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Conclusion: How Ideas Change over Time

Over the last three decades the world has experienced extraordinary changes—in income and growth, in health and life expectancy, in urbanization and demography, in technology and commerce. We have seen radical change in the balance of economic activity toward emerging-market and developing countries. And we are in the midst of an information and communication technology revolution that is upending old practices and modes of social interaction. These changes have brought immense benefits, together with, in some cases, social and economic tension and stress. They have also placed enormous pressures on natural resources and the environment, including the air we breathe, the water we drink, and the land we use. Having been fueled by hydrocarbons, these changes are also disrupting the climatic conditions within which our civilizations have developed.

Many of the profound changes of the last three decades will continue over the next three. We will see a fundamental structural transformation of the world economy. Global population is expected to reach around 9 billion by 2050, and more than 6 billion of those people will likely live in cities, which are the engines of global economic growth. Pressures on natural resources and the climate will intensify, increasingly threatening the potential for growth and prosperity, if we continue with old technologies and ways of doing things. At the same time, newer technologies are opening up extraordinary possibilities across the whole economy, including in the way we can generate, manage, and use energy.

Most of the decisions we need to take on climate change will be made in the context of these unfolding changes. Developing and middle-income countries are increasingly recognizing the unattractiveness of dirty models

of industrial growth and the widespread benefits of a cleaner, more efficient, smarter-technology and service-oriented alternative. Restructuring toward cleaner and more efficient growth also provides a compelling response to many of the challenges faced by high-income countries, including weakening competitiveness, falling living standards of many, aging population, aging infrastructure, congested cities, and rising budget deficits. If the changes involved in the structural transformations are managed well, radically reducing waste, congestion, pollution, and the degrading or destruction of land and forests, the majority of the emissions reductions needed to stay within a 2°C pathway (with a 50–50 chance) could be delivered. Achieving the further reductions in emissions that are necessary will involve more ambitious policies and investments in the areas of energy systems, land use, and urban infrastructure, but if done wisely these too will bring many attractive economic, social, and environmental benefits.

The deepening understanding of these interlinked transformations that has emerged in recent years, and of the scale of the opportunities they bring, is one of the most important developments that has occurred since I led *The Stern Review* in 2005–2006. Indeed, the world has changed dramatically not just over the last 30 years but in these last few. There have been other important changes, too—mostly helpful, but some not so. We have experienced a major global financial crisis and recession, which have diverted many leaders' attention from climate change. Yet the costs of low-carbon technologies, particularly renewable energy technologies, have fallen dramatically over this period, making low-carbon substitutes in many parts of the world competitive with high-carbon incumbents. In particular, low-cost, decentralized renewable energy and storage technologies provide life-changing opportunities for many of the world's poor people, especially those without access to grid-supplied electricity—"sustainable energy for all" is becoming a realistic vision, not just an inspiring one. Yet technology has also advanced in hydrocarbons, making ever deeper and farther-flung fossil fuel deposits more accessible at a time when their use needs to be phased down.

The world has also gained much experience in climate policymaking at all levels of government, yielding valuable lessons for tomorrow's policymakers. At the international level, cooperation on climate change

is moving—slowly, but moving—toward a more dynamic and collaborative model. At the domestic level, there is increasing recognition of the multifaceted role that policies and institutions can play in enabling a structural transformation toward low-carbon while promoting growth and poverty reduction. Cities are showing great leadership in reducing emissions through innovative approaches. And the important interconnections between climate change and other issues are becoming much clearer—not merely the linkages between climate impacts and other challenges, but also between policies to tackle climate change and the measures needed to tackle other significant challenges that countries face today. The climate-and-health linkages, for example, have been much more deeply studied and communicated to policymakers in recent years—including, in particular, the links between coal-fired power generation, air pollution, and public health. And, of course, the climate-and-economy linkages have become more prominent, as emphasized in the work of the Global Commission on the Economy and Climate.

Taken together, this constitutes very substantial change in the eight years since *The Stern Review* was published. In summary, the arguments that the costs of inaction greatly exceed the costs of action, strong then, are still stronger now, and we have deepened our understanding of the dynamics of economic change and international interactions. All that said, notwithstanding substantial progress in many countries, progress is far too slow.

This is a time to choose. The first option involves continuing to rely on past technologies, methods, and institutions: it could give us a sort of growth for a while, in a pattern we know, and which many find unattractive and troubled, which will lead to chaos, conflict, and destruction toward the middle and second half of this century. The second option involves embracing and harnessing the positive changes unfolding around us, investing strongly and innovating intensely to bring about not only a much more attractive way of living but also growth which can be sustained. The choices we now face present an enormous opportunity. But delay is dangerous. If we fail to take this opportunity and attempt to follow the old ways, the opportunity will be gone. We use it or lose it.

That we have such a choice follows from the basic four arguments that I have set out in this book. First, we are on a path with strongly

rising greenhouse gas emissions which could lead to global average surface temperatures not seen on this planet for millions or tens of millions of years. The consequences could include hundreds of millions of people having to move, with the associated risks of severe and extended conflict. Second, to avoid these risks, or to reduce them radically, fundamental change will be necessary, including essentially zero emissions in the second half of this century, zero-carbon electricity by midcentury, and managing our forests and land much better than we have in the past. Much of the fundamental change required in emissions will occur in a period of remarkable structural transformation, full of opportunities for efficiency and emissions reductions. That transformation will happen in some form or other: it is we who will determine whether it goes well or badly. Third, delay is dangerous because flows of emissions build stocks of greenhouse gases which are, particularly for carbon dioxide, long-lasting and difficult to remove at scale, and because high-carbon capital and infrastructure, which can last for decades, can lock us into high-emission activities. Fourth, the alternative paths, the transitions to a low-carbon economy, are likely to be full of discovery, innovation, investment, and growth, much as we have seen in other waves of technological change over the last 250 years. Further, the alternative ways of producing, consuming, and living will likely be cleaner, quieter, safer, more energy-secure, more community-based, and more biodiverse in the short and medium term as well as involving far lower climate risks in the medium and long term.

Establishing these arguments on the basis of principles and evidence from science, economics, economic history, ethics, and other disciplines has been the primary purpose of this book.

Getting the arguments right is a crucial necessary condition for motivating the climate action that these arguments justify. However, it is not sufficient: the reasons for inaction go beyond simply the proliferation of bad arguments and the misunderstanding of good ones. Though I and many others find that those arguments provide a compelling case for strong and urgent action, we are, as a world, moving far too slowly. If action is to be accelerated and the grave risks are to be radically reduced, we must understand why we are moving so slowly. In this concluding chapter, drawing on analyses and arguments in earlier chapters but also introducing some new ones on how ideas

change, we examine some of the key reasons for inaction and suggest some ways in which they could be overcome. I first set out what I think some of the key challenges are and then discuss some historical examples of how ideas have changed on other relevant issues, and draw lessons that could usefully be applied to climate change. The chapter concludes with some thoughts about whence the necessary societal change could come.

10.1 Why are we moving too slowly?

10.1.1 Analytical difficulties and failings

This book has tried to tackle directly some of the analytical controversies—both misunderstandings and deliberate falsehoods—that contribute to the slow pace of action on climate change, including failure to grasp the four key arguments summarized above. Other crucial analytical problems include the unwillingness of many to recognize moral responsibilities toward future generations, the importance of equity among people (noting that it is usually the poorest, who have contributed the least to creating the problem, who are hit the earliest and the hardest), the nature and scale of what is happening around the world, and the important role that international cooperation, of the right kind, can and should play in the response to climate change.

I have also examined some of the analytical weaknesses of arguments made by those who have attacked the science. A common strategy of deniers and skeptics is to try to sow doubt in the mind of the public about the underlying science, which identifies the great risks we face, in order to suggest that climate action is unnecessary or unwise. But even if there were grounds for doubt about the basic science, to draw from such doubt the conclusion that we should not act would require the assumption that we can be confident that the risks are small. It is incumbent on the deniers, particularly because the science points to the dangers of delay, to substantiate that assumption by demonstrating that we can indeed be confident that the risks are small. In the face of the scientific evidence, such a demonstration would be close to impossible. Yet most of the deniers have either failed to understand that the position they espouse requires this demonstration, or they are not engaging in public argument in good faith.

10.1.2 Communication deficit

The logical arguments presented above, if they are to have traction, require effective communication. Action on climate change has been hampered by a deficit in the communication of sound arguments, and a surplus of effective communication of the misguided ones.

Effective communication on climate change requires at least three things.[1] First, the key elements of the analytical case for climate action must be presented together: inspiring change requires an articulation of the problem, demonstration that there are effective and attractive responses, and a sound path for implementation. However, many advocates have focused narrowly on the science and risks of climate change; until relatively recently there has been insufficient communication of the opportunities and benefits of action and the means by which they can be realized. Second, messengers matter. Different audiences trust different types of messengers. If movement for change is to be widespread and gather momentum, we can expect to see different communicators and champions for different audiences. Third, climate change communication, to be effective, must utilize rhetoric and frames that resonate with the values and emotions that could inspire action—in this case, local and global collective action on a large scale.[2]

One or more of these elements is often missing in communication by those who argue for strong climate action. Meanwhile, deniers and other opponents of action have often communicated the arguments for inaction much more effectively, frequently through appeals to self-interested values and mobilizing messengers who are trusted, it seems irrespective of the quality of the case being made.

The media inevitably play a vital role in communicating the risks of climate change and the opportunities for and benefits of action. A study of factors influencing concern about climate change in the US over the period 2002–2010 concluded that "media coverage of climate change directly affects the level of public concern. The greater the quantity of media coverage of climate change, the greater the level of public concern."[3]

Media coverage can be particularly important where issues of frequency, risk, and probability are involved. This is because people tend to assess the frequency or probability of an event by "the ease with which

instances come to mind," and personal experiences, dramatic events, and more frequent or prominently reported or observed events come more easily to mind.[4] Since many changes wrought by climate change occur gradually and imperceptibly, and since most people most of the time do not personally experience the extreme weather events that are consistent with climate change, the extent to which an issue is represented in the media can have a large effect on people's perception of its frequency or probability. Such extreme weather events can, indeed, serve as powerful opportunities to illustrate the risks associated with climate change. Yet too often media discussion of extreme weather becomes bogged down in the question of whether it can be proved that the particular event was caused by climate change.[5] The important issue, however, is that climate change is a key determinant of increased risks of extreme events. When extreme events occur, the media have a particularly important role to play in communicating the science accurately, in terms of changing weather *patterns* and *risks* and thereby helping the public to understand the origins of the risks.[6]

The media can also influence our response to events when they do occur. For example, media reportage can affect the extent to which people provide aid to victims in times of crisis.[7] Responses to the Indian Ocean tsunami of December 2004 and super typhoon Haiyan in 2013 appear to have been greatly influenced by seeing the devastation on television screens across the world. One study found that the climate change imagery used in newspapers affects people's perceptions of the issue's importance and of their ability to do something about it.[8]

The importance of frequent, accurate, clear, and accessible public discussion of climate change places a great responsibility on media organizations. However, many such organizations have operated under a misguided conception of what is required by "balance," i.e., that scientific evidence on climate change needs to be balanced with nonscientific opinion.[9] This is clearly a gross distortion, and should be seen as akin to putting flat-Earthers on an equal footing with professional physicists. Even worse, some media have actively pursued an editorial agenda of denial and obfuscation.[10] And focusing on false or misguided debates about the science has arguably diverted media discussion away from discussing possible responses to climate change.

10.1.3 Psychological barriers

The discipline of psychology has much to teach us about why we are not acting, individually and collectively, with an urgency and at a scale commensurate with the challenge. Increasingly, psychologists are doing applied work focused explicitly on responding to climate change.[11] Psychology is not a discipline in which I specialize, but I have tried to listen to and learn from psychologists, including Danny Kahneman and Bob Cialdini, to whom I am very grateful.[12] I cannot hope to do justice here to the myriad psychological processes that work against action on climate change, but it is worth highlighting a few key lessons.

The discussion on communication highlighted some of the cognitive heuristics and biases that can lead us astray in the perception of frequency and probability. We also know that people's attitudes and behavior can be strongly influenced by situational influences. Surveyed attitudes toward climate change can be affected, for example, by the local temperature at the time and place at which the response is elicited,[13] by whether the respondent perceives the current temperature to be warmer or cooler than usual,[14] and even by the temperature of the room in which they happen to be.[15]

There is also evidence that social and cultural features of one's situation have a systematic influence on perceptions of risk generally, and on beliefs about climate change in particular.[16] Dan Kahan and colleagues at Yale's Cultural Cognition Project found that people's risk perceptions concerning climate change correlate with their basic values: low risk perception correlates with an individualistic/hierarchical worldview; high risk perception is more likely if an individual's world view is more communitarian/egalitarian. Additionally, they found that greater scientific and numerical ability has a slight polarizing effect: those with an individualistic/hierarchical worldview perceived climate change to be of *less* concern the greater their scientific and numerical ability. Interpreting their results, the authors posit that people adapt their beliefs about climate change to conform to their social peer group; and that people are more proficient at so adapting the more scientifically literate and numerate they are.[17] If this interpretation is correct, then it would suggest that the task of communicating and persuading people to act on climate change may be more challenging than many believe. Different "messengers" will have different effects for different audiences.[18]

Another barrier to climate action—and indeed to any kind of structural change—relates to the disproportionate value people ascribe to avoiding losses as opposed to achieving gains (people are "loss averse"), and the power of the status quo as a psychological reference point against which people code outcomes as gains or losses (the "endowment effect" and "status quo bias").[19] These phenomena are the psychological roots of a tendency toward social, economic, and political conservatism that makes it more difficult to pursue the alternative, low-carbon path that I have described, notwithstanding the attractiveness of that path relative to the status quo.

Psychological insights are also useful in illuminating why climate actions that are economically rational at a micro scale, such as cost-effective measures to improve energy efficiency, are not taken. One challenge is that the rewards, in terms of energy and cost savings that could be made by simple household efficiency measures, are not immediately clear to people in their daily household activities. Technology and design can help to overcome these barriers through products that make it simple for people to both understand their energy use and adjust it to save money; Google's $3.2 billion acquisition of Nest Labs, a leading product developer in this area, in 2014 indicates their view of the market potential.

10.1.4 Structural barriers

In addition to barriers at the individual level, we can identify structural and institutional barriers. A first set of structural challenges concerns the organization of politics, and the structure of political economy, within many countries where action is needed most urgently. There will be groups who could see themselves as threatened that can or will act collectively and politically. Industrial revolutions involve dislocation—for example, this one requires the rapid decarbonization of the energy sector, and policy-induced increases in the costs of emissions-intensive goods and services (e.g., hydrocarbon-based electricity), so that the cost includes the damages inflicted on others. Managing such changes, particularly where this involves dislocation, will always be politically challenging—particularly when the costs are short-term, some of the co-benefits are medium-term, and the climate benefits are long-term. Many politicians face short-term electoral incentives and there is a temptation to avoid

perceived costs and disruption, which means avoiding action despite the attendant medium- and long-term benefits. We may hope our leaders would act in the longer-term interest, even if this involves political risks. Good leaders can do this well, drawing political energy from pursuing a larger vision. But we must understand that perceived structures of political incentives may point in the wrong direction, and must think carefully about how those incentives can be influenced.

There are deep structural problems in the politics and political economy of many countries that lead to the disproportionate influence of vested interests over the formulation of policy and the tenor of public opinion, along with the mass disengagement of ordinary citizens from the political processes that shape their lives. Some recent analysis suggests that representative democracy in many parts of the world is facing a profound crisis[20]—and at precisely the time it needs to be functioning at its best if it is to take decisions that are important for the long term.

Structural features in the worlds of business and finance, in the media, and in social relations may also hold back climate action. In business and finance, excessively short-term incentive structures direct capital away from long-term value creation,[21] and a dearth of disclosure and transparency requirements in many jurisdictions on key issues like firm-level emissions, energy use, investments in fossil fuel assets, and so on hinder the efficient operation of markets and the democratic process. In many countries the media are not structured in a way that encourages the critical democratic function of promoting long-term public interest. They are often organized on a narrow model according to which many of the key media players see themselves as providing a purely private good to viewers, listeners, or readers, and are oriented to very immediate "consumer interests." That can undermine discussion and information about economic, community, and social interests and the longer term.

There are important difficulties connected with social structures, divisions, and inequalities. For example, it has been found that "conservative white males are significantly more likely than are other Americans to endorse denialist views" on climate change, and that "these differences are even greater for those conservative white males who self-report understanding global warming very well."[22] Moreover, debates in the US about energy and carbon pricing are made more challenging by existing

inequalities in income and wealth: those at the top have a disproportionate ability to use their wealth to influence argument and political choice, and are particularly motivated to do so when wealth is associated with hydrocarbons.

10.2 Examples from the history of social change

The barriers to climate action are many. Generating the necessary change will be fraught with challenges. But societies have made big, difficult structural changes before. How have they done so? There is no very close parallel to a risk-related, policy-based change of economy and society on the scale required by climate change; but there are other major changes that are instructive. I will touch here on the cases of smoking, leaded petrol, drunk driving, and HIV. Later in this chapter I shall examine some relevant examples of social justice movements.

The evidence on the effects of smoking on health was built on the epidemiological work of Richard Doll and others in the 1950s and 1960s, together with an understanding of the biological mechanisms at work. It was developed over a number of decades. Eventually the overall evidence on the risk was overwhelming, and strong public policy came into effect. Regulation, tax, information policies, and advertising were (and still are) all used. Policy was based on evidence. But the process took a long time and was fiercely contested by vested interests. More than 50 years after the first clear results, smoking rates have declined significantly in many advanced countries but are still rising in many low- and middle-income countries, where 80% of the world's smokers now live.[23] Policy on smoking seems to have been led by the medical profession, which, after seeing the evidence grow stronger and stronger, put pressure on governments to act. The profession also shared its concerns with the general public in an attempt to encourage it to change its ways, and also to build support for its arguments to government on the importance of action. The medical profession and government appealed to our "higher selves"—the desires of many smokers to give up smoking—or to our health interests in a more objective sense, over "the lower self" that is more vulnerable to temptation, immediate gratification, and addiction. But evidence on damage to others through "passive smoking" appears to have been important, too.

In many ways, policy and action on smoking followed an expert-led, top-down, professional route to formulating policy and fostering the behavioral change that was required to manage and reduce risk. In that case, strong evidence, effectively communicated, was essential. So too was the willingness to take on the powerful vested interests in tobacco.

The replacement of leaded by unleaded petrol, which has occurred partially or completely in most countries, has been driven by two factors: increasing evidence and concern about the health impacts of lead, resulting in regulatory measures to reduce, and in many countries phase out, the content of lead in gasoline; and the use of catalytic converters, with which leaded fuels are incompatible.[24] These two factors played different roles in different countries.[25] In those countries where health concerns were the driving force, we have seen developments in some respects similar to smoking—an understanding of epidemiology and the biological mechanisms at work led to top-down action, with regulation being the main policy tool. On both smoking and unleaded petrol, once policy and action gained momentum, they spread fairly quickly. On unleaded petrol the battle was won relatively quickly, and leaded petrol is now very rare around the world. On smoking it continues.

Policy change on drink and driving appears to have had stronger bottom-up pressures. In the US, Mothers Against Drunk Driving, or MADD, appeared to have a powerful influence.[26] In the case of tobacco, the dangers of passive smoking showed that smoking was not just a decision for individuals about their own fate, and with drunken driving the evidence of risk to others was still more obvious. Thus for both drunk driving and smoking, highlighting the danger to others may well have played a powerful role in combating a more individual-choice-based or narrowly libertarian position.

Interestingly, on drunk driving the changing behavior came about in at least two ways: the developing understanding of the irresponsibility of drunk driving in its dangers to others, and the incentives or penalties such as fines, driving bans, and imprisonment. The legal imposition of significant penalties seems to have reinforced the emergent social norm and moral stigma associated with drunk driving. Changing perspectives on irresponsibility appeared to come from overall evidence, knowledge of individual cases (either through personal life or in the media), and public discussion of the issues.

Action on HIV/AIDS seems to have been still more strongly driven from below than in the case of drunk driving. Those who demanded action to tackle HIV/AIDS felt that their goals would not be addressed on the scale and with the urgency necessary unless they conducted a vigorous and highly political grassroots campaign. They had to deal, in some parts of the political spectrum, with a moralistic opposition or reluctance to act associated with censorious views around sexually transmitted diseases. The campaign by groups such as ACT UP was high-profile in the US and elsewhere, with targeted demonstrations and campaigns including on Wall Street and at the offices of the Food and Drug Administration and the National Institutes of Health. It was very effective at both national and international levels in mobilizing necessary public health action, treatment, and research. There is, of course, much more to do on HIV/AIDS around the world, but there is surely a strong lesson here about effective public grassroots pressure.

Generating strong action on climate change is a challenge that exhibits features not shared by these other issues. Tackling climate change is not merely about reducing the use of a single type of product, or treating one single source of risk; it will require setting in train a dynamic process—an energy-industrial revolution—that fundamentally transforms our economy and society. Industrial revolutions and waves of technological change come about in different ways from those associated with the pressures arising from public perceptions. They are driven by anticipated returns from investment and alternative activity or occupations. Demand for new products or services (electricity, motor cars, trains, communication, and so on) is influenced by consumer recognition of their usefulness or value. The lesson here is surely that if new technologies and different ways of doing things are to advance quickly, they must be seen as profitable, attractive, and useful. In the case of climate change it will be, in part, policy that will make them so—for example, by influencing the behavior of producers and consumers with prices and taxes that reflect the costs of emissions, and thus making markets work better. That is a key difference from other industrial revolutions.

At the same time, we should not see policy only in terms of price and market incentives. We have seen in the above examples and earlier in the book that regulation can have a very powerful role to play, as it did with unleaded petrol. So too can social and moral norms, which change

perceptions of what is morally and socially responsible behavior by individuals, businesses, and governments. As such, the process of change associated with climate action can also learn from past revolutions in moral and social attitudes—for example, the abolition of slavery; the decline of the practice of foot-binding in China; the decline of dueling and other forms of violence; the expansion of voting rights and other civil rights to historically oppressed groups; and, more recently, international divestment from apartheid South Africa.[27]

10.3 The lessons for climate change

Let me try to distil some lessons from the examples considered above, and from others touched on or explored elsewhere in the book (e.g., the past waves of technological progress discussed in chapter 2).

Good analysis is critical. In the cases involving policy responses to risk, such as smoking, leaded petrol, and HIV/AIDS, good analysis played a critical role. Generating policy change requires, first and foremost, posing the policy questions in the right way—in other words, in a way that reflects the issues we face, and is based on sound theory and evidence. Climate change concerns the management of risk on a colossal scale. Second comes the marshaling of the arguments and evidence about the risks so that there can be an understanding of what is at risk and what is involved in reducing those risks—on climate change, this spans the reduction of emissions and adaptation to the climate change that is now unavoidable. In other words, the identification of options for action that can tackle the issues. Third, we have to examine the details of alternative paths and show their benefits, costs, and necessary investments.

Appealing to values and a sense of justice can be powerfully motivating. In many examples of historical change—the HIV/AIDS case, for example—appeals to values and a sense of (in)justice have been powerful motivators for action. Two simple but crucial points stand out from the arguments presented in this book. First, climate change involves the causation of harm, and risks of harm, to current people and to future people (and to many other living things) on a massive scale. Perspectives from each of the diverse ethical theories considered in chapter 6 would likely regard this harming as a wrong. Framing emissions in terms of

causing harm may be more morally motivating than appeals to utilitarian calculations. Personal involvement in the causation of harm engages people's emotions in a way that impersonal calculations do not.[28] This phenomenon may partially explain why, historically, many powerful moral campaigns have involved demands to stop causing harm.[29]

Second, the transition must be equitable and seen as equitable. That requires the global economy to be decarbonized in a way that promotes development, growth, and poverty reduction in poor countries. Decarbonizing the global economy equitably is eminently possible and is the moral core of equitable access to sustainable development, in the language of COP 16 (described in chapter 9). Similar principles apply to considerations of inequality and poverty within countries.

Communicate strategically and use examples. Effective communication was very important in the case studies of change discussed above, particularly those relating to smoking, drunk driving, and HIV/AIDs. In my experience of climate change communication, examples are often very powerful devices, particularly in demonstrating the impacts and risks and in showing the attractiveness of a low-carbon path. In developing countries in particular, if climate action is to be accelerated, the argument must be convincing that an environmentally sustainable growth path is not a threat to the fight against poverty. There are communities and countries that are showing the way, as we have seen in this book, but examples have to be shared and multiplied. Thankfully, eight years on from *The Stern Review*, there are many more examples that can be mobilized to communicate the benefits of climate action.

Extreme weather events can be the most powerful examples of all. They can provide "moments of power"[30] to make the case for climate action, as then Mayor Michael Bloomberg of New York, and others, found with Superstorm Sandy in 2012. A prime minister of Australia without the prejudices against climate science of Tony Abbott would have seen the extreme heat and fires of 2013–2014 as an opportunity to do the same. Let me be clear that this is not about faulty arguments such as attributing with certainty a particular extreme weather event to climate change. It is about using examples to illustrate patterns and dangers and showing that such events could become more severe and more common—and, crucially, explaining that what we see now, at about 0.8°C above the nineteenth century, is tiny relative to what we risk at 3, 4, or 5°C.

Governments might also appeal to the appropriateness of people paying the full cost of their actions when they buy goods, emphasizing that carbon pricing and regulation are simply a means of ensuring better-functioning markets. People might recognize the sound policy in abolishing the subsidy that is associated with, or defined by, the ability to emit and pollute for free. Governments might also appeal more directly to people's sense of responsibility for avoiding harm. There is some analogy to the desire to avoid goods made by child labor, or to buy fair-trade tea even though it might cost a little more. And the linkages between international climate and development policies can be strengthened, rhetorically as well as substantively, so that mitigating climate change is, and is seen to be, a core feature of development, intimately intertwined with poverty reduction. Indeed, climate responsibility is about the sustainability of poverty reduction in the future, and the action involves fostering inclusive growth and poverty reduction now.

Packaging policies. From the case studies of previous social change, we can see that a wide variety of creative interventions by governments can have an important direct and indirect effect in achieving changes. This book has set out the combination of the most important policies for tackling climate change. However, given the many constraints, both structural and transient, that governments face in trying to undertake serious reforms, these policies will need to be supplemented, supported, and packaged in strategic and creative ways, utilizing all means that governments have at their disposal, and tailored to local conditions.

In the smoking, HIV/AIDS, and drunk driving examples, governments in many parts of the world played helpful roles by providing information, nudging people by making it easier to undertake more healthy behavior, using their rhetorical powers to persuade the public, and in many countries effectively using emotionally resonant public advertising to shift attitudes and preferences. Many of these levers could usefully be deployed in tackling climate change alongside the main, more economics-oriented policies discussed in this book.

There are other ways that politicians can package and frame climate action to overcome the difficulties they face. Some climate action does have short-term benefits: for example, "green stimulus" in recessions, when interest rates are low and labor is underutilized, can boost growth,

jobs, and incomes; and energy efficiency measures can reduce energy bills immediately. Moreover, stimulus of a kind that promotes the growth story of the future is surely wiser than one that tries to promote activity in areas that are damaging and will decline. Reduced air pollution from phasing out coal, for example, which has very large potential benefits, could come through quite quickly—recall that the social costs of air pollution are more than 4% of GDP in many countries, and more than 10% in China (see chapter 2).

Integrating climate action with other reforms, such as lowering other taxes, increasing health services (for example), other efficiency-improving reforms, sound industry policy to support the growth of low-carbon industries, investments in public transport, and so on, with clear articulation of the climate benefits and co-benefits, can also help to mobilize support for climate action.[31] If the reforms are efficient, by definition the gains to the winners of reform should outweigh the losses to losers and it should be possible to identify and cultivate a coalition of support for the changes. Governments can also play a powerful convening role in fostering such coalitions to support reform efforts. The benefits of this type of reform, focused as it is on efficiency, growth, and risk reduction, should in principle be supported by a financial and business community that is thoughtful and analytical.

Carbon-related fiscal measures and accompanying transfer payments as appropriate, together with direct public policies, can help reduce poverty and inequality. For example, ensuring that some of the revenues from carbon/environmental taxation are applied to assisting affected workers and communities find new sources of employment and income in the low-carbon economy is both a moral and a political imperative. And part of the revenues could be used to protect poorer people from any associated rise in energy prices. Giving people time to adjust to changes in prices by phasing in carbon prices, or abolishing fuel subsidies, gradually and in ways that can be predicted is another way of managing distributional impacts. Taking the opportunity to phase out fuel subsidies during periods when the world price of oil is falling makes political sense. One of the most effective ways of tackling fuel poverty is through the insulation of homes of poor people.[32] Further, if the dynamics of learning go well, then rises in energy prices as a result of climate policies are likely to be temporary.

International cooperation can help drive change. International cooperation has helped drive political change across a range of historical issues, and it will be very important in the case of climate change, as we saw in part III of this book. First, it is important to understand what others are doing and planning. That is the foundation of cooperation. Without that understanding, it is all too easy to assume that they are doing nothing or very little. Second, the plans a country indicates should be credible if they are to form the basis of cooperation. That does not necessarily mean that they need to be "legally binding and enforceable" at the international level; rather, the credibility of a country's plans is primarily a function of its domestic structures, institutions, understandings, and track record. Third, international cooperation and domestic actions can reinforce each other. Confidence in the latter leads to progress in the former and vice versa. It is a great mistake to assume that we have to give up on the former and rely only on the latter. And fourth, we must think rigorously about the *type* of institutions and principles at the international level that are best suited to building confidence and driving domestic structural transformations.

The pace of transformation to a low-carbon world is unlikely to be steady: build momentum. Big changes take a long time to initiate, but once initiated can take hold surprisingly quickly. Decarbonizing the global economy will not be a simple process that involves applying pressure and then straightforwardly peaking and reducing emissions at steady rates until they reach zero or near zero. As the last quarter-century of efforts to tackle climate change has shown, political, social, technological, and economic change of this magnitude can be a long time coming; much effort can be spent with seemingly few results. This can be dispiriting. But big changes can happen very quickly once tipping points are reached, whether social, political, economic, or technological. A wave of low-carbon innovation, growth, and prosperity will likely develop a momentum of its own, and the low-carbon world will become the normal one. The challenge is to make this happen sooner rather than later.

Technological, economic, social, and political change are all needed and can reinforce one another. Pressures and forces from a variety of directions are typically needed to generate large-scale changes. The interaction between developments in science/knowledge, professional engagement, policy leadership, and grassroots activism were all important, to

various degrees, in the cases of smoking, drunk driving, leaded petrol, and HIV/AIDS discussed above. With regard to technological revolutions, technological and economic conditions are typically important drivers, as we have seen. However, changes in social, institutional, and political arrangements can change perceptions of what is possible and desirable, create new markets, generate demand for new products, services, and business models, give rise to new types of skills and knowledge, allocate capital, and otherwise change the incentive structures within which technological and economic forces operate.

On climate change, we already see technological innovation, changes in relative prices, changes in social norms, new policy interventions, and other pressures having a significant effect. These forces are not isolated; they interact. German feed-in tariffs, and Chinese economic conditions, led to the large growth in installed capacity of solar PV, which brought down costs through learning and scale, changing relative prices in many countries, leading more people to put solar panels on their roofs, spurring the growth of new industries, changing the political economy, creating new pressures on and opportunities in electricity markets, affecting business models, generating pressures for further policy change, and so on.

10.4 Leadership and social pressure: likely sources of change

The acceleration of action on managing climate risks requires policy change, and we must therefore examine how such change can happen. Leadership and social pressure are critical. Leaders who are respected and trusted, and can communicate the issues clearly and effectively, have played important roles in social and policy change throughout history. Leaders have often catalyzed social movements for change, and, conversely, such movements have generated new leaders. What might the sources of leadership and social pressure be?

Those in political leadership carry a special responsibility for the future of their country and thus a responsibility to take a long view. Unfortunately, trust in politicians is low in many countries, and many politicians who understand the issues have been diverted by economic crises or intimidated by confrontation with vested interests. Strong action on climate change is often seen as making short-term election more difficult. But there is no more important issue, and it is their duty to lead.

Pressure from civil society, the business community, and subnational governments can foster national political leadership. In many societies, religious leaders and movements will be prominent in influencing social and political attitudes and decisions. In my view, they are of particular significance on climate, since at the heart of the arguments are ethical issues around moral responsibility toward younger generations and moral responsibility toward the world as a whole. And some of the most prominent religious leaders are beginning to raise the issue: Pope Francis has made the case for climate change action and environmental protection; when speaking on these issues he warned an audience in Rome on 22 May 2014 that "if we destroy creation, creation will destroy us!"[33]

In many countries royal families carry special respect, and that too places a responsibility for balanced and considered leadership. Royal families often take a long view—many see their role as, in large measure, the promotion of the long-term welfare of their country and its peoples. And the lifetime of a dynasty is much longer than that of a government. There are some strong examples, such as H.R.H. Prince Charles in the UK, of royals who accept that responsibility and speak out strongly and effectively.

Some viewers, listeners, and readers have strong trust in particular media outlets—for example (to take a UK-focused view), the BBC in the UK and the BBC World Service worldwide. Such outlets carry a special responsibility to present the issues regarding climate change in a responsible way. There are prominent individual broadcasters or writers who carry great trust, such as Sir David Attenborough or Lord Melvyn Bragg, to take UK examples again. They too carry great responsibility; in these two cases they bear it well.

Actors, celebrities, and sports stars are followed by many, and they also have their responsibilities. It is interesting that these are the people whom UN agencies often enlist to be "ambassadors" for important causes. In many cases, young people look up to them. And young people can mobilize them. The example of Kony 2012 showed how empathy by young people across the world toward the young forced into Joseph Kony's "Lord's Resistance Army" in East Africa could generate pressure for celebrities to demand action. Another example has been the role of Bono and Bob Geldof, through major concerts such as Live Aid in the

1980s and Make Poverty History in 2005, in generating support for poverty reduction and other initiatives in Africa.[34] The latter generated strong pressure on G8 leaders at the July 2005 Gleneagles summit, and that meeting produced a substantial debt relief package.

Academics, teachers, and professionals also have their roles to play: they are often (though not always) seen as trustworthy. We are familiar with the role played by scientists: the US National Academy of Sciences and the UK's Royal Society have been outspoken, as have scientific academics across the world. There is much more to do in communicating, but their focus is increasing and they are becoming more effective.

The medical community, in particular, enjoys high levels of trust and respect in societies across the world. There are many medical professionals involved in public health who are calling for action on climate change. We have seen in the last few years the mounting evidence of the dangers of air pollution from the burning of fossil fuels. Already this accounts for millions of deaths a year. Recent calculations of costs[35] in terms of GDP based on WHO health evidence point to costs in China of more than 10% of GDP and in Germany of 6%, with high costs in many other countries.[36] It is a major issue. Other important potential health costs include extreme weather events, malaria, communicable diseases, and the movement of people, particularly from potentially severe and extended conflict. And alternative lifestyles such as those involving less urban pollution, more walking and cycling, and better public transport can bring not only higher material standards of living but also better health. Encouragingly, there is a growing literature, and increasing political and policy mobilization, among the health community for action on climate change. I mentioned in chapter 7 the Climate Health Commission, which extends pioneering work done in 2009 by the Lancet-UCL Commission on Climate Change.[37] The health dangers of climate change also received prominent attention thanks to interventions by the health community around the time of the latest IPCC reports.[38]

In addition to these sources of pressure, there are three further sources that are likely to be especially important: business, cities, and young people.

Among the most important of the constituencies are businesses, from small farms to big international corporations. Notwithstanding problems of short-termism in some parts of the business world, many businesses

remain inclined to take a long view, and those businesses can be very influential. We have seen throughout this book how businesses can lead through the power of their example, including by producing low-carbon and otherwise sustainable goods and services, by making big advances in their energy and resource efficiency (see chapter 2), by promoting emissions reductions and environmental sustainability throughout their supply chains, and by applying an internal carbon price to their operations (see chapter 7). In these ways and more, businesses are demonstrating what can be done and how to combine growth and environmental responsibilities.

Business can also play a powerful and constructive role through the advocacy of strong and clear climate policy. While it is all too often the incumbent beneficiaries of the high-carbon status quo who dominate politics and policy formation, public business leadership on climate change is gathering pace. Caring for Climate—a joint initiative of the UN Global Compact, UNFCCC, and UNEP—seeks to mobilize a critical mass of companies around the world to demonstrate leadership on climate action. In accordance with the initiative's Business Leadership Criteria on Carbon Pricing, businesses are invited to "publicly advocate the importance of carbon pricing."[39] More than 1,000 businesses and investors—alongside 73 national governments, 11 state and provincial governments, and 11 cities—signaled their support for carbon pricing through a series of initiatives announced at the UN Secretary-General's Climate Leadership Summit in September 2014.[40] In Europe, the Prince of Wales's Corporate Leaders Group called for governments to put in place policies to prevent the cumulative emission of more than a trillion tonnes of CO_2, arguing that passing that threshold would lead to unacceptable levels of climate-related risk.[41] And We Mean Business, a coalition of organizations working with thousands of the world's most influential businesses and investors, advocates that governments implement a range of climate policies, from eliminating high-carbon subsidies to carbon pricing, and adopt a long-term global goal of "net zero emissions well before the end of the century."[42]

These examples show that many businesses understand the risks of climate change and the impacts it will have on their businesses; they see the market growth opportunities of a low-carbon world; they recognize that customers, shareholders, and staff look for environmental

responsibility in their activities; and they are seeking clear signals from governments so that they can invest with confidence in the low-carbon economy.

Cities, too, can be powerful agents of change. First, cities can see many of the co-benefits of climate action in a very direct way. Better city planning, public transport, walking and cycling infrastructure, and urban green spaces reduce congestion and urban air pollution, improve mobility and the efficiency of travel, and create a more appealing urban environment. Green buildings save energy, water, waste, and materials, and hence costs and resources in general, and bring home to people the benefits of green design in a very powerful way. Second, with some 90% of urban areas situated on coastlines, cities are on the front line of climate change, vulnerable to impacts such as sea level rise and coastal storms[43]—and their citizens share the impacts of disasters together as a community in a way that can be a powerful motivator for change. Consider the examples of New Orleans after Hurricane Katrina in 2005, the Mumbai floods of the same year, and New York after Superstorm Sandy in 2012. Third, cities are big enough to be very significant in terms of both emissions and politics. Cities house more than half the world's population, consume over two-thirds of the world's energy, and produce 70% of global CO_2 emissions.[44] And, while city governments' jurisdictional authority varies across the world, cities commonly have significant powers over transport, buildings, waste, energy efficiency, urban finance and economic development, community development, and adaptation.[45] And fourth, city governments have an advantage in policy implementation because they are typically physically closer to, and have deeper relationships with, their constituent residents and businesses than do officials and agencies at the state or national level.

Cities like Singapore and New York provide strong examples of what cities can do, and networks like C40 Cities are helping to diffuse good practices and build collaborative initiatives across large cities (see chapter 7). Through a combination of leadership and social pressure, city governments and their constituents could well push their national counterparts toward more ambitious climate policy.

Finally, young people are, and will continue to be, a powerful source of pressure for climate action. For it is they who will suffer most from the negligence of earlier generations, including this one. When I was

young, it was apartheid, Vietnam, and civil rights that moved many of us to protest and agitate for change. And change came. There are differences, but also numerous parallels, with the issue of climate change. In earlier cases, the changes being demanded could be produced (once the political will had crystallized) more quickly and decisively than the changes needed to tackle climate change. On the other hand, those cases required long and difficult struggles led by those most deeply affected but where others could act in support. The common object of those struggles was to overcome destructiveness and injustice. Climate change is destructive and unjust.

Today's young people can and should hold their parents' generation to account for their present actions. They can elicit an emotional response that can motivate action. If thinking about the lives of unborn future generations seems too abstract to motivate you to act, try instead looking a young child or grandchild in the eye and asking yourself what sort of future you are leaving for them. There is something that, on reflection, many adults would surely find repugnant in the idea that they will leave their children a damaged planet that will radically affect their life possibilities.[46]

Of course, while many of the ideas and much of the science of climate change are long-standing, it would not have been part of the schooling of most adults. Schools have a special role to play in building a measured, evidence-based understanding of climate change, and in fostering discussion and reflection about the sort of values that their societies should uphold and pursue. Children can then teach their parents: I am reminded of the song "Teach Your Children Well" by Crosby, Stills, Nash & Young,[47] which also says "teach your parents well." Education goes both ways.

This book has sought to show that the case for urgent and radical action is extremely strong, and that the tools to make it happen are firmly within our grasp. To generate the acceleration that is now critical if we are to avoid dangerous climate change, we need leadership and social pressure to keep building—from young people, from cities, from business, from all of the other sources I have described, and more. If that pressure is focused, intelligently and vigorously, in the right areas, if governments heed the lessons, and if well-designed policies are

implemented as a result, then political tipping points could be reached and big changes could happen surprisingly quickly.

We are at a remarkable point in history. We have a chance to combine the profound structural changes we are seeing in the world economy and extraordinary technological change on the one hand with a rapid transition to a low-carbon economy on the other. We can simultaneously find a much more attractive way to grow and develop, overcome poverty, and radically reduce the grave risks of climate change. We must decide and act or the opportunity will be lost. The time is now.

Why are we waiting?

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By: Nicholas Stern

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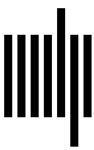

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