2) social or societal outcomes – ones that affect the welfare of a community or society, such as economic growth or social harmony; 3) biospheric outcomes – ones that concern the health or preservation of the natural world, such as forests, soils, and non-human species.[126]

The relative priority that a person gives to these types of outcomes affects, first, her awareness of and concern about environmental problems. Studies in the United States and in Sweden have found that people who give great importance to the welfare of the biosphere and of the community are more aware of and more concerned about the consequences of environmental changes than are those who put greatest value on their own personal welfare.[127]

The values or goals that people emphasize also influence their norms about proper behavior, including that relevant to climate change[128] and, most importantly, often influence their actual behavior. People who give great value to the natural world – those who endorse survey items such as "It makes me sad to see natural environments destroyed" – are more likely than others to be willing to reduce their car use (Swedish study),[129] to take political or economic actions, such as boycotting a company that pollutes (Virginia study),[130] and to take a variety of other actions to help preserve the environment (multinational studies in Nicaragua, Spain, Peru and the U.S.).[131]

People also are more likely to take pro-environmental actions when they give great importance to outcomes for other people and society (for example, endorsing such items as "the thing that concerns me most about deforestation is that there will not be enough lumber for future generations"). The more importance a person gives to cooperation and to the welfare of others, the more likely he is to be willing to reduce his personal car use (Swedish study);[132] to prefer public transportation (study in northwestern U.S. city);[133] to participate in a "green electricity" program (Michigan study);[134] to join an environmental organization;[135] and to take other political and conservation actions intended to preserve the environment.[136]

In at least two studies, ecocentrism (i.e., valuing the natural environment highly) was found to be a stronger influence on pro-environmental behavior than valuing either societal welfare or self interest. For example, when Michigan students who participated in a "green electricity" program were asked to rank five possible reasons for doing so, "reducing air pollution from electricity will improve the health of natural ecosystems" was ranked highest in importance, followed by "… will benefit residents of southeastern Michigan." That "my health, and the health of my family, may improve because the program will improve air quality" ranked a distant third.[137]

The role of egocentric values (those that give prime importance to personal welfare) is mixed. Most relevant studies have found that placing greater value on personal outcomes either does not contribute to, or actually decreases, pro-environmental actions.[138] However, at least one study found that, along with social-altruistic and biocentric values, egocentric values contributed to pro-environmental behavior and that only egoism (awareness of consequences for oneself) predicted willingness to pay taxes for environmental protection.[139] Thus, it appears that while pro-environmental behavior

usually is motivated by concern about the natural environment and/or society, concerns about personal welfare may play a role if they are activated – i.e., when people see a direct impact of the environment on their personal welfare.

Outcomes that are important to people – whether they concern the self, society, or the natural world – also differ in several other ways. Outcomes may be valued because they are useful or because they are morally right. Valued outcomes may be material (e.g., wealth) or non-material (e.g., pleasure from viewing a beautiful landscape). They may be short-range or long-range. In addition to the types of outcomes they value, people also may value particular types of social arrangements by which decisions affecting outcomes are made.

Moral and Utilitarian Outcomes

People may react to and behave differently toward outcomes that they value primarily as morally desirable or undesirable as compared to outcomes they value in terms of their usefulness. Unrestricted use of environmental resources may be seen as either morally sanctioned (e.g., the view that God created man to have mastery over and use of nature) or as morally wrong (e.g., the view that because God created the natural world, it is wrong to abuse it). Similarly, unrestricted use of natural resources may be seen either as having great utilitarian value (e.g., for raising the current standard of living) or as hurting important utilitarian values (e.g., destruction of tropical forests may remove sources of new drugs).[140]

Thus, people may place moral value, or utilitarian value, or both, on a variety of divergent outcomes. However, those who give priority to moral values, rather than to utilitarian values, are more likely to display pro-environmental attitudes and behavior. A study in three western hemisphere nations (Trinidad, the Dominican Republican, and the United States) showed that people who have strong moralistic/aesthetic values (e.g., strongly agreeing that all life in nature has a right to exist) are more likely to support environmentally-helpful policies than are those who give high priority to utilitarian values (e.g., protecting jobs and using land for housing). In both the Dominican Republic and the United States, those with strong moralistic/aesthetic values were more likely than others to support establishment of stricter laws to protect natural resources and, among those in the United States, to regulate timber cutting and establish national parks. Those in all three countries who had the strongest utilitarian values were less likely than others to support policies that protect the environment.[141]

Material and Non-Material Outcomes

Outcomes – whether for oneself, society or the biosphere, and whether seen from a moral or a utilitarian perspective, may be either materialistic or non-materialistic. Some scholars have asserted that people in advanced industrial nations have been shifting

from valuing material things (basic necessities, possessions) to an emphasis on noneconomic nonmaterial outcomes that constitute a high quality of life.[142] Research to test this hypothesis has not always had consistent findings.[143] But a number of studies have found that those with stronger non-materialistic values are more committed to preserving the environment. For example, researchers in Berne, Switzerland asked a random sample of respondents their reactions to a number of statements that reflected materialistic versus non-materialistic values (e.g., "I would rather have a secure job than a healthy environment"). People who had stronger non-materialistic values were significantly more likely than others to report environmentally-positive behavior in a variety of domains (e.g., transportation to work, amount of energy used). In an analysis that controlled for the effects of a number of other variables, including knowledge of environmental problems, personal values (of which materialism was the main component) had the strongest direct effect on environmental behavior. A follow-up study by the same researchers found that "green" drivers (i.e., those who chose to purchase catalytic converters to reduce pollution) scored significantly higher on post-materialist values than did drivers who did not adopt this device. [144]

A study of materialist and post-materialist values in Istanbul, Turkey, shows a somewhat more complex picture. In this study, both materialist and post-materialist values were measured by presenting respondents with twelve different goals and asking them to rank these goals when they were grouped in a number of different ways. Examples of items referring to materialistic goals are [economic] growth rate, fighting rising prices, and defense. Items designed to tap post-materialistic value priorities include (among others) freedom of expression, a more humane society, and beautiful cities and countryside. Behavioral dispositions were assessed by asking respondents whether they would support each of three specified projects to improve the environment if it would cost their household each of several amounts. The projects were aimed at controlling: a) a local problem – sea pollution in Istanbul; b) a national problem – soil erosion; and c) a global problem – ozone depletion.

With several other variables (including education and material security) controlled, both materialist and post-materialist values were significant predictors of willingness to pay for certain environment projects. The stronger people's materialist values were, the more likely they were to be willing to pay for the national project (reducing soil erosion) and the global project (controlling ozone depletion). At the same time, stronger post-material values were a predictor of willingness to pay for a local project (reducing sea pollution in Istanbul) and for the global (ozone) project.[145] These results remind us that environmental problems may engage both material and nonmaterial values. For example, clear-cutting of forests may be economically costly (due to later shortages of wood and soil erosion) while it also damages the beauty of the landscape. The relative effect of material and non-material values on people's behavior may depend on how a problem is framed and the specific outcomes that are involved.

Short-Term and Long-Term Outcomes

Many important environmental outcomes (e.g., poor air quality, polluted rivers) may occur now or occur very soon while other outcomes (e.g., flooding of coastal cities due to global warming) may occur primarily in future decades or centuries. Interviews with Americans show that the welfare of future generations – including especially their own children and grandchildren – has a considerable impact on the environmental attitudes and behavior of many people.[146] A study of students and members of the public in a German city found that one of the criteria by which people judged environmental risks is the amount of time before consequences occur (short or long-term). In that study, judgments of the time before consequences occur did not predict whether people felt various emotions about specific environmental problems. However, a study of transportation preferences among residents of a northwestern American city found that preference for public transportation rose as people perceived cars to have a strong environmental impact but only when they also gave high consideration to the future consequences of their behavior.[147]

While the amount of evidence on this matter is limited, we may reasonably conclude that, in general, people who are concerned about long-term outcomes for their families and society are more likely than others to engage in environmentally-friendly behavior.

Types of Social Relations Valued

In addition to the value that people may give to outcomes for themselves, the community, and the biosphere, they may assign value to the kind of social relationships – especially power arrangements – that determine relevant outcomes. Some scholars have distinguished among those with an entrepreneurial disposition (relying on market forces and individual autonomy), a hierarchical disposition (favoring control by an elite acting for the community), and an egalitarian perspective (favoring equality of influence and of allocation of resources). They have argued that these social orientations influence attitudes and behavior on environmental issues.[148]

Research generally supports the proposition that people who are more supportive of private entrepreneurial activity and of conventional authority structures tend to be less concerned with environmental dangers and less supportive of environmental regulation than are those who favor more social equality. Among Americans, white males who are well educated, earn high incomes, and are politically conservative have been less concerned than others about environmental risks, and more likely than others to trust government and industry with making proper decisions to manage technology.[149]

In several national surveys Republicans and conservatives were less likely than Democrats and liberals (and also than Independents) to think that global warming is

occurring, less likely to think it's a serious problem, and less likely to support government action (such as regulating CO_2 emissions) to reduce climate change.[150] In other studies, those who held strong conservative or traditional values (e.g., giving high importance to obedience and social order) and those who valued competition or individual outcomes over equality were less likely than others to be concerned about the consequences of environmental degradation.[151] Many conservatives may not fully recognize the extent to which climate change threatens the status quo.

In summary, the value that people give to various types of outcomes influences their behavior. In general, concern about the preservation of the natural world and about the welfare of society has contributed more to people's efforts to combat climate change than has concern about their personal benefits. Efforts to preserve the environment also generally have benefited most from people giving greater value to moral, rather than to utilitarian, outcomes and to long-range, rather than short-range, outcomes. And those who generally value social equality have been more likely to support measures to deal with environmental problems than are those who value entrepreneurial activity and conventional authority.

SOCIAL INFLUENCES

All of the things that have been discussed here as influencing environmental behavior – emotions, expected benefits and costs, appraisals of the situation, and personal characteristics – may, in turn, be affected by a person's position in society (as Figure 1 indicates). We may consider, in particular, the influence of demographic characteristics (especially gender, age, and social class); media exposure; and the opportunities and incentives that society provides for relevant behavior.

Demographic Groups

Gender

Studies in both the U.S. and Europe generally indicate that women are somewhat more likely than men to engage in pro-environmental behavior, such as choosing a car with good gas mileage or participating in a "green electricity" program.[152] This gender difference occurs even though men tend to be better informed about environmental and climate change matters. However, men appear to see the consequences and risks of environmental problems generally and climate change in particular as less serious than do women and are less concerned about the risks.[153] In part, these findings may reflect the higher priority that women, as compared to men, have been found to give to altruistic values.[154] It may be, too, that men generally have a greater tolerance for risk than do women and may place relatively higher value on utilitarian, compared to moral, goals.

That men tend to show less environmental concern in their personal behavior does not necessarily mean that they are less likely than women to favor pro-environmental social policies. At least one study in the U.S. found that men were somewhat more likely than women to support policies (such as various energy-related taxes) intended to reduce global climate change.[155] Thus, while men tend to be less worried about climate change than are women, they seem to recognize the wisdom of societal policies to deal with this problem.

Age

Surprisingly to some, older people tend to act to support the environment more than do younger people. While a study in Michigan found little age effect on participation in a "green electricity" plan,[156] a national American survey found that older people were more likely than younger ones to support a series of actions that counter climate change (e.g., choosing a car with good gas mileage, using less air-conditioning and heating).[157] In Holland, a national survey found that older people were most likely to report performing a variety of environmentally-positive behaviors, including buying environmentally-positive foods, recycling, and applying energy-saving measures (e.g., water-saving shower heads).[158] A large-scale survey about environmental issues in fifteen European countries found that the youngest people (15-24) were more likely than the oldest (55 and older) to say that they are "not making an effort to take care of the environment because it doesn't have any impact as long as others do not make an effort."[159]

Surveys in Europe find that older people are not generally better informed on environmental matters; knowledge among different age groups varies by issue. However, older persons tend to be more worried about environmental problems than are younger people.[160] [They also tend to rely on different types of media, reading newspapers more and seeing films and using the internet less than do younger people – though any effect of these differences in media usage is unclear.]

Other differences among age groups that may be relevant include the smaller average size of households among older people (thus, less need for household energy and less time needed for family concerns) and a generally high level of civic involvement (e.g., in voting) among older people, which may extend to greater concern about the societal effects of environmental problems.

Social Class

Separate, though related, aspects of social class – education and income – have received some attention in studies of environmental attitudes and behavior.

Studies in the United States and in a set of fifteen European countries all found that better educated people are more likely than those with less education to act in environmentally-helpful ways. Thus, better educated Americans were more willing to take a variety of voluntary actions and to support a variety of social policies aimed at combating climate change.[161] Better educated Dutch were more likely than their less educated countrymen to take various environmentally-positive actions (such as buying environmentally-friendly food) – though education is not related to energy use in Holland.[162] Among Europeans, the better-educated were more likely than those with less education to say that they are "making an effort to take care of the environment…"[163]

In both Europe and the United States, the better-educated are not necessarily more concerned than others about environmental risks but they are better informed about the environment. And in Europe they express more trust in experts (scientists, environmental organizations, etc.) than do the less-educated.[164] It may be also that better-educated people generally have a longer-range perspective concerning both family and social outcomes. Such a longer time perspective contributes to positive attitudes and behavior on environmental issues.[165]

While more education and higher income tend to go together, the effects of higher income sometimes is different from that of education. The study of participation in a "green electricity" program in Michigan, in which participants paid a little more for energy produced in non-polluting ways, found that higher income people were more likely than others to participate.[166] But the Dutch study of environmental behavior found that, with the effect of education held constant, higher income people scored more poorly on an index of thirteen environmental behaviors and used more energy than did lower-income people.[167] And a study of risk perceptions among Americans found that rich conservative men – apparently those most satisfied with current social arrangements – judged a variety of environmental risks to be lower than did most other Americans.[168]

Although the amount of evidence is small, these findings suggest that, while some high-income people use their means to support energy-savings programs, the more affluent lifestyle of wealthier people (more appliances, more cars, etc.) makes many of them more likely to use energy and less likely to take some environmentally-conscious (and money-saving) actions such as using a half-full washing machine, leaving audio and video on stand-by, and buying toilet paper from recycled paper (among the behaviors mentioned in the Dutch study). Richer people also tend to be more conservative politically, which is associated with lesser support for government policies intended to improve the environment.[169]

Overall, then, more education and higher income appear to have different, sometimes conflicting, effects on environmental behaviors. More education tends to lead to more environmentally-positive behavior but higher income has more mixed effects.

Region

A recent national survey of Americans examined differences in attitudes about global warming of people in different regions of the United States.[170] Southerners were least concerned about global warming and least supportive of a number of government actions to control climate change (e.g., subsidizing renewable energy, a gas tax). People in the Northeast were the most supportive of measures to counter global warming (such as reducing emissions of greenhouse gases, regulating carbon dioxide as a pollutant, and imposing a gas guzzler tax). Midwesterners were intermediate in their attitudes and Westerners varied in the extent of their support on different issues, giving least support among all regions to regulating CO_2 and low support for a gas tax but relatively high support for a business energy tax.

These regional differences probably reflect, at least in part, regional differences in political and ideological leanings. Southerners tend toward the Republican Party and a conservative viewpoint, both of which were found in the same study to be associated with less support for combating global warming. Northeasterners tend to be more Democratic in party allegiance and more liberal in political outlook, both of which were associated with support for measures to combat global warming. Midwesterners and Westerners are more evenly balanced in their ideological and political leanings.

It appears also that there are regional differences with respect to the perception of environmental problems that contribute to observed regional differences in policy views. Thus, Southerners express least concern about global warming while Northeasterners are most concerned. Such differences in perceptions may stem from the political and ideological differences noted among regions and/or from other sources (e.g., the types of environmental problems faced and discussed in each region).

Media Influences

What people know about and how they judge environmental issues, such as climate change, often is influenced by the way these topics are treated in the media – newspapers, radio, TV, the internet, etc.[171]

Studies in the U.S., Europe, New Zealand, and elsewhere show, first, that media give coverage primarily to sensational events – i.e., those that are catastrophic and involve violent deaths. Seeing media coverage of dramatic or violent negative events has a marked effect on perceptions. People tend to overestimate the extent to which such events are common.[172]

Much less often do the media pay attention to less dramatic long-term events, such as drought or rises in disease, that may cause larger numbers of deaths over a longer period. And when they address explanations of, or solutions to, a problem, it is usually to

highlight conflicting claims, not to assess their relative validity.[173] (This "balanced" approach may lead people to believe that there is a major scientific debate about whether CO_2 emissions affect global warming. Actually, an overwhelming majority of scientists agree that this effect is occurring.)

What effects does exposure to the media have on people's understanding of climate change? A survey of Seattle residents found that as exposure to media (especially newspapers, magazines, public radio, and books) increased, awareness of the causes, effects, and solutions to global warming increased markedly.[174] Two national surveys in the United States in late 1997 and early 1998 (around the time of the Kyoto conference) compared Americans' beliefs and attitudes concerning global warming in the periods just before and just after extensive media coverage of debate on this issue. Evidence from the surveys indicated that, during this period of increased media attention to the issue (most of which depicted global warming as bad), the proportion of Americans who read or heard a media story about global warming rose (from 38 to 50 per cent). The percentage of people who thought environment is an "extremely important" issue rose slightly (from 9 to 11 per cent), and more people said that they had done "a lot" or a "moderate amount" of thinking about this subject (rising from 54 to 65 per cent).[175]

However, the amount of media coverage of an environmental issue may not affect overall public views on an issue. In the study just mentioned, which compared opinion before and after increased media coverage, there was little change in Americans' belief in the existence of global warming, in belief that global warming would be bad for people, or in beliefs about what should be done to deal with global warming. While overall views about public policy did not change, there was a shift in policy views that varied with people's political party identification. Democrats became more likely to support strong actions to combat global warming (which prominent Democrats had been advocating) while Republicans (whose Party leaders were opposing such measures) became less likely to support these actions than they were before the greater media coverage began. This result is consistent with other research findings that show that people tend to react to media messages, including those on climate change, by fitting them into their previous views.[176]

The ways in which climate change is commonly being reported have been found to often have a counterproductive effect -- by "immobilizing people". Researchers in the United States performed an analysis of discourse on climate change in media coverage, as well as in environmental group communications on the issue, and also studied public reactions through interviews, focus groups, and a national poll. They found that the more people are bombarded with images of devastating effects of global warming, the more apt they are to "tune out" such frightening messages and focus instead on protecting themselves and their families. Further, the study found that several other common ways of depicting climate change often contribute to people feeling that there's little that they as individuals can do about the problem. These include depicting global warming as

being about "scary weather," which evokes a "weather frame" (and thus outside human control) and focusing on long timelines. The researchers recommend that communications on climate change should stress the possibility of effective action that can be taken quickly, framed in the context of forward-thinking, efficiency, prudence, and caring.[177]

Several other aspects of events, and of media coverage of events, also affect public understanding. In a period when media coverage of climate change in the U.S. was more extensive than that of the "ozone hole," public understanding of the ozone hole was much better than understanding of climate change. Ungar has explained this seeming paradox by saying that understanding of ozone depletion was easier because there was a "bridging metaphor" from popular culture ("a hole") and a sense of crisis (immediate risk of skin cancer), conditions that were absent in the more complex and long-term case of climate change.[178] Other researchers also have recommended the use of a simplifying model, analogy or metaphor to help the public understand how global warming works. They found, for example, that the terms "CO_2 blanket" or "heat trap" worked better than "greenhouse-gas effects" to trigger constructive responses.[179]

Overall, available research indicates that when people are exposed to more media information about climate change, their knowledge about this subject is increased. However, media coverage often is superficial or difficult to understand and partisan discussion in the media may polarize opinions by political loyalties. Media presentations that fit popular images, concern crises, or deal with dramatic or violent events have the greatest public impact. To encourage engagement with, rather than avoidance of, the issue, messages must stress the possibility of effective action.

Opportunities and Incentives for Action

The actions people take that may affect the environment depend also on their particular situations. Especially important are the practical alternatives and the incentives that are present, including those provided by specific programs and by the social groups to which people belong.

Available Options

Circumstances in which people act differ in terms of what options are available to them and how convenient, easy, and costly various alternatives are. A good example is the circumstances in which opportunities for recycling are provided. Many experiments have examined the effects of making recycling more convenient and easier to perform.[180] Some of these experiments found that providing more and nearer recycling containers substantially increased the volume of cans, paper, and newspapers that were deposited. For example, one study found that adding additional newspaper containers more than doubled the weight of paper recycled by trailer park residents.[181] Other studies found that

employees who were asked to deliver recyclable paper to a centralized container recycled less than those having nearer containers;[182] another found that simultaneous collection of trash and recyclables increased participation over the level of collections on different days.[183] Of course, the very existence of a recycling program provides many people an opportunity that would not otherwise be present.

Opportunities for other kinds of environmentally helpful behavior also may be present to varying degrees. "Green electric" programs that offer people the option of getting some portion of their electric power from renewable sources, usually at some extra cost, have been offered in some localities in the U.S. and elsewhere.[184] Recently-introduced energy efficient cars, such as so-called hybrid cars, provide a transportation option not previously available. Public transportation alternatives to autos, such as extensive bus routes and light-rail lines, are available in some places but not in others.

Other options that can reduce energy usage and cut greenhouse gases are not widely available or not available at affordable prices. For example, few people have access to affordable solar, geothermal, or wind power.

In sum, circumstances vary in the extent to which people have realistic options for actions that they perceive to be helpful to the environment – especially options that are not very costly or difficult to use.

Incentives to Take Action

When a person has the realistic option of taking some pro-environmental action (recycling, reducing energy use, etc.), he may choose to do so for a variety of private reasons – his values, his appraisal that a serious environmental problem exists, his view of his personal costs and benefits, etc. In addition, he may be exposed to events and stimuli – such as those connected with environmental programs – that provide more incentives for action.

A number of techniques for stimulating pro-environmental actions have been investigated. These include: 1) prompts; 2) eliciting commitments; 3) goal-setting; 4) providing feedback on results; 5) providing rewards; and 6) penalizing negative actions. Closely related to the use of such techniques, the power of social groups to change behavior has been examined.

Prompts. Prompts are written or verbal communications to encourage people to take a certain type of action. The effects of prompts, such as flyers, brochures, and face-to-face reminders, on recycling behavior have been studied in a number of experiments.[185] In general, prompts of various sorts have had a positive influence on recycling behavior. However, such positive effects often have been small or short-lived after the prompts

stopped. Verbal and written prompts together have been more effective than either one separately.

The most effective prompting strategy has been to recruit as "block leaders" individuals who were known to their neighbors and involved in neighborhood affairs. For example, in one experiment "block leaders" were asked to tell their neighbors about a curbside recycling program and to deliver monthly written reminders. Residents contacted by block leaders recycled significantly more often than before and more often than those who received informational brochures and monthly written reminders but no visits by a block leader.[186]

Eliciting Commitments. Another intervention strategy is to obtain verbal or written commitments from people that they will take certain pro-environmental actions for a given period. Experiments on increasing recycling have obtained such commitments both from individuals and from groups. Five relevant experiments summarized in one review[187] all found that those who promised to recycle actually did so significantly more often and/or in greater amounts than people who had not made such commitments. For example, after signing a statement indicating their willingness to recycle for four weeks, residents of a retirement home substantially increased the pounds of paper they collected and students in a college residence hall who signed individual commitments to recycle increased their participation in the program substantially. In general, the strongest effects were found when promises to recycle were made in a signed statement and concerned the person's own actions. In most of the experiments, people who had made commitments to recycle for a given period (such as a month) continued this behavior beyond the commitment period at a higher level than they had shown before the intervention.

Goal-Setting. Having clear goals has been found to increase effort in a variety of settings – work, sports, etc.[188] Goal-setting also has been used as a technique to encourage environmentally helpful behavior. Experiments have shown that setting goals for recycling has helped to increase collections of paper by elementary students and of cans by college students.[189] In these experiments specific goals were set by people other than those asked to recycle. When individuals or groups set their own goals, the effects on their behavior may be even stronger.

Goal-setting also is part of a community program to save energy and water, the "Nordlicht Campaign," that has been developed in Germany.[190] Participants in one phase of this campaign were asked to work toward a savings goal, in terms of kilometers driven or litres of fuel used, for at least a month. The individual recorded his specific goal on a coupon which he sent to a campaign office. This type of goal-setting (which has other aspects that I will discuss shortly) has had some success in reducing consumption of energy in an area of Germany studied.

Feedback. Another situational element that increases motivation is feedback on past performance.[191] Studies of a variety of behaviors – including such environmentally relevant behaviors as driving speed, gas consumption, and recycling – have found that people generally are more likely to take recommended actions if they get feedback on past efforts.[192] For example, people (staff and students) who used a lounge area in a South Korean university greatly increased the weight of cans and paper cups that they put in recycling containers each day after written and graphic feedback on each previous day's collections were prominently displayed. Either written or graphic feedback has been effective, but there is some evidence that a combination of these two forms of feedback may be more effective than either alone.[193]

Feedback on prior performance may be given either to individuals or to groups. Both have had some success. Writing about the Nordlicht campaign to increase energy-saving behavior by Germans, Friedemann Prose comments, "Individual feedback attracts attention to the cost-benefit aspects of climate protection behavior for the individual. Social feedback stresses that climate protection is a common task and that many small changes in behavior of many individuals can lead to a major overall effort for climate protection."[194] The Nordlicht campaign provides feedback by geographical region which, Prose notes, "makes comparison and stimulation of positive competition between areas and regions possible."[195]

While feedback alone usually provides a positive impetus to desired behavior, feedback has its greatest effect when it is combined with other positive conditions – especially goal-setting.[196] People care more about how they have done (shown in feedback) when they have some goal they are trying to reach.

Rewards and Penalties. Rewards and/or penalties are commonly used to try to change many kinds of behavior. Some environmental policies provide positive incentives for desired behavior while other policies provide disincentives for undesirable behavior. For example, reducing prices of public transport may provide a positive incentive for using a train or bus while raising the tax on gasoline creates some added penalty for car use. Studies of people's reactions to policies aimed at encouraging various means of transport and various other means of energy-savings show that people are more likely to accept policies that reward people for positive behavior than those that penalize them for negative behavior. And policies that greatly restrict people's freedom of choice are not widely acceptable.[197]

These findings do not necessarily mean that the use of rewards and preserving choice, while acceptable to the public, will necessarily be more effective than policies that rely more on restricting choices and penalizing destructive behavior. For example, reducing the price of public transport generally has not been very effective in reducing the use of private cars while increasing the cost of driving has had more success in

reducing car use.[198] Thus, what people find most acceptable and what actually affects their behavior is not always the same.

Both acceptability and effectiveness are necessary. To be successful in the long run, effective policies must also be acceptable to most of those people affected. Otherwise, they are likely to be resisted, evaded, and eventually reversed. When a broad public accepts a policy change, both individual attitudes and social norms support it and the change is more stable.[199]

Social Norms. Social norms, especially those present in social groups with which the individual identifies, can exert a powerful influence on behavior.[200] Behavior that impacts the environment is no exception. This review has noted some examples. These include findings that: among Swedish government and business decision-makers, organizational norms mediate the effect of personal values on support for climate change policies; among those university students in Germany whose personal concern about the environment was low, intended use of a car (versus public transportation) depended mainly on individuals' perceptions about what "most of the people who are important to me think"; many Australians who were interviewed about climate change were reluctant to take positive actions because they saw their individual actions as isolated and of marginal value when not in a community or institutional context; in the United States, programs that prompt people to recycle waste materials have been most successful when people are solicited by their neighbors.

The power of social networks and social norms has been used on a major scale by the Nordlicht campaign for climate protection in Germany.[201] The fact that feedback about energy savings is provided by regions, thus fostering community competition, has already been noted. In addition, the campaign is supported by a variety of social organizations, including districts, towns, communities, associations, clubs and business firms. Churches, parent and environmental groups, neighborhood groups and others provide social networks for distributing information about the campaign. Local and regional media have publicized overall participation in the campaign and in their district as well as a list of top performers in individual area. In these ways, the power of group and community norms has been mobilized in support of energy savings and other climate protection measures.

Summarizing briefly this section on incentives: People are more likely to take pro-environmental actions when they are prompted, when they make commitments, when they have goals, get feedback, and are rewarded (or, sometimes, penalized) for their actions. These social stimuli are most effective when they are intertwined with social norms that support appropriate behavior. Prompts, requests for commitments, group goals, feedback and rewards all communicate social norms and are effective primarily because most people are motivated to do what is expected of them by those people who matter to them.

CONCLUSIONS AND POLICY IMPLICATIONS

This research review began with the question: Why do some people support public actions to counter undesirable climate change and/or take personal actions to counter such change, while other people do not do so? On the basis of the research work reviewed we can now form some overall conclusions and draw some policy implications about how to encourage positive actions.

People's behavior relevant to the environment – and to climate change in particular – depends, first, on 1) the expected benefits and costs of their actions; and 2) their emotions concerning the situation.

Showing Benefits and Costs

As social policies and actions require more personal sacrifices, people's willingness to take such actions declines. But as people come to see that climate change threatens to impose high costs on them and their children, on their society, and on the planet, their willingness to take counter-actions increases.

Policy Implication 1. Show people that they and their society will benefit more (rewards minus costs) from effective actions to counter climate change than from actions that contribute to climate change. Such messages would point out the many serious costs that are likely to occur as a result of climate change (more serious hurricanes, flooding coastal areas, droughts, health problems, forest destruction, economic problems, etc.) that would be meaningful to individuals. Relevant messages also would point to cost savings and to other personal and societal advantages of policies and actions aimed at reducing climate change (savings from energy efficiency; creation of new industries; health benefits, less reliance on foreign oil, etc.).

The aim would not be to deny that countering climate change requires changing our behavior in ways that involve some sacrifice. It is, rather, to convince people that, given the realistic choices, making such changes is the better alternative.

Arousing Emotions

Behavior is influenced not only by calculation of the benefits and costs of alternatives, but also by emotions. Emotions – including, fear, anger, sadness, guilt and shame – affect behavior relevant to the environment. The kind of emotion aroused affects the likelihood of particular types of behavior. For example, fear tends to lead to

support of measures to avoid a danger, anger to punishing those who are creating a problem, and guilt to personal action to alleviate the guilt.

Policy Implication 2. Provide information about climate change in a form that is concrete enough, graphic enough, and personal enough to arouse people's emotions about the issue. While it would be morally questionable and probably counterproductive to stir panic about climate-related danger, real threats need to be communicated in ways that arouse appropriate concern and link that concern to effective action. Similarly, accurate information about those whose pursuit of private gain is increasing risks for the public should appropriately arouse anger and information about the ways in which ordinary individuals are contributing to climate change should appropriately increase feelings of guilt and shame. Such emotions – as well as positive feelings of caring for one's family, community, and the earth itself – would need to be channeled toward constructive personal and societal actions aimed at reducing the dangers.

Changing Appraisals of the Situation

People's views about the benefits and costs of actions to counter climate change, as well as their emotions about climate change, depend in large part on their appraisals of the situation: How serious is the problem? What are the possible solutions? Who is responsible for action? What is my own personal role?

Seriousness of Problem

Most people think that global warming has begun and a great many acknowledge that it is a serious problem. However, compared to other national problems (the economy, health care, crime, etc.), the public has not ranked climate change among its top concerns. People judge the seriousness of a problem or threat by the magnitude and the probability of its costs. The magnitude of a possible loss is seen as greater as it involves more people and greater suffering; is longer-lasting and less reversible; is more personally relevant; is more immediate; is more morally reprehensible; and has few compensating benefits. People see a loss as more probable as they get more relevant information that they trust, the problem is seen as less controllable, and memorable events occur that confirm the threat.

Policy Implication 3. Convince people of the great seriousness of the problem of climate change by making clear the magnitude of the possible losses involved (including those that are immediate and personal) and the high probability of these losses occurring (including making clear the connections between recent memorable events and likely future events).

Ways of Dealing with Climate Change

While people generally recognize that climate change is a serious problem, most have only vague and often incorrect ideas about effective ways to deal with the problem. Many people mention measures, like filtering pollution from emissions or eliminating aerosol cans, that are ineffective or only marginally helpful to counter climate change. Many are not clear that the emission of carbon dioxide, caused by the burning of fossil fuels (primarily oil, coal, and natural gas), is the primary human-made cause of climate change. Also many are not aware that the most effective counter-measures are the reduction of CO_2 emissions through energy conservation, energy efficiency, and alternatives to fossil fuel energy.

Policy Implication 4. Let people know what the most effective ways to counter climate change are. Make clear the specific types of social policies and specific kinds of personal actions that will help reduce burning of fossil fuels, thus reducing CO_2 emissions and countering climate change.

Who Is Responsible; Who Should Act

Most people blame government and businesses most for not doing more to combat climate change. They think these institutions – especially government – should do more, but have little confidence that they will do so. Public trust in scientists and in environmental organizations is higher than their trust in business or government. Many people would like to have an independent and authoritative body that would provide reliable information on climate change. Despite the perceived shortcomings of government, it is seen by most as the only actor with the power to do what is needed.

Policy Implication 5. Public officials and others need to activate the public's latent support for government action to combat climate change by demonstrating and publicizing public actions that have been effective.

Policy Implication 6. Greater prominence and publicity should be given to the funding and recommendations of independent authoritative scientific groups in which the public can have confidence.

Most people recognize that they, as individuals, and their local community also make some contribution to climate change and many feel uneasy about their own role. However, many also feel that they are helpless to do anything effective about the problem. The more effective people think they can be, the more likely they are to act in environmentally helpful ways. Such helpful actions also are more likely when individuals feel a moral obligation to help counter climate change and when they feel that their personal actions are part of a broader community or societal effort.

Policy Implication 7. Make clear how changes in the individual's own actions and those of his community can help combat climate change.

Policy Implication 8. Point out reasons why avoiding the bad effects of climate change may be considered a moral obligation (to one's children and grandchildren, to community and to society, to one's religious or other beliefs).

Fitting Messages to Personal Values

Having more knowledge about climate change may lead people to support and take action to counter such change. But the effect of information on behavior depends on the conceptual framework within which it is interpreted and the social context in which the individual is embedded.

Individuals' reactions to information about the environment are affected by their values – that is, what goals or outcomes they value most. Those who value highly the health and welfare of the natural environment or of the broader society are more likely to take actions to preserve the environment (including actions to counter climate change) than are those who value their own personal welfare most. However, those who focus on their own personal outcomes may support measures to protect the environment when they see a direct impact on their personal welfare.

People who judge the value of outcomes primarily on a moral basis are more likely to support policies that protect the environment than are those who judge outcomes mostly on their utilitarian value. Those who give great value to non-materialistic outcomes (such as preserving the beauty of our natural surroundings) tend to report more actions to protect the environment than do those who value materialistic outcomes (such as possessions) more highly. Also, political Liberals and those who favor more social equality are more likely than Conservatives and others with strong allegiance to the status quo to be concerned about environmental risks and more likely to support public actions to protect against such risks.

Policy Implication 9. Attempts to change attitudes and behavior concerning global climate should not only provide people with relevant information but also put such information in the context of the values and social norms that are important to them. Ways in which actions to counter global climate change will promote a variety of values should be highlighted as appropriate for particular audiences and for particular actions.

Fitting Messages to Demographic Characteristics

Women are more likely than men, and older people are more likely than younger ones, to be concerned about environmental problems, including climate change, and to take personal actions that help to protect the environment. However, there is some

evidence that men are as likely as women to support policies intended to reduce climate change.

Not surprisingly, better educated people are likely to be better informed about the environment and about climate change in particular. They also are more likely to take personal actions and to support policies to combat climate change. Income differences have less consistent effects.

Among Americans, there are substantial regional differences. Southerners are least concerned about global warming and least supportive of government action to control climate change. Those in the Northeast are most concerned and most supportive of public action to deal with this problem. Midwesterners' and Westerners' views on this issue are intermediate.

Policy Implication 10. Messages intended to gain support for actions to combat global warming should be tailored to the demographic characteristics of the audience – including its mix of genders, ages, education level, and regions. Messages need to be appropriate to the differing knowledge levels, values, self-images, emotional sensitivities and relevant benefits and costs of the different groups.

Creating Opportunities for Action

Not surprisingly, but importantly, people are more likely to take actions that promote a healthy environment when they are offered realistic options that are affordable and not difficult to use.

Policy Implication 11. Promote the availability of affordable, convenient alternatives that can help combat climate change – for example, "green" electricity programs, public transportation, and making alternative fuels for cars widely available.

Providing Social Support for Action

A number of strategies to help motivate people to take environmentally responsible actions have been found to be effective. These include: 1) verbal and written prompts, especially by neighborhood leaders; 2) having people make commitments to take specific actions; 3) getting people and groups to set goals (such as a target for reduction in energy usage) and giving feedback about progress toward meeting the goals; 4) providing rewards and/or penalties, for individuals and/or for groups, depending on actions taken. A program is more likely to be accepted by the public when compliance is linked to rewards rather than to penalties.

These and other specific strategies are most likely to motivate individuals to combat climate change when each person sees his or her own actions as part of a broader community or institutional effort. Acting not in isolation but as part of a social grouping, the individual is more apt to perceive that sacrifices are shared; her own efforts are effective; she has the support of friends, neighbors, and colleagues; and that, by taking responsible actions, she will receive the approval of those whose opinions she values.

Policy Implication 12. Programs to combat climate change should be structured so that the individual sees his actions as part of a shared social effort that involves shared goals as well as feedback and rewards for progress toward the goals.

In overview, then, an effective program to mobilize public support and action to combat climate change needs to arouse people's strong feelings about the problem and convince them of the benefits of action by communicating clearly the seriousness of the threat, the actions needed to deal with the threat, and the role of individuals and groups in this effort. These messages should come from trusted persons and should be tailored to the values and self-images of particular audiences. The power of social groups should be activated by making individual actions a part of social efforts that include providing affordable convenient action options and providing incentives based on commitment to goals, feedback on progress, and rewards for effective action.

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