

CHAPTER 8

The Way Forward

No single solution is available to tackle global warming—the nation will need to enlist a full suite of policies and other incentives at the international, national, state, and local levels. Fundamentally, however, we need to shift to a clean energy future that can help solve three of our biggest challenges at once: breaking our dependence on oil, putting Americans back to work, and cutting carbon and other heat-trapping emissions to levels that will stave off some of the most devastating effects of global warming.

Fortunately, our analysis shows that it is technologically and economically feasible for the nation to achieve the needed cuts in emissions. In fact, the Blueprint also

shows hundreds of billions of dollars of savings for consumers and businesses.

This chapter details some of the critical climate, energy, transportation, and international policies we need to address climate change. These policies form the building blocks of our clean energy future.

8.1. Building Block One: A Well-Designed Cap-and-Trade Policy

A central element of our climate policy should be a cap-and-trade system that sets tight limits on carbon emissions, and charges polluters for the emissions they do release. Legislation establishing such a system should require an auction through which industry



Federal legislation to reduce carbon emissions must be flexible enough to respond nimbly if new scientific information—such as fast-changing conditions in the Arctic—indicates the emissions cap or other measures should be strengthened. For this reason, federal legislation must include a science review provision, and the scientific recommendations must be evaluated and acted upon quickly.



Preserving tropical forests is an effective and fairly inexpensive way to curb a significant portion of the world's carbon emissions. Protecting these forests also benefits the people who depend on them—and the foods, products, and services the forests provide—for their lives and livelihoods, and preserves biological diversity. Federal legislation should allocate some revenue from the cap-and-trade system as an incentive to preserve tropical forests.

must purchase allowances to release those emissions (see Chapter 3).

That is an effective way to raise the revenues we need to invest in clean energy solutions; protect consumers, workers, and communities; and help people and wildlife adapt to the unavoidable effects of climate change. A cap-and-trade system that auctions allowances will also create a clear market signal that rewards cuts in carbon and other heat-trapping emissions and drives private investments in clean energy.

In designing an overall climate policy that includes cap and trade, U.S. policy makers must focus on several critical features:

Ensuring deep reductions in emissions. The United States must cut its total emissions at least 80 percent by 2050, and start on a path to achieving that goal by cutting emissions aggressively in the next 10 years. Government should set specific limits on carbon emissions from as many sources as possible, and provide incentives to cut emissions from other sources, to ensure that reductions will occur economywide. Our Blueprint analysis shows that the nation can meet a cap set at 26 percent below 2005 levels by 2020, and 56 percent below 2005 levels in

2030—taking us a considerable way toward meeting the 2050 target.

Rapidly responding to the latest science. Recent research is helping us understand how quickly and intensely the nation and the world are already feeling the effects of global warming. Any comprehensive response should therefore include a continuing review of the underlying science, and of the effectiveness of the U.S. program for addressing climate change. That approach should also be able to respond nimbly to the latest scientific information by setting new limits on emissions and creating new or more effective responses.

Funding protection for tropical forests in developing countries. Because tropical deforestation and forest degradation in developing nations contribute about 20 percent of worldwide global warming emissions, maintaining tropical forests is one of the most effective and least expensive ways to address global warming. A strong U.S. approach should channel a modest amount of revenue from the auction of carbon allowances to countries that preserve their forests, and also allow U.S. businesses subject to a cap on emissions to pay directly for a small number of carbon offsets in those countries.

Investing auction revenues wisely. As noted, government should auction carbon allowances and invest the revenue in programs and technologies that will help the nation shift to cleaner and more efficient energy. Government can also use auction revenues to help consumers pay energy bills and move to cleaner forms of energy and transportation, and provide transition assistance and job retention for workers and communities. Government can also use the funds to help U.S. companies remain globally competitive; help states, municipalities, tribes, and developing nations respond and adapt to the effects of global warming; and preserve threatened wildlife and ecosystems.

Containing costs appropriately. The most cost-effective way to tackle global warming is to invest heavily in energy efficiency measures, clean vehicles, and better transportation choices—all of which will drive down energy costs for consumers, businesses, municipalities, and states.

To enable companies subject to a cap on emissions to find the lowest-cost source of emissions cuts, a cap-and-trade system should allow such companies to purchase a limited number of carbon offsets: investments in reducing emissions from uncapped sectors, such as by paying farmers to adopt practices that allow soil to store more carbon.

BOX 8.1.

How We Can Cut Emissions More than One-Third by 2020

Chapter 1 lays out a rationale for making significant cuts in U.S. carbon emissions by 2020, based on the urgency of the science and the need for a clear policy direction to move the nation toward a clean energy economy without delay.

Our findings show that the United States can cut global warming emissions 30 percent below 2005 levels (equivalent to 19 percent below 1990 levels) by 2020,* while providing substantial cost savings for consumers and businesses. And those figures do not include the full potential for storing carbon in the domestic agriculture and forest sectors. This is therefore a conservative estimate of the reductions that the nation could achieve domestically.

A separate UCS analysis shows that if our nation uses a modest amount of revenues from the auction of carbon allowances to help tropical nations reduce deforestation and forest degradation, the United States

can reduce global warming emissions another 10 percent below 2005 levels (Boucher 2008). Negotiations on a global climate treaty now under way clearly show that the United States has the capacity and responsibility to finance even further reductions in carbon emissions by investing in the use of clean technology in developing countries. While these negotiations are still a work in progress, such investments could credit the United States with more cuts in emissions under a treaty.

Given the urgency of the science; the large potential for deep, cost-effective cuts revealed by the Blueprint; the danger that we will lock ourselves into high-carbon technologies; and the importance of meeting our global obligations, we recommend that the nation reduce emissions at least 35 percent below 2005 levels (or 25 percent below 1990 levels) by 2020, primarily through domestic action.

* Our modeling results show that capped firms over-comply with the cap set at 26 percent below 2005 levels in 2020, achieving actual reductions of 30 percent below 2005 levels.



Given the urgency of the science, the most expensive thing we can do is nothing. Recent scientific research suggests the effects of global warming are happening faster and more intensely than projected in the 2007 IPCC report. Coastal communities in the U.S. Northeast, where sea level is rising considerably faster and higher than the global mean, are particularly vulnerable. The Climate 2030 Blueprint lays out a clear and bold plan to curb carbon emissions.

However, such offsets must be limited, because firms in the capped sectors must have an incentive to alter their production and investment decisions if we are to meet our goals for sharply cutting global warming emissions and transition to cleaner technologies. Quality standards for offsets must also be closely monitored and enforced, so as not to compromise the nation's goals for cutting emissions.

Containing the costs of capped companies by creating a “safety valve”—setting an upper limit on the price of carbon allowances—would be unacceptable, because cuts in emissions could easily grind to a halt

under such a policy and undermine the nation's entire effort to address climate change.

Preserving states' rights. Any policy should preserve rather than preempt the ability of states to implement their own more stringent climate, energy, and transportation policies.

8.2. Building Block Two: More Efficient Industries and Buildings

Making our industries and buildings more efficient must be a cornerstone of any comprehensive strategy for cutting carbon emissions. Energy efficiency can yield quick, significant, and sustained reductions in energy use, while providing substantial savings on energy bills for consumers and businesses. Creating a highly energy-efficient economy, however, requires policies and programs to help overcome significant and entrenched market barriers. The following policies build on the most effective approaches pursued by pioneering states and the federal government.

Enact an energy efficiency resource standard (EERS). Such a standard would require electricity and natural gas providers to meet targets for reducing their customers' energy use. It would also create a nationwide trading system for efficiency while spurring utilities to increase investments in efficiency. Some 18 states and countries such as France, Italy, and the United Kingdom have adopted such a standard.

Set new and higher energy efficiency standards for a broad range of appliances and equipment. Appliance and equipment standards save energy by requiring that various new products achieve minimum levels of efficiency by a certain date. Such standards have been one of the federal government's most successful strategies for reducing energy consumption in homes and businesses since their inception more than two decades ago.

Adopt more stringent energy efficiency codes for buildings. Stepping up energy codes over time ensures that builders deploy the most cost-effective technologies and best practices in all new residential and commercial construction.

Advance the deployment of combined-heat-and-power (CHP) systems. The nation can accomplish this by setting federal standards for permitting CHP systems and connecting them to the local power grid, and by establishing equitable interconnection fees and tariffs for standby, supplemental, and buy-back power. Greater funding for federal and state programs that spur the use of CHP through education, coordination, and direct project support is also needed.



By incorporating efficient design features and building materials, the LEED Platinum-certified Genzyme Center in Cambridge, MA, reduces its energy costs by more than 40 percent compared with a comparable building. Heat-retaining concrete slab construction moderates the interior temperature, while a double-paned glass curtain wall maximizes insulation and allows most employees to work in naturally lit space. Genzyme benefits from reduced energy costs while employees enjoy the improved quality of their work environment.

8.3. Building Block Three: A Clean Future for Electricity

Energy experts have identified dozens of actions that policy makers can take now to reduce carbon emissions from the electricity sector. Here are a few.

Support a strong federal renewable electricity standard. Congress should enact a national standard requiring electric utilities to obtain at least 25 percent of their power from clean renewable sources by 2025. Studies have shown that such an approach is both feasible and affordable. Indeed, 28 states and the District of Columbia have adopted such standards, while the Senate has passed legislation establishing a standard three times, and the House of Representatives once. The national trading system in these bills would allow utilities to reduce their carbon emissions at an affordable price while creating jobs and stabilizing fuel prices.

Extend tax and other financial incentives for renewable energy. On-again/off-again extensions of tax credits for renewable energy have produced a boom-and-bust cycle that injects needless uncertainty into the financing and construction of such projects and raises their cost. Congress should also reduce incentives for fossil fuels and nuclear power, which are mature technologies that have already received enormous subsidies.

Triple today's federal funding for research and development of energy efficiency and renewable energy. A significant increase in R&D funding for clean energy technologies is needed to lower their costs and spur the widespread use essential to achieving dramatic cuts in carbon emissions.

Resolve state and local conflicts around siting electricity transmission lines and renewable energy projects. Policy makers must also reduce the state-by-state balkanization that is crippling creation of a nationwide grid for renewables.

New federal rules need to streamline siting efforts on federal lands while preserving their unique attributes and habitats. Congress should give the Federal Energy Regulatory Commission (FERC) more freedom to expedite new transmission capacity for renewable energy projects at the regional level. Congress also needs to reexamine provisions in the Federal Power Act that prohibit FERC from discriminating among power sources.

8.4. Building Block Four: A Smarter, Cleaner Transportation System

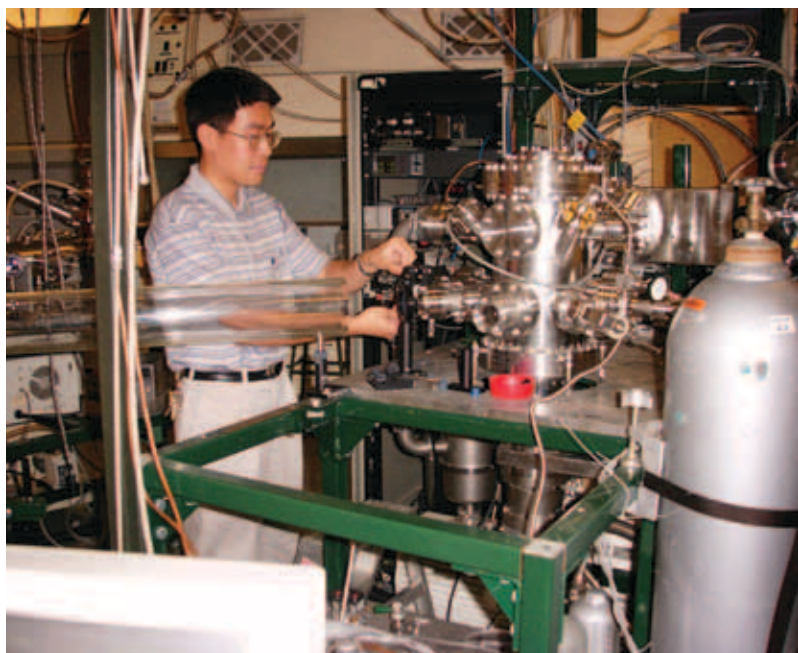
The transportation sector offers significant opportuni-



A strong federal renewable electricity standard—requiring utilities to obtain a percentage of their energy from renewable sources—will rapidly push these technologies into the marketplace. Twenty-eight states and the District of Columbia have already adopted such policies; not coincidentally, more wind power was installed in the United States over the past two years than in the previous 20. Wind represented 42 percent of all new electricity generating capacity installed in the country in 2007 and 2008.

ties for cutting carbon emissions while reducing the cost of meeting our critical targets for addressing global warming. These reductions come from switching to low-carbon fuels and reducing our dependence on oil—which would also reduce consumers' and businesses' projected annual transportation costs about \$120 billion by 2030. To achieve those cost savings, policy makers should create tools to strengthen each leg of the transportation sector: vehicles, fuels, and transportation choices.

Require investments in cleaner vehicles through tougher standards. The nation can save money and oil while cutting heat-trapping gases by



Research and development on emerging efficiency and renewable energy technologies—such as this researcher testing advanced photovoltaic equipment—should be increased. While implementing existing near-term solutions, we must continue to develop innovative technologies to ensure we achieve emissions reductions of at least 80 percent by 2050.

requiring automakers to integrate advanced technologies that boost fuel economy and reduce emissions from refrigerants across their entire fleet. Requiring cleaner, more efficient vehicles will also create jobs, help put the auto industry on the road to recovery, and ensure wise investment of public dollars used to help automakers.

Because many of these technologies fall under both the Clean Air Act, administered by the Environmental Protection Agency (EPA), and laws governing fuel economy, overseen by the National Highway Traffic Safety Administration (NHTSA), those two agencies can work together to set tougher standards for cars and light-duty trucks.

For example, the EPA should cap vehicle emissions from cars and light trucks at no more than 200 grams per mile of CO₂ equivalent by 2020, (with car and light-truck fuel economy reaching about 42 mpg), while NHTSA sets fuel-economy standards to support the EPA's efforts. By 2030 the EPA should cap vehicle emissions at no more than 140 grams per mile (with car and light-truck fuel economy reaching about 55 mpg). Within this process, there should be a transition to the EPA as the lead agency creating standards for vehicles in consultation with NHTSA.

In tackling medium- and heavy-duty vehicles, the EPA may be able to move more quickly than NHTSA,

as it has fewer restrictions on its statutory authority. The EPA's experience with setting standards for smog-producing and toxic emissions from heavy-duty vehicles, and its voluntary SmartWay fuel-saving program for such vehicles, should also prove valuable in the standard-setting process. Standards for medium-duty trucks should cap carbon emissions at no more than 780 grams per mile by 2020, and 500 grams per mile by 2030. Heavy-duty vehicles should emit no more than 1,075 grams per mile by 2020, and 840 grams per mile by 2030.

The EPA should set standards for all vehicles, not just highway vehicles, including airplanes, ships, off-road vehicles, and rail. All contribute to global warming, and all need to improve.

Require investments in cleaner fuels through a low-carbon fuel standard. The EPA also has an important role to play when it comes to fuels. A low-carbon fuel standard (LCFS)—which requires cuts in life-cycle carbon emissions per unit of energy delivered—is the next step up from today's renewable fuel standard (RFS).

The RFS applies to only about 10 percent of the transportation fuel pool, while an LCFS would encourage cuts in the carbon content of transportation fuels across the board. The latter would also avoid giving particular types of fuel special treatment, and allow the industry to determine the most cost-effective route to compliance.

The EPA already has authority under the Clean Air Act to establish a low-carbon fuel standard. The targets should be a 3.5 percent reduction in life-cycle carbon emissions from transportation fuels by 2020, and a 10 percent reduction by 2030. An LCFS would prevent an increase in global warming emissions from the use of high-carbon fuels such as tar sands, liquid coal, and oil shale. It would also guard against the types of biomass resources that could have that effect by spurring significant changes in land use. For an LCFS to be effective, it must take into account the full life cycle of a fuel, including both land-use changes and offshore emissions.

Maintain states' authority to set standards on global warming emissions from both vehicles and fuels. California's efforts to clean up smog and toxic pollution from vehicles, and encourage stronger sales of hybrid and electric vehicles, testify to the ability of states to act as laboratories for innovative energy and environmental policies. The next opportunity lies in California's efforts to reduce carbon emissions from cars, trucks, and fuels.

Congress must protect states' authority to develop such innovative policies and address new challenges as they emerge. That authority sustains progress when the federal government does not act quickly or aggressively enough, and it must be protected even as federal agencies establish national standards.

Encourage smarter travel, and include transportation under the carbon cap. Vehicles and fuels are just two parts of the transportation puzzle. To capture the remainder, a cap-and-trade system must include transportation. Doing so will send a price signal to all transportation users to reduce carbon emissions by choosing the best mode of transportation and curbing demand. Both pieces are crucial to meeting transportation's portion of the global warming challenge.

Besides including transportation under the cap, the federal government should tie all federal funding for transportation projects to efforts to cut carbon emissions. That will encourage innovative planning, improved mass transit, and intelligent transportation systems that make travel easier while reducing the need for it.

Federal agencies also need to encourage states to adopt pay-as-you-drive insurance, shift gas taxes to

per-mile fees to sustain and expand revenues for repairing highways and expanding transit, and reward innovative local planning that encourages smarter growth and transportation options. Meanwhile states and localities must do their part to encourage alternatives to cars and trucks without sacrificing daily mobility, such as by making cities and towns more bike-friendly and walkable.

Encourage and invest in advanced transportation technologies. Federal support is also essential in developing, demonstrating, and deploying ultra-low-carbon vehicles, fuels, and infrastructure. The federal effort should focus on technologies that offer significant cuts in carbon emissions but that will have trouble entering the market on their own, such as low-carbon biofuels and vehicles that run on electricity or hydrogen from renewable energy sources.

However, all aspects of advanced transportation technologies need further R&D, from the basic science of batteries, fuel cells, and low-carbon biofuels to their low-cost manufacture and the infrastructure needed to sustain them. The federal government's role is especially critical given that the industry's investment in R&D is now in doubt due to severe financial challenges.



California has consistently led the way in efforts to clean up smog, encourage sales of electric vehicles, and, most recently, require carbon emissions reductions from vehicles and fuels. These policies should be adopted at the national level while preserving states' authority to push for cleaner vehicles and fuels.

To effectively address climate change, the United States must make deep cuts in its carbon emissions. However, there is also an urgent need to help reduce emissions in developing countries and to help poorer countries prepare for the changes we can no longer avoid. Comprehensive policies both domestically and abroad should help make renewable energy technologies, such as these PV modules installed on the roof of the Satyanarayanpur Health Center in West Bengal, India, more accessible and affordable.



Ensure that transportation policies are consistent and durable. The automotive industry needs certainty when making significant new investments, and the nation needs deep cuts in carbon emissions, so policies that encourage those investments and deliver those reductions must be strong and remain so even with a changing of the political guard. That is especially true for vehicle technologies, because 15 years can elapse before they exert their full impact as the fleet of cars and trucks turns over.

By consistently investing in a wide range of advanced technologies during the next 20 years rather than shifting focus with every new election or trend, the nation can ensure that we will have the tools we need to meet our transportation goals.

8.5. Building Block Five: International Policies

We were unable to model international policies in our analysis. However, we know that serious action to fight global warming will require the cooperation of all nations, as well as specific actions by industrialized countries. While the most important step our nation can take is to dramatically cut its own emissions, there is also an urgent need to help developing countries reduce their emissions and adapt to climate change. As a first step, the United States should engage constructively in U.N. negotiations now under way on a new climate treaty that keeps further warming below 2°F.

A comprehensive U.S. approach to global warming should include the following international policies.

Support for curbing tropical deforestation. Tropical deforestation now accounts for about 20 percent of heat-trapping emissions worldwide. Besides cutting back on its own emissions, the United States should finance and support the efforts of forest-rich tropical countries to slow their deforestation rates. A portion of the revenues from the auction of carbon allowances could fund this initiative. Investing just 5 percent of allowance revenues in this effort could reduce tropical deforestation by 20 percent (Boucher 2008).

Funding for sharing clean technology. Transitioning the global economy from its dependence on dirty fossil fuels to clean technologies will require serious investments in research, development, and wide-scale deployment. The United States should invest a portion of its auction revenues in efforts to share clean energy technologies, and should also consider agreements on intellectual property that would allow those technologies to be widely deployed more quickly.

Funding for adapting to global warming. Unfortunately, the world is already committed to a certain amount of global warming because of past and current carbon emissions. Particularly vulnerable communities and regions are already experiencing the effects of climate change, and will continue to bear the brunt. The United States and other developed nations must fund efforts to help these communities and regions build

BOX 8.2.

How It Works: REDD

Policies for reducing emissions from deforestation in developing countries—known as REDD—can be very cost-effective ways to slow global warming. The opportunity costs of preserving tropical forestland, which are the majority of the costs of REDD, are low because most deforested land is used in ways that bring very low returns. For example, 60–70 percent of Amazon land deforested in the 1990s was used for low-quality cattle pasture, with many acres required to support a single cow.

A UCS analysis (Boucher 2008) describes how REDD could work in practice. Some of the highlights of that analysis are described below.

Under a REDD system, developed nations would compensate tropical nations for these opportunity costs once the tropical nations had slowed their rates of deforestation and documented the resulting cuts in carbon emissions (calculated for each country as a whole). Funding could come from a variety of sources, such as auction revenues from cap-and-trade systems, official development assistance, or levies on aviation fuels or timber imports.

If funding for curbing deforestation came from carbon offsets purchased by companies in developed countries like the United States, net emissions would not drop, as a cut in emissions in the tropical country would be countered by more emissions in the United States. Our REDD modeling assumed that U.S. funding for REDD would come from a non-offset source such as auction revenues. As a basis for comparison, The European Commission recommends using 5 percent of auction revenues under the EU Emissions Trading System for this purpose.

Three major groups of researchers have modeled the costs and potential of REDD (Kindermann et al. 2008). Our analysis averaged the output of their models—modified to incorporate other costs of implementing a REDD program, and realistic expectations for how quickly it could become truly global—to create a new set of cost curves.

The analysis found costs of REDD that are comparable to those of other recent studies. For example, cutting tropical deforestation in half by 2020—the goal announced by both the U.K.’s Eliasch Review and the European Commission’s October 2008 report on

REDD—would cost about \$20 billion a year. The EC estimated an annual cost of \$15 billion to \$25 billion, while the Eliasch Review cited a range of \$18 billion to \$26 billion. Thus a variety of estimates of the cost of REDD are converging on the same relatively modest figures.

If funding were available, would tropical countries reduce their deforestation rates? Indications are that the answer is yes. About 30 members of the Coalition for Rain Forest Nations put REDD on the agenda of international climate talks in 2005. And several tropical countries have already stopped and even reversed deforestation (Rudel et al. 2005), along with most temperate ones.

For example, Brazil recently released its National Climate Change Plan, which aims to reduce deforestation by slightly more than 70 percent through 2017, compared with the baseline level from 1996 to 2005. (The nation will measure progress in hectares deforested rather than tons of CO₂ emitted, but the results should be similar.) Thus, if developed nations can find a relatively small amount of funding, developing countries seem willing and able to accomplish ambitious goals.



About 20 percent of global carbon emissions result from the destruction of tropical forests. A sensible global warming policy must contain financial incentives for developing countries to protect their forests.

resilience in the face of climate change, especially the poorest areas. A portion of the auction revenues from a cap-and-trade program could augment existing funding for international development.

8.6. Conclusion

We are at a crossroads. The Reference case shows that we are on a path of rising energy use and heat-trapping emissions. We are already seeing significant impacts from this carbon overload, such as rising temperatures and sea levels and extreme weather events. If carbon emissions continue to climb at their current rate, we could reach climate “tipping points” and face irreversible changes to our planet.

In 2007 the Intergovernmental Panel on Climate Change (IPCC) found it “unequivocal” that Earth’s climate is warming, and that human activities are the primary cause (IPCC 2007). The IPCC report concludes that unchecked global warming will only create more adverse impacts on food production, public health, and species survival.

The climate will not wait for us. More recent studies have shown that the measured impacts—such as

rising sea levels and shrinking summer sea ice in the Arctic—are occurring more quickly, and often more intensely, than IPCC projections (Rosenzweig et al. 2008; Rahmstorf et al. 2007; Stroeve et al. 2007).

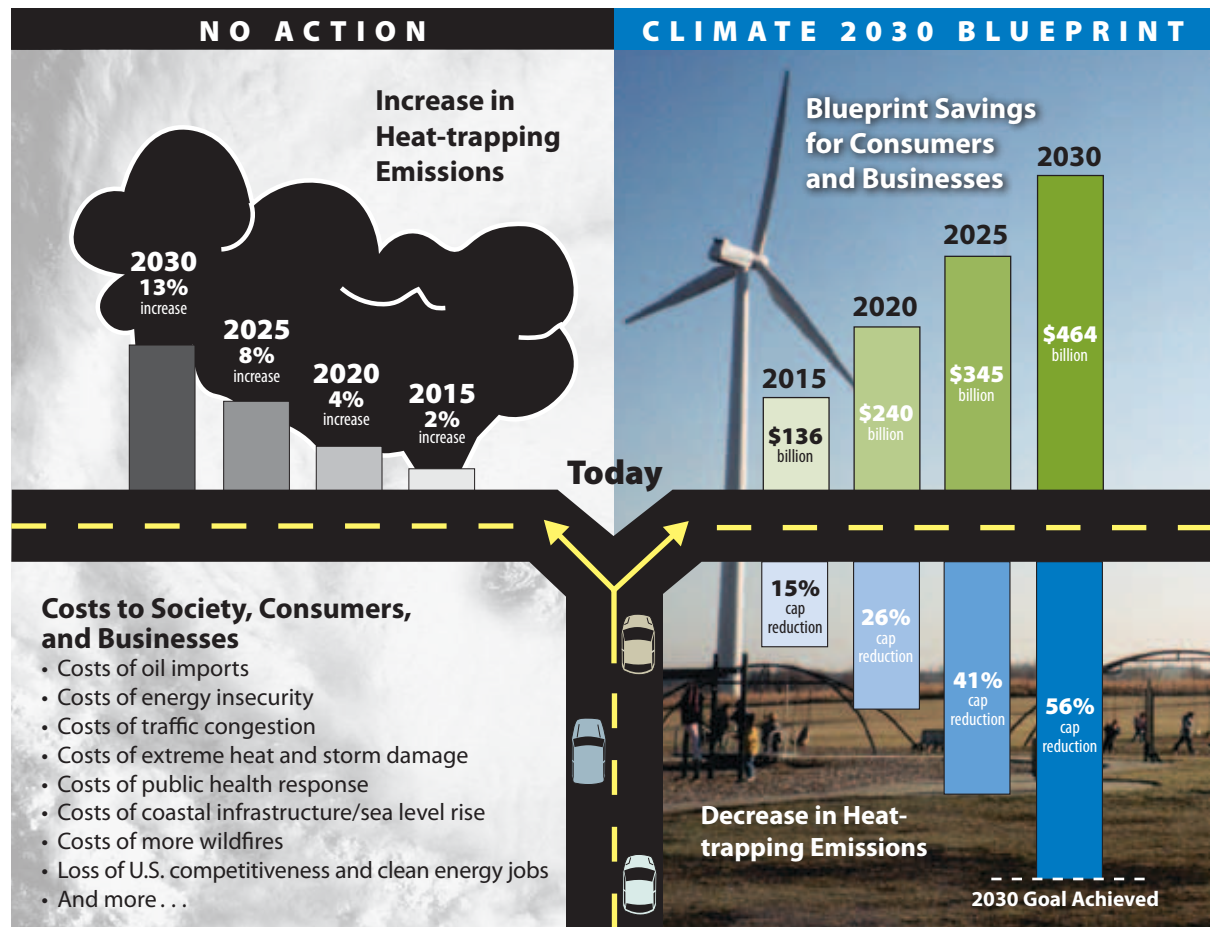
The most expensive thing we can do is nothing. One study estimates that if climate trends continue, the total cost of global warming in the United States could be as high as 3.6 percent of GDP by 2100 (Ackerman and Stanton 2008).

The Climate 2030 Blueprint demonstrates that we can choose to cut our carbon emissions while maintaining robust economic growth and achieving significant energy-related savings. While the Blueprint policies are not the only path forward, a near-term, comprehensive suite of climate, energy, and transportation policies is essential if we are to curb global warming in an economically sound fashion. These near-term policies are also only the beginning of the journey toward achieving a clean energy economy. The nation can and must expand these and other policies beyond 2030 to ensure that we meet the mid-century reductions in emissions that scientists deem necessary to avoid the worst consequences of global warming.



The Climate 2030 Blueprint demonstrates that we can cut our carbon emissions while maintaining robust economic growth and achieving significant energy-related savings. A near-term, comprehensive suite of climate, energy, and transportation policies is essential to cost-effectively curb global warming and build a revitalized clean energy economy.

FIGURE 8.1. Choosing a Clean Energy Economy



Note: Emissions increases and decreases are relative to 2005; Blueprint savings are relative to the Reference case.

The United States is at a crossroads. We can choose to transition to a clean energy economy that addresses a multitude of challenges (oil dependency, energy security, global warming, air pollution) or we can choose to ignore these problems.

The Climate 2030 Blueprint shows that we can build a competitive clean energy economy that will save consumers money and give our children a healthy future.

Conversely, choosing to ignore our energy problems commits us to continued reliance on dirty fossil fuels and to the damaging costs associated with climate change. These costs include the consequences of sea level rise that threaten our coastal communities, disruptions in food production, and illnesses associated with extreme heat and diminished air quality.

This transition will certainly require some up-front investment costs. However, the Climate 2030 Blueprint will reduce energy use and consumer and business energy bills—even in the early years. These savings more than make up for the costs of building a clean energy economy.

The time to invest in our future is now.