accomplished, to be ready before a meeting in Copenhagen in 2009. Importantly, it was agreed in Bali that this new agreement would, unlike the Kyoto Protocol, include emissions reductions by both industrialized and developing countries. Subsequent negotiations quickly split over the relative efforts required of these two groups.

In 2008, as George W. Bush's presidency was reaching its end, the campaign to succeed him heated up. Sen. Barack Obama was the Democratic nominee and he was opposed by the Republican nominee, Sen. John McCain. Both candidates accepted the reality of climate change and the need to do something about it — in fact, Sen. McCain had tried several times over the previous decade to get an emissions reduction bill through the U.S. Senate. The disagreements between the candidates on climate policy were quite minor — e.g., arguments over how much we should rely on nuclear power to reduce emissions, how deep the cuts should be in 2050.

A 13.8 The Obama years: 2009-today

Barack Obama became President of the United States in January of 2009. Shortly thereafter, in December 2009, an international meeting in Copenhagen took place to negotiate the follow-on to the Kyoto Protocol. While hopes were raised by renewed U.S. engagement under the Obama Administration, the Copenhagen meeting was marked by continuing disputes between developing and industrialized countries over sharing the burden of action. Developing nations wanted the industrialized world to make sharp near-term (e.g., by 2020)

reductions in emissions, whereas the industrialized world wanted the developing nations to agree to quantitative emissions reductions.

On the final day of the conference, President Obama and a handful of key developing country leaders negotiated an agreement known as the *Copenhagen Accord*. The Accord included these major points:

- Global temperatures should not rise more than 2°C beyond preindustrial temperatures.
- Deep cuts in emissions will be necessary. Recognizing equity issues, these deep cuts may be delayed in developing and poor countries.
- The world's rich industrialized countries each agreed to set their own target for emissions in 2020. Since the adoption of the Accord, the European Union, for example, agreed to a reduction of 20-30% below 1990 emissions, while the U.S. agreed to a reduction of 17% below 2005 emissions.
- The world's developing countries agreed to take on mitigation efforts, but did not accept specific emissions targets. China, for example, agreed to reduce greenhouse gas intensity (the T term in the IPAT relation) by 40-45% below 2005 levels by 2020. However, given rapid economic growth of China, this still corresponds to increased emissions.

- Flexibility should be incorporated into policies in order to achieve emissions reductions at the lowest cost.

- Adaptation must necessarily be part of our response. Industrialized countries agree to provide resources to help poorer countries adapt.

Around that same time, Obama and his Congressional allies began advancing major bills on health care and climate change through Congress. In response to this, as well as general opposition to President Obama's policies, the Tea Party, a libertarian wing of the Republican Party dedicated to reducing the role of government in our lives, became a major force in U.S. politics. Because policies to reduce emissions require some government intervention in the energy market — usually by pricing carbon emissions either through a carbon tax or a cap-and-trade system — the Tea Party rabidly opposes climate legislation.

The rise of the Tea Party put immense pressure on Republican politicians to reject climate change science and any legislation to reduce emissions. Before 2009, a number of prominent Republicans openly acknowledged the risk of climate change and supported policies to reduce greenhouse-gas emissions. This included leaders in the party such as John McCain (2008 Presidential nominee), Mitt Romney (2012 Presidential nominee), and Newt Gingrich (former Speaker of the House). After 2009, however, each of these politicians adopted a sceptical position on the science of climate change and opposed legislation to reduce emissions. Republican politicians who did not adopt this viewpoint quickly found themselves out of a job.

In 2010, Tea Party-affiliated candidates, virtually all of whom reject the science of climate change or the seriousness of the problem, were elected in numbers high enough to fundamentally change the composition of Congress. This ended any opportunity to get comprehensive climate legislation through the U.S. Congress.

Conservative pushback on climate policy was also occurring in other countries. In Canada, the conservative government of Prime Minister Stephen Harper withdrew from the Kyoto Protocol in 2011. The government did this because of well-worn criticisms of the Protocol (e.g., it does not include developing countries) and because Canada has immense oil reserves in the form of tar sands, which will likely be worth significantly less if the world agrees to stringent emissions reductions. In 2013, a conservative government in Australia began rolling back a price on carbon emissions that had been implemented several years earlier by the previous government.

By the end of 2012, the end of the Kyoto Protocol's commitment period, most industrialized countries had not achieved their Kyoto Protocol targets (2008-12 emissions about 5% below 1990 levels). Those that did, mostly in central and eastern Europe, relied on the fact that the base year was 1990, prior to the collapse of the Soviet Union. After the dissolution of the Soviet Union in 1991, much of the inefficient industry there was shut down, leading to a huge decrease in emissions; despite subsequent growth, emissions there had yet climbed back to 1990 levels by the Kyoto Protocol's commitment period.

In 2012, Barack Obama was re-elected President and he made climate change a key issue in his second term. Given the composition of Congress, though, getting any climate legislation through it was clearly impossible. The Obama Administration instead turned to Executive Orders — policies the President can implement without Congressional approval — and existing authority granted to the Administration under the U.S. Clean Air Act to address climate change.

In 2014, the EPA announced regulations for fossil-fuel-powered electricity generating units. The required emissions reductions vary by state, but will lead to an average reduction of about 30% from these plants. Owing to the high carbon intensity of coal, these new regulations will make it quite difficult to operate conventional coal-fired power plants. These regulations will certainly be challenged in court, but, if enacted, they represent the first legitimate effort by the U.S. to reduce emissions.

Around the same time, the IPCC released its Fifth Assessment Report. It concluded that, "It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century." This continues the trend towards strengthening the attribution statement — it now uses the words *extremely likely*, which denotes a 95% chance of being correct (compared to *very likely* (90%) in the Fourth Assessment and *likely* (66%) in the Third Assessment).

A 13.9 The breakthrough: U.S.-China bilateral agreement

In November 2014, a blockbuster climate deal was announced. The U.S. and China, the two biggest emitters, together responsible for about one-third of emissions, agreed to limit their emissions. The U.S. agreed to emit 26-28% less carbon dioxide in 2025 than it did in 2005. This was perhaps not such an amazing commitment: in response to the Copenhagen Accord, the U.S. had already committed to reducing emissions by 2020 — but this agreement doubled the pace of emissions reductions.

More impressively, China agreed that its emissions would peak before 2030. This was a true shift in policy, since China had previously only talked about greenhouse gas intensity reductions, not emissions reductions. In order to do this, they committed to produce 20% of their energy in 2030 from renewable power sources. This requires them to build about 1 GW of renewable power every week for the next 15 years.

While the deal only covers the U.S. and China, I believe that future generations will look upon this as a turning point in negotiations over international climate policy. Including the E.U., which already has aggressive emissions reductions targets in place, this deal means more than half of the world economy, which emits more than half of the carbon dioxide, has agreed to significant deflection of their emissions trajectories.

Most importantly, China is the de facto leader of the developing world, and China's agreement to limit emissions in the near term will put enormous

pressure on other developing countries to do the same. It will put even more pressure on industrialized countries that refuse to reduce emissions. Over the years, the excuse that China had steadfastly refused to reduce emissions had become one of the most important arguments for those countries — and now that excuse is gone. Countries like Canada and Australia will find it progressively harder and harder to do nothing about climate change.

This agreement has energized the international negotiation process. The next important climate meeting will be in Paris at the end of 2015, where they hope to work out a global emissions reduction agreement.

A 13.10 Chapter summary

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- Scientists have been studying climate change for nearly 200 years, and in that time a successful theory of climate has emerged. This theory is described in Chapters 1–7 of this book.
- The first prediction of human-induced climate change was made by Svante Arrhenius, who recognized in the late 19th century that human combustion of fossil fuels might warm the climate. In the late 1930s, Guy Stewart Callendar made the first claim that human-induced global warming had arrived.
- In the 1950s, people realized that humans possessed the power to greatly modify our environment – and not to our benefit. And the economic growth and increases in wealth occurring at that time meant the environment had more value to people, and people had more money to spend to enjoy it.
- In the 1970s and 1980s, the debates over ozone depletion and acid rain were a preview for the debate over climate. Those opposed to

action on these problems refined the strategy of the tobacco companies: Cast doubt on the science.

- The first climate treaty was the Framework Convention on Climate Change or FCCC. This treaty enshrined three important principles: 1) "common but differentiated responsibilities," 2) the precautionary principle, and 3) an agreement that the world should limit greenhouse-gas emissions in order to prevent "dangerous" climate change.

- The 1997 Kyoto Protocol included binding reductions of emissions for industrialized countries – these countries had to reduce emissions from 2008 through 2012 by roughly 5% below 1990 emissions. There were no restrictions placed on developing countries.

- The 2009 Copenhagen Accord included the agreement that the world's goal should be to avoid 2°C of warming above pre-industrial temperatures. In addition, industrialized countries agreed to set their own emissions reduction targets for the year 2020.

- In late 2014, the U.S. and China mutually agreed to limit their emissions. This may be viewed in the future as a turning point in the efforts to get an international agreement to limit emissions.

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A Terms

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Chlorofluorocarbons, or CFCs

Climate skeptics