

CLIMATE **PRAGMATISM**

**INNOVATION, RESILIENCE
and NO REGRETS**

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— THE HARTWELL ANALYSIS IN AN AMERICAN CONTEXT —

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TABLE of CONTENTS

4 INTRODUCTION

8 POLICY PLURALISM

9 ENERGY TECHNOLOGY
INNOVATION

9 THE ENERGY INNOVATION IMPERATIVE

14 SEIZING THE OPPORTUNITY

17 RESILIENCE to EXTREME
WEATHER

21 NO REGRETS POLLUTION
REDUCTION

27 THE WAY FORWARD

29 NOTES and CITATIONS



INTRODUCTION

Future historians of efforts to address climate change will almost certainly look back on 2010 as the end of one era and the beginning of another. The first began with the creation of the United Nations Framework Convention on Climate Change (UNFCCC) in Rio de Janeiro in 1992 and ended with the negotiation of the Copenhagen Accord in December 2009. By the Cancún talks in late 2010, the emphasis of international negotiations had shifted from efforts to establish legally binding emissions limits to more modest agreements to invest in new energy technology, transfer technology among nations, and support climate resilience efforts in the developing world.

If efforts in this direction are redoubled, this shift of priorities could redeem international climate cooperation. What's more, as the old framework has collapsed, new American leadership to address global energy, economic, and environmental challenges also becomes possible. In recognition of this reality, a group of scholars and analysts recently convened in Washington, DC to discuss the potential for renewed American engagement on climate change and the development of a strategy that's effectiveness, paradoxically, would not depend on any agreement about climate science and the risks posed by uncontrolled greenhouse gas emissions. *Climate Pragmatism* is the result of that meeting and is co-authored by several of the same scholars who produced *The Hartwell Paper*.*

The old climate framework failed because it would have imposed substantial costs associated with climate mitigation policies on developed nations today in exchange for climate benefits far off in the future — benefits whose attributes, magnitude, timing, and distribution are not knowable with certainty. Since they risked slowing economic growth in many emerging economies, efforts to extend the Kyoto-style UNFCCC framework to developing nations predictably deadlocked as well.

* **The Hartwell Paper: A new direction for climate policy after the crash of 2009** argues for a changed approach to international climate policy after the sustained failure of the United Nations Framework Convention on Climate Change. The paper argues that “decarbonisation will only be achieved successfully as a benefit contingent upon other goals which are politically attractive and relentlessly pragmatic.” The paper calls for “human dignity” to serve as a necessary guiding principle of climate policy and outlines three central objectives consistent with this guiding principle: (1) ensuring energy access for all, (2) developing clean and scalable energy technologies that are ultimately cost competitive with fossil fuels absent subsidy, and (3) building resilience to climate change. It also argues for vigorous action to reduce non-CO2 climate forcings and pollutants such as black carbon and ozone. The result of three months of intensive work by a group of 14 authors from Asia, Europe, and North America, the paper was published in May 2010 by the MacKinder Programme at the London School of Economics and the Institute for Science, Innovation, and Society at the Saïd Business School, University of Oxford. It can be viewed here: <http://bit.ly/HartwellPaper>

INTRODUCTION

The new framework now emerging will succeed to the degree to which it prioritizes agreements that promise near-term economic, geopolitical, and environmental benefits to political economies around the world, while simultaneously reducing climate forcings, developing clean and affordable energy technologies, and improving societal resilience to climate impacts. This new approach recognizes that continually deadlocked international negotiations and failed domestic policy proposals bring no climate benefit at all. It accepts that only sustained effort to build momentum through politically feasible forms of action will lead to accelerated decarbonization.

If this new era is to be led at all, it will be led primarily by example, not global treaty. The Copenhagen Accord is one of essentially voluntary actions among major emitters. The accord perpetuates the conceit that international negotiations will ultimately include legally binding emissions reduction targets, but in reality, the emissions targets will be unenforceable and thus constitute aspirational goals, not binding limits. That reality became ever clearer at UNFCCC negotiations in Cancún in December 2010. The substantive parts of the Copenhagen Accord are the new multilateral agreements to invest in new energy technology, slow deforestation, and build disaster resilience — far better grounds for global cooperation than unenforceable emissions targets and timetables.

A new climate strategy should take a page from one of America's greatest homegrown traditions — pragmatism¹ — which values pluralism over universalism, flexibility over rigidity, and practical results over utopian ideals. Where the UNFCCC imagined it could motivate nations to cooperatively enforce top-down emissions reductions with mathematical precision, US policymakers should acknowledge that today's global, social, and ecological systems are too messy, open, and complicated to be governed in this way. Whereas the UNFCCC attempted to create new systems of global governance, a pragmatic approach would build upon established, successful institutions and proven approaches. Where the old climate policy regime tried to discipline a wildly diverse set of policies under a single global treaty, the new era must allow these policies and measures to stand—and evolve— independently and according to their own logic and merits. And where the old regime required that everyone band together around the same core motivation and goals, policymakers today are likely to make the most progress to the degree that they refrain from centrally justifying energy innovation, resilience to extreme weather, and pollution reduction as “climate policy.”

INTRODUCTION

Energy innovation, resilience to extreme weather, and no regrets pollution reduction — each of these goals has its own diverse justifications:

- Support for energy innovation today comes from those concerned about the high (and rising) economic costs, not to mention the foreign entanglements created by America's dependence on oil; the need for greater energy access in poor countries; diseases and deaths caused by air pollution, oil and gas drilling, and coal mining and waste; and the potential for America to manufacture and export new energy technologies at a profit. All of these motivations play to America's strengths, and each can assemble a strong coalition of support.
- Rich and poor countries alike are vulnerable to a wide range of complex socio-technical disasters, some climate change-related, some not. Domestically, Hurricane Katrina and the recent Mississippi flooding provide compelling rationale for improving resilience to extreme weather events, whether they are exacerbated by climate change or not. Internationally, US support to build disaster resilience in developing countries is strong and longstanding, and US foreign aid remains the highest in the world. When harnessed to build resilience to extreme weather and disasters, both domestic and international efforts will be more successful.
- And motivated by a clear desire to protect public health, the United States has long been a global leader in the development and deployment of pollution abatement technologies, from the creation of smokestack scrubbers to the invention of alternatives to ozone-depleting chlorofluorocarbons (CFCs). A redoubling of such efforts can yield simultaneous progress to reduce climate forcings.

Globally, almost all of the important action occurring on energy innovation and adoption has occurred and is occurring in support of one or more of this diverse set of reasons, not just climate change. The only two countries in the world to have significantly decarbonized their energy sectors over recent decades, Sweden and France, did so in response to oil shocks, not environmental fears. Last fall, the Indian government imposed a small fee on coal consumption, not for climate mitigation, but to fund advanced energy development to meet future energy needs. In October 2011, the Japanese government plans to begin gradual tax increases on coal, oil, and natural gas, fuels the nation lacks in any abundance, in order to raise an

INTRODUCTION

estimated \$3 billion (¥240 billion) annually by 2015 to fund the development and adoption of advanced energy technologies.² When fully phased in, the fossil energy tax will amount to just 3.6 cents per gallon of gasoline (¥0.76 per liter).

Likewise, efforts are ongoing from the Netherlands and Japan to the Maldives and India to build greater resilience to the vagaries of nature, including better infrastructure, emergency planning, and resilient design of everything from sea walls and skyscrapers to food crops. Meanwhile, the development of crops that are resilient to climate stresses, such as drought, has proceeded irrespective of specific predictions of anthropogenic warming impacts, and nations continually pursue cost effective improvements in public health and environmental quality.

For the United States and other nations to effectively pursue energy innovation, resilience to extreme weather, and pollution reduction, policymakers must make a clean break from the pitched and polarizing climate wars of the last twenty years and embrace a more pluralistic and pragmatic approach.³ Already, the international community is moving in the right direction. In mid-January, UN Secretary General Ban Ki-Moon announced that the focus of his efforts would shift away from climate and toward accelerating the development and deployment of clean energy, especially in the developing world.⁴ China presses ahead with the deployment of new, low-carbon energy technologies to enhance security of supply, improve public health conditions, and build a profitable new domestic manufacturing sector.⁵ And President Barack Obama's 2011 State of the Union Address focused squarely on energy innovation in the context of economic renewal and competitiveness, rather than climate change.⁶

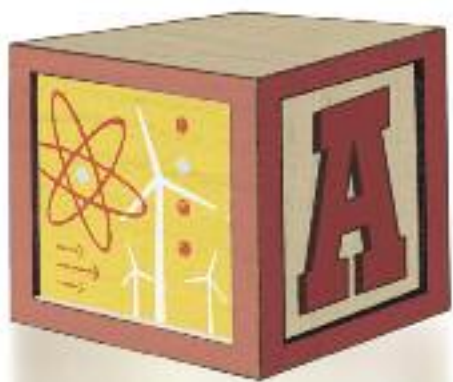
POLICY PLURALISM

Before the UNFCCC settled on a mitigation framework focused on emissions reduction targets and timetables, and a modest adaptation framework narrowly focused on adapting to “anthropogenic climate change,” the international community’s approach to global warming was framed around multiple policies and measures, many of which could be justified for non-climate reasons. This was a prudent approach.

Below, we propose three baskets of policies focused on energy technology innovation, resilience to extreme weather, and “no regrets” pollution reductions. This return to a focus on policies and measures embraces the openness, heterogeneity, and contingency that the UNFCCC framework ultimately treated as problems to overcome. In contrast, we view these qualities as assets and central to a pragmatic approach to climate change. And while the UNFCCC process gave nations every incentive to keep proposing increasingly “ambitious” long-term emissions reduction targets while continually missing near-term goals, this approach would return to policy levers that national policymakers can actually affect, while steadily building on near-term successes.

None of the policies and measures described below must be pursued in a centralized manner, readers need not agree with all of them, and policymakers should avoid unnecessarily combining them. Even so, there are obvious synergies between them. For example, accelerated technological innovation will drive down the price of non-fossil energy technologies, which, in turn, can reduce air pollution and help power the economic development that developing nations need to become more resilient to extreme weather.

ENERGY TECHNOLOGY INNOVATION



THE ENERGY INNOVATION IMPERATIVE

Global energy use is expected to rise nearly 50 percent by 2035 and as much as double or triple by midcentury.⁷ Policymakers in the Kyoto era viewed soaring global energy demand as an obstacle to emissions reductions. In this new era, we should see it as an opportunity — to catalyze innovation, to enfranchise hundreds of millions of people who now lack access to modern energy sources, and to discover new decarbonization paths.



It will be challenging to meet growing global demand with fossil energy alone. Already, oil production is strained by rapidly rising global demand, with higher prices and increased market volatility the obvious result. While coal remains available in more plentiful quantities, global demand has already begun to pressure prices upwards, as more and more nations require ever-increasing imports of conventional fossil fuels to power growth. Coal imports in China and India are slated to rise 78 percent in 2011 alone, driving up international prices to the highest level in two years and introducing new volatility to global markets.⁸ At the same time, the public health impacts of rapidly rising coal consumption have already begun to significantly burden many nations, with the World Bank and Chinese State Environmental Protection Agency estimating that the health costs of air and water pollution in China bleeds an estimated 4.3 percent of the nation's GDP.⁹ Observing these trends, the International Energy Agency declared in 2010 that the long-term global energy outlook is "patently unsustainable" and raises a clear long-term imperative: the development of cleaner, more affordable, and massively scalable new energy technologies.¹⁰

In the past year, however, the potentially sweeping ramifications of vast new discoveries of shale gas have come into full view. In 2010, shale gas production unlocked by new horizontal drilling and “fracturing” techniques provided nearly one quarter of all US natural gas production, with unconventional natural gas production rising 12.5-fold since 2000.¹¹ There is still considerable uncertainty about how much shale gas “plays” may eventually produce, but estimates are significant and resources are distributed across the globe. A US Energy Information Administration survey of 48 shale gas basins distributed across 32 countries suggests that shale gas formations may increase worldwide estimates of total technically recoverable natural gas supplies by 40 percent.¹²

In the short or medium terms, shale gas may relieve global energy supply pressures and help accelerate the decarbonization of the power sector. The long-term implications are less certain. Greater global reliance on natural gas may simultaneously lay the infrastructural foundation for a long-term transition to the use of sustainably produced hydrogen or biogas *and* undermine near-term incentives for the proactive development of new, advanced, non-fossil energy technologies. And while new shale gas production has come online quickly, creating something of a glut in North American gas markets, growing demand has historically been quick to take up any new slack in the global energy system. Furthermore, individual gas wells both come online *and* deplete quickly, producing roughly 25 percent of their total production in the first year and about 50 percent in the first four years. Largely as a result, global gas markets have been through a number of historical cycles, swinging quickly and often unpredictably from tight, volatile markets and soaring prices to supply gluts and rock-bottom prices and back again. What the future holds remains uncertain.

Thus, even as increased reliance on natural gas is likely to be the new business-as-usual course for much of the world, these long-term uncertainties make the proactive diversification of energy supplies and the development of clean, affordable, and scalable non-fossil alternatives the most prudent course of action.

For America, this prudent course holds tremendous opportunity. Developing new supplies of clean, cheap, and abundant energy is the key to finally ending a dependence on volatile global oil markets that holds our economy hostage and compromises our foreign policy and basic values. Every day, oil imports bleed more than \$1.4 billion out of the US economy,¹³ a challenge to national prosperity in both the short and long terms. Modernizing the nation’s

ENERGY TECHNOLOGY INNOVATION

energy system can reduce public health impacts, strengthen the security of the energy grid, and mitigate climate risk. At the same time, with virtually all of global energy demand growth occurring in emerging economies,¹⁴ the country that can invent, manufacture, and export clean and cost-competitive energy technologies can harness a multi-trillion dollar export opportunity.¹⁵ As a nation of intrepid innovators and entrepreneurs, the United States has the wherewithal to capture a leading share of this global growth market.

For these and other reasons, diversifying the nation's energy system, developing advanced energy alternatives, and reducing an over-reliance on oil and conventional fossil fuels has long been a national priority. The history of American innovation shows that smart public investments can effectively catalyze the invention of remarkable new technologies to advance public welfare, from railroads and rural electrification to semiconductors, smart phones, and the Internet.¹⁶ These forces can once again be harnessed to capture this energy innovation opportunity.

Unfortunately, sustained progress towards a clean, secure, and affordable energy system has so far proven elusive. Despite vigorous activity in alternative energy markets in recent years, today's low-carbon energy technologies are still relatively immature, costly, and in some cases incompatible with the reliability and high-density demands of modern energy systems, particularly when deployed at any significant level of market penetration. Solar and wind energy are intermittent, require large amounts of land, and frequently require the transmission of electricity over very long distances in order to exploit optimal sites for their large-scale deployment. Present-day biofuels are similarly land intensive, require significant energy inputs, and still need to be blended with petroleum fuels in order to power conventional engines. Electric vehicles suffer range limitations that dampen consumer interest, face up-front costs nearly twice that of conventional petroleum-fueled vehicles, and will require the widespread deployment of new charging infrastructure to become ubiquitous. Nuclear power, alone among low-carbon energy technologies, has a demonstrated capacity to generate large quantities of affordable, low-carbon, baseload power. However, new plants using current-generation technology face high capital costs, large and complicated construction projects, and public concerns about operation and waste disposal that are only likely to be reinforced by the Fukushima nuclear accident. In combination, such challenges have greatly slowed the development of new nuclear power capacity in the United States for several decades and continue to impede a nuclear renaissance based on these conventional designs.

ENERGY TECHNOLOGY INNOVATION

Technological obstacles to scaling up alternative energy sources aside, the cost of most present-day low-carbon energy technologies limits their ability to replace fossil-based energy at any significant scale in the United States or abroad. Wind energy, the lowest cost and most readily scalable of today's renewable technologies, still costs roughly 50 percent more than electricity from new natural gas plants when deployed onshore and is even more costly offshore.¹⁷ Solar thermal and photovoltaic technologies generate electricity at roughly two to five times the cost of coal or gas plants.¹⁸ Alone again among present low-carbon technologies, nuclear power can approach cost competitiveness with fossil-based energy and it remains the low-carbon energy technology of choice in many parts of the world. However, development and construction costs associated with new nuclear plants in the United States are speculative at present. It has been two decades since a new plant was constructed, so first-of-a-kind plants in the United States are likely to be expensive. Moreover, uncertainties about total costs may continue to overwhelm the loan guarantees and other modest incentives offered by the federal government to help re-launch a domestic nuclear power industry.

In the face of the persistent cost gap between cleaner alternatives and incumbent fossil fuels, low-carbon energy sources continue to rely on sustained public subsidy anywhere in the world they are being adopted at scale. At significant degrees of market penetration, however, these subsidies become unsustainable, both fiscally and politically, even in rich nations. More to the point, global energy demand growth in coming decades will be driven almost entirely by emerging economies, which are likely to be unable to sustain high public subsidies or high carbon prices to drive clean energy deployment.

Both incremental and radical innovations are therefore required across the full suite of low-carbon technology options.¹⁹ Without such innovation and improvement, the rapid pace and massive scale of low-carbon energy deployment required to meet global energy demand while averting potentially catastrophic climate risks will prove all but impossible to achieve. This central innovation challenge must be tackled directly and proactively.

Fortunately, with a diverse array of emerging technologies at hand, the energy sector holds huge potential for innovation, and the United States is well poised to drive this clean energy transformation. The United States has led the world in energy technology transformations in the past just as it has led in most other domains of technological innovation. Indeed, the US innovation system — its key institutions, as well as its human resources and vibrant private

sector — are assets that can make America a global leader in developing the affordable, scalable, low-carbon energy sources needed to fuel the world. But accelerating energy innovation to make low-carbon power sources affordable and ready to meet global energy needs will require that we reset US energy policy as well as US climate policy.

SEIZING THE OPPORTUNITY

Efforts in the United States to address carbon emissions and promote renewable and low-carbon power have predominantly put the deployment cart before the energy technology horse. That is, policymakers have attempted to mandate, subsidize, or create markets for clean energy technologies without seriously attending to the innovation effort that is going to be necessary before non-fossil energy sources are capable of meeting the demands of the nation's energy system, let alone growing global needs. It is time for fresh thinking to rise to the energy innovation imperative.

Today, there is hardly a single energy technology that doesn't receive some kind of federal subsidy. Far from the government "picking winners and losers," the federal government lavishes subsidies on virtually every energy technology we have. For the well-established fossil fuels that overwhelmingly power our economy, we continue to offer tax write-offs and subsidize exploration and production. For nuclear power, the federal government takes on the low probability risk of costly accidents that would otherwise render private ownership of nuclear plants impossible, while offering loan guarantees to reduce investor risk for new plant construction. For renewable energy alternatives like wind and solar power, we subsidize deployment in hopes that the technologies will improve to the point that they might be able to affordably meet a significant portion of the nation's energy needs.

While US policymakers are unlikely to eliminate energy subsidies altogether, we might reasonably expect them to discipline and optimize those subsidies to better serve national objectives.²⁰

In the case of nuclear power, we should continue to invest in a new generation of safer and more affordable plant designs, an approach that has become more urgent since the nuclear

meltdowns in Japan. In particular, new smaller modular reactor designs should be safer, can be built in increments that are easier to finance, and have the potential to be mass-manufactured rather than constructed on site, offering the possibility of reductions in the cost of new nuclear power.²¹

Support for solar, wind, biofuels, and other renewables also needs to be radically reconsidered. Those technologies today remain expensive. Largely as a result, even with significant state and federal subsidies²² and supportive regulatory mandates in many states, these renewable energy sources still comprise only a tiny portion of US energy production. If these technologies continue to rely on major subsidies, as they begin to supply more significant portions of America's energy needs, the cost to the public will become prohibitive.

Put simply, we must make clean energy cheap. For emerging and immature energy technologies, deployment subsidies therefore need to better reward innovation and price improvements, not simply production of more of the same.²³ At the same time, the nation must ramp up today's paltry national commitment to energy innovation to the scale of a true national priority — from just \$3-4 billion annually today,²⁴ to reach \$15 billion or more annually.²⁵

Furthermore, whatever the level of investment, policymakers must reform and strengthen the energy innovation system, including more productively focusing on commercial-oriented innovations; supporting more high-risk but high-reward research; effectively linking the various stages of the innovation process through better institutional arrangements; and fostering collaboration between public and private sector researchers, universities, technology companies, manufacturers and suppliers, and investors.²⁶

To support this critical effort, America should use our current energy endowments to ensure we can develop the clean, affordable, and scalable energy technologies needed to power the nation over the long term. In the case of ongoing oil and gas production, lease and royalty revenue generated by the exploitation of those finite resources ought to be poured back into energy innovation. A small fee could be added to the operation of old power plants that have already fully recouped their initial investment but receive license extensions to operate beyond their original planned lifespan, so that today's affordable power system funds the innovative energy technologies of tomorrow. Meanwhile, a small surcharge on electricity sales (known as a "wires fee"), on gasoline or oil use, or even a small carbon charge should

be implemented, not to penalize energy use or price fossil fuels out of the market, but rather to ensure that as we benefit from today's energy resources we are setting aside the funds necessary to accelerate energy innovation and secure the nation's energy future.²⁷

RESILIENCE to EXTREME WEATHER



The global poor are likely to prove most vulnerable to extreme weather and natural disaster impacts of all kinds. At the same time, the best route to improved resilience is economic development and modernization. The world's emerging economies thus have every reason to be wary of both climate destabilization and, if structured poorly, the very policies designed to mitigate greenhouse gas emissions. This is one of the central paradoxes of climate change policy, one the old UN framework has addressed poorly, focused as it was on raising the cost of fossil energy — and thus potentially slowing the development prospects of the global poor.



The old UNFCCC effort tried to resolve this paradox by setting up adaptation aid as incentive for rich nations to pay poor nations to agree to a global emissions reduction agreement. Yet this system was undergirded by rough concepts of “climate justice” and the “climate debt” owed by the industrialized nations to the world’s poorer populations. This rhetorical framework would prove to be a poor motivator of additional international assistance. A framework of “debt” created a strong incentive for developed world diplomats to limit their nation’s responsibilities by enshrining a narrow definition of adaptation into the UN framework. Fatally, this definition was premised on the belief that adaptation to *man-made* climate change could be distinguished from, and was somehow more morally desirable than, adaptation to the extremes of climate more generally. Developing nations soon had every incentive to classify as many requests for aid as possible under the banner of “adaptation to climate change” and every opportunity to return to the polarizing postcolonial rhetoric so common to UN forums. One deceptive turn inspired another, and many rich countries that had promised adaptation funding in Copenhagen simply relabeled existing development aid as “adaptation” funding.

RESILIENCE TO EXTREME WEATHER

American policymakers should move beyond this dysfunctional framework. First, nations must shift their focus away from adaptation to anthropogenic climate change and towards resilience to extreme weather events of all types, without regard to cause. After all, it is immaterial if a hurricane is marginally more intense due to climate change than it would otherwise have been; the route to resilience is the same regardless. Societies remain vulnerable to many types of hazards, and resilient societies are those best prepared to respond effectively to a diversity of threats.

In reality, this distinction between “natural” and “anthropogenic” impacts has little meaning, given that the consequences of disasters are as strongly determined by societal factors (such as the population living in substandard housing at sea level) as by “natural” ones (such as the intensity of a hurricane). Dissolving this impossible distinction can also return efforts to build climate resilience to the well-established domain of national, bilateral, and multilateral cooperation on disaster preparedness, economic development, and modernization — objectives to which the world’s wealthy nations already contribute great sums. Again adopting a pragmatic process of building on prior successes and existing momentum, nations would therefore be wise to focus on climate resilient development strategies that make populations less vulnerable to extreme weather and disasters of all kinds, an objective that should inform both domestic and multilateral development efforts. This framework does not require agreement about climate science or climate policies and directly addresses universal concerns about securing greater resilience to disasters.

Second, economic growth and modernization is central to enabling the construction and maintenance of resilient physical infrastructure and human societies. Economic growth in turn requires increasing amounts of energy consumption, which means that for developing nations to grow and modernize over the next century they will need new, affordable sources of energy. Developing nations will continue to choose fossil energy as long as it out-competes clean energy sources. Meanwhile, for the 1.4 billion people in the world without any access to electricity,²⁸ fossil fuels themselves are already too expensive and more affordable energy alternatives are desperately needed.

Expanding access to energy throughout the developing world is thus a key strategy to reduce vulnerabilities, an insight that the previous climate regime was incapable of acknowledging or addressing. Furthermore, with global energy consumption likely to dou-

RESILIENCE TO EXTREME WEATHER

ble or triple by 2050, nations that manufacture and export affordable alternatives to fossil energy will gain the economic advantage from selling abroad and the security advantages of not being overly reliant on importing fuels at home, creating a win-win incentive for the world's technologically advanced nations to participate in this key effort to expand energy access and build global climate resilience.

Third, development institutions and policymakers should value ecosystem services to protect human communities against extreme weather and disasters. The removal of barrier islands in the Gulf Coast region increased New Orleans's vulnerability to hurricane damage, a vulnerability made tragically evident when Katrina struck. Development support, whether internationally through the World Bank or nationally through public disaster services, should be tied to intelligent planning that builds resilience to extreme weather disasters. This is a matter of common sense, irrespective of one's views on climate science.

Elsewhere, improving degraded ecosystems (such as industrial brownfields) in cities and suburbs can address pressing non-climate issues such as urban heat islands, storm-water management, erosion and landslide risks, and livability of residential and business areas. At the same time, improved ecosystems can increase carbon sinks and avoid negative contributions to regional-scale climate changes. Internationally, tropical forests, wetlands, and other ecosystems provide stabilization, filtration, and amenity services to farms and cities. The conservation of such ecosystems should be viewed as part of their development.

All of these efforts to make nations more resilient to extreme weather can also support national efforts to reduce local air pollution, the subject of our final section.

NO REGRETS POLLUTION REDUCTION



In mid-2009, at the height of the Congressional battle over cap and trade, two senators who supported climate action, Barbara Boxer (D-CA) and John Kerry (D-MA), and one who vehemently opposed it (and even denies the reality of climate change), James Inhofe (R-OK), joined together to cosponsor an effort to investigate ways to reduce black carbon (soot created by the partial combustion of fossil fuels and biomass). The motives spanned both health and climate spheres and clearly differed among the cosponsors. Their cooperation harkens back to a tradition of bipartisan air pollution policymaking in the United States, and it serves as a parable for what might be possible when the central focus of concern shifts from climate change and potential future risks to pollution and its negative consequences today.

Addressing public health risks associated with conventional air pollutants, including black carbon, methane, stratospheric ozone-depleting chemicals, precursors to tropospheric ozone, and mercury, offer Americans significant public health benefits that are immediate, well known, and often welcome across the political spectrum. Limiting these pollutants reduces respiratory and cardiovascular diseases, smog and haze, mercury poisoning, melting of glaciers and ice sheets, and changes in regional climates. Worldwide, air pollution causes an estimated three million deaths per year, according to the World Health Organization.²⁹ Whatever one's view of climate change, most Americans and most nations can agree that reducing pollution at modest or no cost to the economy is the definition of "no regrets" action. If many of these efforts also offer near-term climate mitigation benefits, so much the better.

Air pollution regulations are imposed incrementally alongside the process of technical innovation, which in turn makes compliance and further pollution reduction possible. Effective regulations and standards deploy best-available technologies while creating an incentive for firms to improve them. This process is non-linear. New technologies make new requirements economically and politically viable, while the threat of new regulations provides an incentive to companies to incrementally improve technologies. For example, regulations and innovation were both well underway for a decade before negotiation of the 1987 Montreal Protocol to reduce emission of ozone-depleting substances. Initially, action was grounded as much in scientific uncertainty as certainty. Indeed, in 1982 the National Academy of Sciences suggested the threat of ozone depletion was less than previously thought. Even so, Congress pursued "no-regrets" policies where cheap, easy (and sometimes even profitable) technological fixes were available, such as a move away from aerosol spray cans, which were banned in the United States as early as 1978. By the time scientists discovered the ozone hole in 1985, not only were domestic and international frameworks already in place, technological progress had continued apace. Indeed, it was technical innovations in industry that made the global treaty and its subsequent amendments to phase out ozone-depleting CFCs both practically and politically possible. Similarly, cheap implementation of the 1990 acid rain amendments to the Clean Air Act was made possible in part due to prior regulations that motivated innovation in technologies to "scrub" coal plant emissions. Equally important was the deregulation of the railroads and subsequent completion of economic rail links between the West, with its low-sulfur coal, and coal-fired power plants in the Midwest and eastern United States. In the cases of both ozone depletion and acid rain, effective wielding of regulations were important

to creating incentives for firms to make necessary investments and to secure the public good of cleaner air.

A pragmatic approach to climate change seeks positive and politically achievable steps that yield discernible benefits, which in turn provide the rationale for the next steps. Thus, from the history of pollution control, pragmatists conclude that it is important to secure (and build upon) modest pollution regulations that have public and congressional support. Such efforts can make immediate progress, even as protracted battles rage over regulations that do not yet command such consensus.

While we cannot effectively manage human impact on the climate over the long run absent the decarbonization of the global energy system — a task that hinges on the energy innovation efforts described above — in the short term, we would do well to seize opportunities to quickly reduce non-CO₂ emissions through traditional air pollution regulations, spread of best practices, and multilateral cooperation. Roughly 40 percent of anthropogenic global warming measured to date is a function of climate forcings other than carbon dioxide, including methane, tropospheric ozone precursor gases, and deforestation. These non-CO₂ forcings will remain significant contributors to global climate change in coming decades. In fact, many of the most evident impacts of global warming, such as melting glaciers, ice caps, and tundra, are accelerated by pollutants that are not, technically, greenhouse gases — notably black carbon.

The tools and institutions for dealing with these pollutants are already in place. Ozone-depleting substances are already regulated under the Montreal Protocol. Existing environmental regulations, including the Clean Air Act and Clean Water Act, may be utilized to reduce harmful pollutants, including smog and particulates, mercury, and black carbon. And methane from many of its sources is readily controlled, sometimes at a profit. Continued and strengthened pressures for more stringent control of these emissions and their agreed-upon harms would also produce immediate climate benefits.

A number of conventional urban air pollutants, including nitrogen oxides, carbon monoxide, methane, and other volatile organic compounds, react in the troposphere to create ozone. Unlike higher-altitude stratospheric ozone — the critical “ozone layer” that shields the earth from dangerous UV radiation — ozone in the troposphere (the lowest portion of the earth’s at-

mosphere) warms the climate, exacerbates asthma and lung disease, and reduces agricultural yields. A study of ozone concentrations in 95 large urban communities in America found a statistically significant association between elevated ozone levels and premature deaths. The study estimated that cutting urban ozone concentrations by one-third could save 4,000 American lives annually.³⁰ Many of these ozone precursors are also potent greenhouse gases.

Mercury, emitted by fossil fuel power plants (mostly coal-fired plants) along with climate-altering substances (including carbon dioxide), is poisonous to humans and affects the nervous system. Emitted from a power plant, mercury can travel tens or even hundreds of miles and be deposited in bodies of water where it is taken up by fish that people eat. Women with elevated mercury levels may give birth to disabled babies and the heavy metal has myriad other health consequences, all of which are well understood and accepted. Existing regulations and industry actions have reduced total US mercury emissions by 60 percent since 1990. Continued incremental progress, wherever cost effective, could yield further reductions in toxic pollutants such as mercury while contributing to the accelerated modernization of America's energy system, with both direct public health and indirect climate benefits.

Black carbon is an all-around hazard. Upwards of two million people die worldwide each year — most of them women and children — from breathing in black carbon and other indoor air pollutants emitted from fuel in indoor cook stoves.³¹ Unlike some other emitted particles, black carbon absorbs solar radiation and warms the atmosphere at regional and global scales. The pollutant is thought to rank behind carbon dioxide and methane as one of the top three contributors to global warming.³² Black carbon particularly impacts Arctic and glacial ice loss; when deposited on reflective ice surfaces, black carbon traps more heat and accelerates melting. Eradicating emissions of black carbon through targeted and enforced regulation is feasible and, in some cases, straightforward. Sources include diesel engines, inefficient cooking stoves,³³ forest fires, and industrial equipment such as brick kilns. In each case (excepting wildfires), existing technologies are available to eliminate black carbon emissions. The economic payback is in some cases relatively quick, and the public health benefits are huge, especially for the poorest in developing countries.

Other emitted aerosol particles, including sulfates and nitrates, are major components of urban smog and haze, producing unhealthy air. These consequences lead to "Code Orange" and "Code Red" air quality days across the country, during which people are

advised to limit their outdoor activities or even stay indoors. While aerosols scatter solar radiation back to space and lead to temporary cooling, they are thought to influence seasonal and regional rain patterns, including the frequency and intensity of monsoons.

Controlling methane gas can often be easy, cheap, and even profitable with many practicable strategies for its control (and subsequent sale as a relatively low-carbon fuel). Sources include mining operations, landfills, rice paddies, livestock, and pipeline leaks. For all of these sources, strategies to reduce methane are well established. Finally, because methane is a potent greenhouse gas with a much shorter atmospheric lifetime than carbon dioxide, controlling the release of methane into the atmosphere will yield rapid, positive climate effects.



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Finally, a set of powerful climate forcings could be readily tackled by extending the Montreal Protocol, which worked to protect the stratospheric ozone layer. Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) are very strong greenhouse gases. Pound for pound, they cause hundreds or even thousands of times more warming than carbon dioxide in both the short and long terms (although the atmosphere contains much smaller quantities of these gases than CO₂).³⁴ Pragmatically extending effective pollution reduction regimes to tackle these potent warming agents could yield significant, low-cost climate benefits.

Dealing with these pollutants will require various policies, institutions, and rules. The physical properties, sources, and policy levers for short-lived agents — black carbon, aerosols, methane, tropospheric ozone, and most commercial HFCs — can be quite different from those for long-lived agents, like carbon dioxide, PFCs, and some HFCs. Widely different sources of pollutants call for a set of diverse policies and regulations suitable for each, from domestic stoves to mines to forestry management. And since the impacts of many of these pollutants are geographically widespread, these are precisely the areas where the United Nations and other multilateral institutions such as the World Bank, the US Agency for International Development, and bilateral collaborations can be most effective, more aggressively pursuing incremental technology and pollution regulation policies for each of these pollutants.

THE WAY FORWARD

If one of the chief defects of the last climate regime was its focus on international action through the United Nations and a single, unifying global treaty, one of the greatest assets of the new framework proposed herein is its emphasis on multiple pathways to climate progress. This paper has deliberately avoided specifying the “right” institution for action; there will be no single or simple answer. In some cases this work should be pursued through Congress, while executive branch departments and agencies can undertake other actions. For some measures, progress is best pursued through multinational collaboration, while for others, American states and metropolitan regions are the best equipped to act. And while the role of the United Nations, overloaded and fractured by the previous regime, will inevitably be diminished, the body could still play a constructive convening role. Meanwhile, more aggressive efforts at cooperative action may best be pursued by smaller groups of nations, such as the G-8 or G-20, or through partnerships between select nations focused on key technology innovations, disaster resilience, or major sources of various pollutants.

At its core, what distinguishes the pragmatic approach described above from the United Nations process to date is that none of these pluralistic measures require unanimous agreement about the problem being solved nor do they depend on international treaty. Furthermore, each strategy delivers near-term benefits that can be captured by those taking action, creating incentive to steadily gather momentum. This pragmatic approach also proposes that action take place on multiple fronts, in diverse venues, supported by wide-ranging constituencies. Indeed, much of the energy innovation agenda described above is likely to be pursued more competitively than cooperatively between nations. Despite a decade’s worth of grand talk about globalization ushering in a new political cosmopolitanism, nation-states remain the world’s dominant actors.

If the protracted climate battles of the past two decades polarized the American people and their representatives in Washington, DC, they also created an opportunity for the *unlikely* minded to come together around the three-part framework described above. The climate wars will no doubt continue between extremes on both sides, but that should not delay a

far-larger set of pragmatic Americans from embracing policies and measures that attract widespread agreement, are adjustable over time, incremental in their implementation, and provide positive feedbacks for further action. For too long, the national and international climate debate has been little more than that: a debate. There is much that people and nations can agree to disagree on, even as they agree to work together on practical actions. It is time to get started.

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The Hartwell group is an informal, international network of scholars and analysts dedicated to innovative strategies that uplift human dignity through mitigation of climate risk, enhancement of disaster resilience, improvement of public health, and the provision of universal energy access. Membership in the network is not fixed, and published products are the views of the listed authors alone, not the group as a whole.

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