At the heart of the debate on climate change are two key facts. The first is the familiar and undisputed observation that human activity is rapidly increasing the concentration of greenhouse gases in the atmosphere. Each year, worldwide fossil fuel use adds about 6 billion metric tons of carbon to the atmosphere, and the concentration of carbon dioxide is now about 30 percent higher than it was at the dawn of the Industrial Revolution.

The second fact is equally important but far more subtle: no one fully understands how the climate will respond. The increase in greenhouse gases could lead to a sharp rise in global temperatures, with severe consequences for ecosystems and human societies. On the other hand, it is possible that the rise in temperature could be modest, easy to mitigate, and far in the future. The most likely outcome lies somewhere between the two, but the intrinsic complexity of the climate makes it impossible to know precisely what will happen with any degree of confidence.

That uncertainty has sharply polarized public debate. On one side are those who point to the possibly disastrous
2  A Realistic Approach to Climate Change

consequences of climate change and argue that emissions must be reduced sharply to lower the risk of catastrophe. A typical argument from this group might be that fossil fuel use should be reduced in order to lower the risk of disintegration of the West Antarctic ice sheet, an event that would raise global sea levels by 3 meters. On the other side are those who point to the possibly small probability of a disaster and argue that there are better uses of society’s resources than reducing an already small risk even further. A typical argument from this group might be that money would be better spent by reducing conventional pollution, investing in new technology, alleviating poverty, and raising educational standards than by reducing greenhouse gas emissions.

There are elements of truth in both positions, but neither is an appropriate response to climate change. An objective reading of current scientific literature indicates that a moderate effort should be made to slow the growth of greenhouse gas emissions. Taking some sort of action is warranted: although climatologists disagree about the timing and magnitude of warming, no one seriously suggests that mankind can continue to add increasing amounts of carbon dioxide to the atmosphere every year without any adverse consequences. Moreover, climate change is essentially irreversible, so it makes sense to avoid causing more of it than necessary, at least until the potential risks are better understood. At the same time, current evidence does not justify a draconian cut in emissions: the cost would be enormous and the environmental benefits might be small. It is easily possible that the resources needed for a sharp reduction would be better spent on more immediate social problems. As a matter of common sense, therefore, the right approach must lie between the two extremes: the policy should provide incentives to reduce greenhouse gas emissions but avoid imposing unreasonably large costs.

To date, however, common sense has played little role in the debate over climate change policy. Instead, polarization of the participants has led to impractical proposals and a decade of policy deadlock. In 1992, the United Nations Earth Summit in Rio de Janeiro produced a landmark treaty on climate change that proposed stabilizing greenhouse gas concentrations in the atmosphere. By focusing on stabilization, the treaty implicitly adopted the position that the risks posed by climate change require emissions to be reduced no matter what the cost. The agreement, ratified by more than 186 countries, including the United States,
prompted numerous subsequent rounds of climate negotiations aimed at rolling back emissions from industrialized countries to the levels that prevailed in 1990. In the end, however, it has had virtually no effect on greenhouse gas emissions; it has not even produced a detectable slowing in the rate of emissions growth. The treaty’s implementing agreement, the 1997 Kyoto Protocol, has been rejected by the United States and spurned by developing countries. Ten years of negotiations have produced a policy that is very strict in principle but completely ineffective in practice.

International negotiations have failed because they have been predicated on the assumption that climate change must be stopped at any cost. However, a climate policy that does not take costs into consideration will never be ratified by the U.S. Senate, and it will be rejected by many other governments as well. One can see why by anticipating the questions that prudent senators will ask when a climate change treaty eventually comes up for ratification. The first question will be, in essence, “Will the treaty’s benefits exceed its costs?” Given current scientific understanding of the climate, the answer would have to be “It is impossible to tell.” That response alone would not condemn the treaty; political decisions often involve uncertainty. However, it would lead to a second question: “Do we know at least that the cost will not be excessive?” It is this question that would be fatal for a treaty based on the assumption that emissions must be reduced at any cost. The answer would have to be “No,” and prudent legislators would have little alternative but to reject the treaty. Any other decision would be irresponsible: it would commit the country to spending a potentially large amount of its resources on a policy that might have very little benefit.

To break the policy deadlock, climate negotiations must be redirected toward a more practical and realistic approach. In order to succeed, the alternative policy must reflect the deep uncertainties in predicting climate change by taking a moderate approach: providing incentives to reduce greenhouse gas emissions but avoiding unreasonably large costs. In addition, the policy’s political prospects will be substantially better if it does not require large transfers of wealth or the surrender of a significant degree of national sovereignty. Finally, the system will need to remain in effect for many years, so it must be designed to allow new countries to enter with minimum disruption and to survive the exit of some of its participants.
Neither of the standard market-based economic policy instruments satisfies all of these criteria. An ordinary tradable permit system would require participants to achieve a rigid emissions target regardless of cost. An emissions tax, on the other hand, would involve huge transfers of wealth and would be politically unrealistic. However, a hybrid policy combining the best features of the two would be an efficient and practical approach.¹

One such hybrid policy would combine a fixed number of tradable, long-term emissions permits with an elastic supply of short-term permits, good only for one year. Each country participating in the policy would be allowed to distribute a specified number of long-term emissions permits, referred to as perpetual permits. The number of perpetual permits would be set by international negotiation; one possibility is that each country would be allowed to issue a quantity equal to the amount of the country's 1990 emissions. The permits could be bought, sold, or leased without restriction, and each one would allow the holder to emit one ton of carbon per year. The permits could be given away, auctioned, or distributed in any other way that the government of each country saw fit. Once distributed, the permits could be traded among firms or bought and retired by environmental groups. In addition, each government would be allowed to sell additional annual permits for a specified fee, say for $10 per ton of carbon.² Other things being equal, the price of a $22 ton of coal would rise by about 30 percent and the price of a $20 barrel of oil would rise by 7 percent. Firms within a country would be required to have a total number of emissions permits, in any combination of perpetual and annual permits, equal to the amount of emissions they produce in a year.

¹ The economic theory behind hybrid regulatory policies was developed by Roberts and Spence (1976). A hybrid approach to climate change was first proposed by McKibbin and Wilcoxen (1997a) and subsequently has been endorsed or promoted by a range of authors and institutions. Examples include Kopp, Morgenstern, and Pizer (1997); Kopp and others (1999); Aldy, Orszag, and Stiglitz (2001); and Victor (2001).

² This figure can be translated into more familiar terms using the carbon content of different fuels. A ton of coal contains 0.65 tons of carbon, so a permit fee of $10 per ton of carbon would add $6.50 to the price of a ton of coal. Similarly, a barrel of crude oil contains about 0.14 tons of carbon, so the fee would add $1.40 to the price of a barrel.
The single most important feature of the hybrid is that it establishes an upper limit on the cost of compliance. No firm would have to pay more than $10 per ton to reduce its emissions because it could always buy an annual emissions permit instead. As a result, the answer to the question “Do we know at least that the cost will not be excessive?” would be “Yes.” Adopting the hybrid, in other words, does not require a country to make an open-ended commitment to reduce its emissions regardless of cost.

The hybrid policy would have many other desirable attributes as well, which are summarized briefly in the box on page 6 and discussed in detail in chapters 5 and 7. Among the most important is that the policy would be very stable with respect to changes in the mix of participating countries. Because permit markets in different countries would be separate, linked only by the common price of an annual emissions permit, one country’s entry into or exit from the system would have no effect on the price of permits circulating in other countries. In contrast, a change in the list of countries participating in the Kyoto Protocol would cause windfall gains or losses to ripple through permit markets around the world.

Moving from the current deadlock to the hybrid approach will require leadership. The United States could jump-start the process by adopting a modified form of the hybrid policy unilaterally. The government could immediately distribute a quantity of perpetual emissions permits equal to the U.S. commitment under the Kyoto Protocol, but with one important caveat: firms would not be required to hold emissions permits unless the United States were to ratify an international agreement on climate change. Essentially, the government would distribute contingent property rights for greenhouse gas emissions. Such a step would be bold, but it also would be in the self-interest of the United States. Rapidly rising world carbon dioxide emissions make it inevitable that some sort of climate policy eventually will be adopted. Issuing property rights as soon as possible would help the economy adapt because it would allow financial markets to help manage the risks of climate policy. For example, a firm worried that it would be unable to comply with future climate regulations could reduce its risk by buying extra permits, or even options on extra permits, as a hedge. A firm able to reduce its emissions at low cost could sell permits (or options) now.
A Hybrid Policy for Climate Change

In its basic form, the hybrid policy allows each participating country to issue two kinds of emissions permits: perpetual permits, which entitle the owner of a permit to emit one metric ton of carbon every year forever; and annual permits, which allow one ton of carbon to be emitted in a single, specified year. Key features of the policy are listed below.

**Perpetual permits**
- Quantity restricted to a specified fraction of 1990 emissions, for example, 95 percent.
- Distributed once, when the policy is first enacted.
- Can be bought, sold, or leased within the country of issue without restriction.
- Can be used only in the country of issue; no international trading.
- Price set by financial markets.

**Annual permits**
- Sold for a stipulated price, for example, $10 per ton of carbon.
- No limit on the quantity sold.

Because the hybrid policy has two kinds of permits, it is more complicated than a simple permit system. However, it has all of the strengths of a traditional permit system and additional advantages as well. It performs especially well in comparison with the Kyoto Protocol.

**Strengths shared with a conventional permit system**
- Reduces emissions in a cost-effective manner.
- Perpetual permits avoid the huge transfers of wealth that would occur under a tax.
- Allows historical emissions to be grandfathered, providing transition relief.
- Has built-in incentives for monitoring and enforcement.

**Additional advantages compared with the Kyoto Protocol**
- Existence of annual permits provides an upper bound on compliance costs.
- Trading is national rather than international.
- Does not rely on large international transfers of wealth.
- Annual permits generate revenue, providing an incentive for enforcement.
- More credible; more likely to be enforced into the future.
- Relatively easy to modify as information arrives.
- Easily adapted to provide incentives for early action.
- Easy to add countries over time; does not require renegotiation of treaty.
- Entry or exit of countries does not affect other permit owners.

**Other notable feature compared with the Kyoto Protocol**
- Does not guarantee any particular cut in emissions: if abatement costs are high, the overall reduction will be less than under Kyoto.
Of course, pricing these permits would present a short-run challenge for financial markets, since it is uncertain when carbon emissions will be regulated. But financial markets confront this kind of problem every day. Within a very short time, an active market would develop with prices that reflected both the likelihood of a policy taking effect and its probable stringency. Indeed, active markets already have been formed for trading privately created emissions permits.3

Overall, a hybrid climate change policy has much to offer. It is flexible enough to deal with the enormous uncertainties regarding climate change. It provides individual governments with an instrument to limit and channel the distributional effects of the policy on different groups within their own countries, reducing the obstacles to ratification. Moreover, we will show that it creates incentives for governments to monitor and enforce the policy within their own borders. It is a practical policy that would reduce greenhouse gases in a cost-effective manner.

The remainder of the book presents the hybrid policy in more detail. Chapters 2 through 4 provide background information on the climate change debate. Chapter 2 summarizes the current state of knowledge about climate change—the science of climate change, the impacts, and the costs of reducing it. Chapter 3 outlines the history of climate change negotiations since the adoption in 1992 of the United Nations Framework Convention on Climate Change (UNFCCC), discussing the 1997 Kyoto Protocol and explaining how it has evolved. Chapter 4 examines the Kyoto Protocol in detail to show that its approach to climate change policy is fundamentally incorrect.

The remaining chapters, 5 through 8, focus on our proposal for a hybrid policy. Chapter 5 presents the economic theory behind it; chapter 6 discusses the practical details of its implementation, including several extensions and refinements that could be adopted; and chapter 7 evaluates its strengths and weaknesses relative to those of several benchmark policies. Finally, chapter 8 outlines a process that could be used to break the current deadlock in international negotiations.
