Observing the drought and wildfires in Australia and California, floods in Houston, sea level rise in Venice, drought in Africa, and intensifying cyclones in many parts of the world, the temptation is strong to despair. It is to think: we have not seen anything yet if the world insists on combusting fossil fuels and emitting greenhouse gases at the present pace. Victims will eventually pay the full cost of harm if polluters refuse to pay it as they combust fossil fuels. However, it does not have to be that way. Payment upon pollution is needed to discourage pollution, to have the finances to innovate carbon-free alternatives, and repay the environmental debt being left to future generations. ‘At present we are stealing the future, selling it in the present, and calling it gross domestic product. … We can just as easily have an economy that is based on healing the future instead of stealing it. We can either create assets for the future or take the assets of the future. One is called restoration and the other exploitation. And whenever we exploit the earth, we exploit people and cause untold suffering’ (Hawken 2010: Introduction).

Hawken’s quotation contains much wisdom, foresight, and hope, but there are weaknesses. First, the ‘we’ ignores the difference between
principal polluters and minor ones, and between (i) principal decision-makers promoting carbon-polluting practices and discounting future harm\(^1\) compared with (ii) those influenced by fossil-fuel promotion. It is easy to miss these distinctions since the social practices and decisions of everyone contribute some carbon pollution because it is currently impossible to avoid fossil fuels entirely. Second, the transition from a carbon-polluting economy to a restorative economy will not be easy nor cheap. The threat is global, creeping yet urgent, and largely imperceptible by the senses. No technological miracles are in sight, despite faith in them to avoid having to change fossil-fuelled practices or paying their full cost. The longer carbon emissions exceed withdrawals, the more danger intensifies, and the harder and more costly restoration will be.

Fossil-fuelled climate change is a multifaceted global problem: ‘The problem of climate change is so massive that it requires a whole range of solutions’ (Suzuki and Hanington 2017: 236–237). The numerous remedies correspond to its various aspects. Previous chapters in this section assessed sociocultural and technological remedies that have been proposed. This final chapter assesses further socioeconomic solutions. The goal is not to choose one solution over others, but instead to analyse the possibilities and weaknesses of each in order to prioritize potentials and diminish flaws. Although there are no magic bullet solutions for fossil-fuelled climate change, there have been many valuable suggestions. The evidence informs this assessment, but the analyses and conclusions are my own.

**Suggestions to Enhance Foresight**

The chapter begins with general suggestions flowing directly from the analysis in this book.

**Understand the Science**

Speth (2012: 16) argues that ‘any hope of changing the system to better serve people and the planet rests on an accurate assessment of the full
Foresight or Discounting Danger? scope of our problems. ... We will do what is needed only when we fully appreciate the situation we face'. Flannery (2015: ix) begins his book entitled *Atmosphere of Hope: Searching for Solutions to the Climate Crisis* by arguing that ‘if we are to have real hope, we must first accept reality’. The reality is that, unless the present treadmill of fossil-fuelled social practices is changed to bring emissions in line with carbon withdrawals, societies will flounder on false hopes and be unlikely to prevent a climate catastrophe. Carbon dioxide emissions causing a cumulative, long-lasting greenhouse effect in the atmosphere are imperceptible by the senses. This results in blind spots in perception and comprehension, what Tong (2019) calls ‘the reality bubble’. Nevertheless, hidden truths come out of hiding because of scientific work. If the scientific understanding is accepted and acted upon, otherwise imperceptible environmental problems can be solved. The only thing more imperceptible than carbon dioxide and atmospheric carbon is the ozone layer and its depletion, but they were revealed by science resulting in international agreements that largely solved the problem. The same can be true for fossil-fuelled climate change.

**Communicate the Science in Ways Non-scientists Can Understand**

There exists a paradox concerning the fossil-fuelled climate crisis. Scientific knowledge about it abounds in scientific journals and the media, but ignorance concerning it abounds too. There is a lack of practical understanding by the population of how fossil-fuelled social practices contribute to the climate crisis, and this affects not only their material practices but also their voting practices. Why? Scientists communicate in gigatonnes of carbon dioxide equivalents, 2 °C global temperature increase, global consequences for future generations, etc. Although correct, this appears abstract to the non-scientific layperson. It is not propitious for inciting willingness to bear the costs of mitigation and change long-standing fossil-fuelled social practices. The 2 °C global average temperature increase appears trivial. Nevertheless, it is enough to
melt glaciers, permafrost, the ice cover of the Arctic Ocean, and intensifies drought, wildfires, floods, hurricanes and other extreme weather. The scientific expression that these calamities ‘are consistent with’ fossil-fuelled global warming also appears abstract and needs to be fleshed out.

Furthermore, the global scientific findings need to be disaggregated into an enormous number of mundane social practices on the local level. The Nordhaus (2013: 19) example given at the beginning of this book bears repeating. If he drives 100 miles in his car, ‘I consume 5 gallons of gasoline. This will produce about 100 pounds of CO₂, which will come out of the tailpipe and go into the atmosphere. I can’t see it or hear it or smell it, and I generally do not even think about it. If I am like most people, I will probably assume that my trip will have no effect on the world’s climate, and so I will ignore the consequences’. Ignorance of emissions imperceptible by the senses and their long-term harm resulting from driving, flying, shipping, cruising, etc., foster these carbon polluting practices and support for fossil-fuel companies and political parties that favour fossil fuels. This contrasts with the visibility of wind farms, which incites fear of declining property values and opposition.

It is essential to alert people to the danger of colourless, odourless carbon dioxide. That is done technically for colourless, odourless carbon monoxide by adding mercaptan to natural gas, which produces a potent rotten-egg odour if there is a leak. Something similar could be added to gasoline for vehicles so that the carbon dioxide emitted would stink to alert drivers to the greenhouse gases they are emitting: heavy gas-guzzling vehicles would stink more than light, fuel-efficient ones. A jet-fuel additive could produce a huge black cloud when combusted by a plane. An additive to bunker fuel or other fuels used to propel ships could produce a blood-red stain on the water in its wake. Additives to fossil fuels could make the greenhouse gases that factories, companies, and buildings emit visible to the eye and perceptible to the nose in proportion to their emissions. Cement factories and fossil-fuelled social media servers would thereby result in ugly big stinks.
However, I have no illusions technological innovations will be steered in this direction. The example demonstrates that technological innovation is not neutral and is steered by cultural and economic decisions. The illustrations are given to drive home that an informed citizenry needs a practical understanding of the consequences of fossil-fuelled practices in order to improve them, including voting practices, investing practices, etc. It is crucial to illustrate in everyday terms the otherwise imperceptible greenhouse gases and their consequences revealed by science. Carbon dioxide emissions from driving, flying, taking a cruise on a huge boat, cremation, producing cement for buildings, and electricity for air conditioning and social media servers need to be understood in pounds or kilograms. This would bring home to people the consequences of social practices much more than speaking of a few gigatonnes emitted by the totality of these practices. This is especially true for carbon pollution by big oligopolistic polluters. Translating the science of global warming into everyday units and illustrations would make them more meaningful to laypeople, whose support is needed if the climate crisis is to be mitigated. Disseminating examples like these would give the population a clear, practical understanding of the problem. The goal is to promote restraint, support for a price on carbon pollution, stimulate low-carbon technological innovations, and voting for political parties that will enact legislation to implement mitigation and adaptation. A practical understanding would also allow people to remedy their own contributions to fossil-fuelled climate change, and avoid feeling guilty later when they, their children and grandchildren, belatedly discover the consequences of their social practices.

Similarly, understandable analogies are needed to enhance comprehension of the dynamics involved. A good example is the atmosphere visualized as a bathtub shown in Fig. 11.1. It is taken from the US Environmental Protection Agency (EPA 2017), but similar sketches can be found in Pielke (2010: 9), Harvey and Orbis (2018: 5), and National Geographic. The US Environmental Protection Agency explains it as follows. ‘If the amount of water flowing into a bathtub is greater than the amount of water leaving through the drain, the water level will rise. CO$_2$ emissions are like the flow of water into the world’s carbon bathtub.'
"Sources" of CO\textsubscript{2} emissions such as fossil-fuel burning, cement manufacture, and land use are like the bathtub’s faucet. “Sinks” of CO\textsubscript{2} in the ocean and on land (such as plants) that take up CO\textsubscript{2} are like the drain. Today, human activities have turned up the flow from the CO\textsubscript{2} “faucet”, which is much larger than the “drain” can cope with, and the level of CO\textsubscript{2} in the atmosphere (like the level of water in a bathtub) is rising' (EPA 2017).

Clear analogies like these, showing the importance of the net change in atmospheric carbon, have been used in specialized books but are not widely disseminated. They are needed to help people understand that global warming worsens if emissions exceed carbon withdrawals and to counter misleading claims of improvement, such as fewer emissions per unit of GDP or per barrel of oil, where the increase of GDP and the number of barrels worsen the fossil-fuelled climate crisis.

Knowledge itself does not guarantee that the climate problem will be solved, since it confronts powerful fossil-fuel oligopolies, long-standing social practices and habits, cultural predispositions, etc. Nevertheless,
a practical understanding by the population and decision-makers is a necessary condition for mitigating it, although not a sufficient condition. Awareness of causal social practices is one significant part of transcending present predispositions of consumers and voters, namely solve the climate problem without changing fossil-fuelled practices or making them more expensive.

**Make the Fossil-Fuelled Threat Concrete**

Framing the fossil-fuelled climate crisis as a threat to the planet is unconvincing and misleading. Everyone knows the planet will not explode because of the combustion of fossil fuels. That framing is a sloppy way of speaking that fails to specify what is at stake. Even if combustion of fossil fuels unleashed forces of nature so destructive they transform Earth into a planet as barren as Mars, our planet would still exist. However, its services to humanity would be destroyed by human socioeconomic practices. This loss of autonomous nature’s beneficial services has to be emphasized. What may not survive is the beneficial habitat humans have enjoyed because of nature's services (IPBES 2019). Framing the crisis as degrading the beneficial habitat for ourselves, our grandchildren, and by extension for humanity and as making nature more dangerous is more accurate and more likely to prompt corrective action.

Similarly, ‘future generations’ seems like an abstraction. People are concerned more concretely about themselves and their loved ones. They would likely be more motivated to change their fossil-fuelled social practices if the hazard were expressed in terms of danger for their significant others, as sociologists call them. It is important to emphasize how climate change will affect grandchildren born today who will have to live in a degraded habitat when they become older, will have to pay for floods and wildfires, and for solutions made more difficult by filling the atmospheric carbon dump. Paying small carbon taxes now could help our grandchildren avoid much greater ones later. If a country, company, or person does not do its share to reduce emissions, then grandchildren will be forced to pay the unpaid externalized costs. Explanations of how the monopolization of the atmospheric carbon sink by the fossil-fuelled practices of
the present generation are leading to the exclusion of grandchildren from living standards their grandparents enjoy should not be avoided. People may be annoyed to learn their social practices are causing the problem, but awareness is a necessary condition for mitigating it.

Although the destructiveness of fossil-fuelled climate change will be greatest in the future and affect the most vulnerable who contributed least to it, the biggest carbon polluters are also being affected now. Australia is a wealthy country and one of the principal carbon polluters in absolute and per capita terms because of reliance on its coal industry. In 2019 it suffered severe drought and in early 2020 catastrophic wildfires, as did California earlier. The wealthy Canadian province of Alberta is one of the world’s largest carbon emitters because its economy is based on extracting and upgrading oil from its tar sands. Drought in the Boreal forest near the tar sands operations resulted in a catastrophic wildfire in 2016 that destroyed part of the city of Fort McMurray. Drought-fostered wildfires in the area also devastated the communities of La Ronge in 2015 and Slave Lake in 2011. Any one disaster has complex causes, but shying away from explaining connections between fossil-fuel extraction and combustion, drought, and wildfires sustains support for fossil fuels.

**There Could Be an App for Carbon Pollution**

Technological innovation is amazing. Smartphones know where and how far we are driving, flying and cruising, and how many steps we take when walking. Ride-hailing apps like Uber have options to withdraw payment directly from one’s account. Dealing with a problem requires measuring it and making its magnitude visible, particularly to those causing the problem. Until now, however, innovation has failed to make visible the harmful consequences of combusting fossil fuels. Most people do not understand how much their fossil-fuelled social practices contribute to the crisis. Margaret Munro (2019: O3) suggests there should be what she calls ‘a planetary conscience in every phone’. It would note whether a fuel-efficient lightweight vehicle or a gas-guzzling SUV or pickup truck is being driven, or the type of plane or cruise ship, the number of passengers, the distance travelled. Then it would calculate the number
of pounds (or kilograms) of carbon dioxide equivalent emissions and each passenger’s share. Her flight from Vancouver to Montreal emitted an average of 1445 kilograms of CO₂ per passenger according to a carbon tracker. Making this visible with a little green icon that pops up and goes bing would inform people of the consequences of their flight, hopefully encouraging them to exercise fossil-fuel restraint when deciding whether to fly and purchase fuel-efficient vehicles. But it could go further. Like Uber’s payment system, the icon could deduct payment to offset the emissions produced and place it directly into a certified carbon offset account. Payment could be compulsory like the charge for Uber’s ride-hailing, with everyone paying the full cost of their fossil-fuelled travel. This would implement the polluter pays principle and undermine the erroneous belief that carbon-dioxide pollution is free because it can’t be seen or smelled.

Munro’s idea could be extended to pollution meters in vehicles, indicating pounds of carbon dioxide emitted. Technologically this is not beyond the capacity of manufacturers, but innovation needs to be steered in this pollution-indicating direction. Speedometers incite drivers to restrain speeding when above the speed limit. Similarly, pollution meters could prompt people to buy light fuel-efficient vehicles, use public transit, fly only when necessary, etc. Visibility would extend to whether people are serious about mitigating climate change by exercising fossil-fuel restraint or whether they practice what Thunberg calls ‘empty words’. Smartphones themselves could be made smart enough to indicate users’ share of emissions generated by the massive fossil-fuelled servers used to make them function. There would be a debate about how to share responsibility for carbon pollution: drivers combusting fossil fuels, passengers, companies enticing purchases of vehicles, flights, cruises, etc. That is where debate belongs, rather than ignoring the consequences of fossil-fuelled practices.

Promote Inclusion and Equality of Opportunity

Using the atmosphere as a carbon pollution dump causes a greenhouse effect, costly wildfires, floods, and extreme weather. A significant threat
is that many of nature’s services, such as glacier runoff, carbon storage in permafrost, reflection by white cover of the Arctic Ocean, will be closed off to latecomers, whether they be future generations or the poor whose countries develop later. They risk being excluded from opportunities that the affluent in this and previous generations have enjoyed. The threat of fossil-fuelled intergenerational downward mobility is emerging. Prevention of fossil-fuelled climate change requires a more cosmopolitan orientation of keeping opportunities open to others, particularly future generations, and including them in benefits from the advantageous natural environment earlier generations have enjoyed. Societies, such as Nordic social democratic ones, which have had the most success in spreading opportunities to all members of society, have also been the best environmental performers in fostering inclusion and opportunities across space and between generations. This needs to be enhanced and inspire other societies.

**Focus on Social Practices Not Just Discourse**

Carbon polluters and supporting governments typically do not admit they are at fault. They advance the discourse that they are decreasing the carbon intensity of production (less emissions per unit of GDP). Even if true, that is a false positive indicator of improvement. In detective work, the advice is: follow the money. Similarly, for detecting the source of global warming, trace carbon-emitting social practices up the chain of command and determine whether emissions exceed withdrawals. This is how to transcend greenwashing.

**Timeliness**

The timeliness of taking action is all-important for a cumulative threat like fossil-fuelled climate change. It is easier, less expensive, and more effective to deal with it early, much like a cancerous tumour, the COVID-19 virus, and the fire at Notre Dame Cathedral. Nature’s threatening dynamics have a runaway capacity if they are not nipped in the bud. Fossil-fuel infrastructures like coal-burning electricity generating
plants, extraction mines, pipelines, etc., constitute major investments, have long lifetimes, and are costly to shutter, hence they lock in emissions for decades. Nordhaus calculated that the cost of delaying measures to mitigate fossil-fuelled climate change for fifty years would be around $6.5 trillion. Research by ‘virtually all other economic modellers, shows that acting now rather than waiting 50 years has substantial net benefits’ (Nordhaus 2013: 300). The key word is ‘net’: reducing costs over the long term requires a willingness to pay the upfront full costs of fossil fuels and of replacing them.

**Combat the Fallacy that Placing a Price on Carbon Pollution Is a Job Killer**

Many decision-makers frame the global warming issue as ‘economy versus the environment’, with claims they are trying to reconcile the two. These claims are sometimes well-intentioned but uninformed whereas others involve deception. Economic growth that causes climate change will harm the future economy (Wagner and Weitzman 2015) and will have long-term costs far exceeding near-term benefits of fossil fuels. The environmental economist Heal (2017) analyses *Endangered Economies: How the Neglect of Nature Threatens Our Prosperity*. He recognizes there were costs to preventing acid rain, but documented that the economic benefits were ten times greater. Similarly, ‘switching from fossil to carbon-free power need not raise the cost of power, as often asserted by the fossil fuel industry’ (Heal 2017: 189). Opponents of clean energy focus on its costs to the exclusion of benefits. Upfront costs of mitigation bring long-term economic gain (Stern 2009). Hawken (2017: 220) agrees: ‘We also look at the net operating cost or savings from climate solutions compared to continuing business as usual. The net operating savings is $74 trillion over thirty years’. The Canadian province of British Columbia implemented a carbon tax, which decreased emissions, and it led all provinces in economic growth, partly because the money raised reduced other taxes. Money collected through pricing carbon pollution can stimulate the economy. Sweden introduced the world’s highest carbon tax in 1991. Since 1995, its total emissions decreased by 25%, its
intensity emissions per unit of GDP decreased by 65%, and its economic growth was 12% higher than the European average (Ragan 2019: A11). Australia had a carbon tax from 2012 to 2014, which reduced its emissions, and its GDP grew by 3% per year (Flannery 2015: 70). Germany innovated feed-in tariffs to develop wind and solar energy and reduce dependence on coal and nuclear energy, which has not prevented it from being an economic powerhouse. Economists agree that taxing bads like pollution is better for the economy and job creation than taxing goods like payrolls, income, profits, etc. (Nordhaus 2013). It promotes innovation, and shifts well-paying jobs to the renewable green energy sector.

It is necessary to underscore the climate-change costs of combusting fossil fuels (wildfires, floods, extreme weather, ocean level rise, etc.). Immediate tiny savings by rejecting carbon taxes will be made at the expense of much greater perpetual long-term costs. Costs are merely displaced to paying for disasters. This is like refusing to pay for disaster mitigation, preparedness, robustness, etc., and then becoming compelled to pay far greater costs later when disaster strikes. Carbon taxes are the most effective, transparent, and least costly way to decrease carbon pollution. The environmental economist Heal (2017: 62) concludes that it ‘is ironic and perhaps a comment on our political maturity that this is probably the least popular of all approaches’.

Carbon taxes will make fossil fuels less competitive against low-carbon energy, and will result in fewer jobs in the carbon-polluting sector. Jobs will be transferred to the low-carbon energy sector. The process involves job shifting not job loss. Heal (2017: 202) concludes that ‘keeping the natural world intact is not expensive – it in fact yields a generous dividend. It’s the destruction of the natural world that will cost us massively in the long run’. Jobs were lost in the asbestos industries when it was found to be dangerous, but alternative products were innovated and safer jobs created. After it was confirmed that smoking cigarettes causes lung cancer, tobacco farmers could no longer sell their crop. They wisely shifted to vegetable and fruit crops, including winemaking, and prospered. There was initial resistance to changing long-standing practices, but the transition to safety was made and prosperity maintained.
Value Services Rendered by Nature’s Dynamics

Ecologists underscore the importance of ecosystem services to humanity. Economists refer to them as ‘natural capital’ (Heal 2017). Many of these services are being degraded by human practices (Thornes 2010). Forests suck carbon dioxide from the atmosphere, but many were clear-cut and others cleared for agriculture. Oceans also absorb carbon dioxide, but as they become warmer and acidic because of emissions, they are less capable of providing this essential service. Global warming melts glaciers, which previously supplied drinking water year-round in mountainous regions. It also melts the Arctic Ocean’s ice cover, reducing the valuable Albedo effect of white ice reflecting the sun’s rays thereby mitigating warming. It melts permafrost, where methane is safely stored by nature, resulting in emissions from this powerful greenhouse gas, and possible runaway climate change. Fossil fuels themselves were produced by the sun’s energy and stored safely underground. The atmosphere is providing the service of a carbon sink, but it is limited. It is important to recognize, value, and protect these services of nature from being degraded by fossil-fuelled climate change.

Aiming for What Is Sociopolitically Acceptable

The chapter turns now to assessing other suggestions. Pielke (2010: 228–229, 231) states ‘the only way to a high carbon tax is to start low. … By explicitly connecting carbon pricing with energy innovation, a virtuous circle is enabled that allows those asked to pay the tax to see the benefits and thus builds the support necessary to sustain investments over decades and longer’. He gives the example of a fuel tax on gasoline that enabled the Eisenhower Administration to build the American interstate highway network. Pielke’s carbon tax would be dedicated to raising revenue for research to innovate energy sources cheaper than fossil fuels. It would be set upstream at extraction of fossil fuels. If his approach ‘were to succeed, then decades hence the world will have a high carbon tax, widespread deployment of low-carbon technologies, and a decarbonized economy’ (Pielke 2010: 232).
Although Pielke correctly sees the political difficulty of implementing carbon taxes, starting low ensures that fossil-fuelled climate change will worsen (Latin 2012) because emissions are currently high. Unfortunately, the world would have a carbonized atmosphere, a greenhouse effect, global warming, and degraded oceans because the further accumulation of carbon emissions would intensify the vicious circle of melting Arctic ice reducing its reflective capacity, melting permafrost releasing methane, etc. There would be no disincentive against combusting fossil fuels until research leads to innovations making low-carbon energy less expensive than fossil fuels, which could take a long time. A low, incrementally increasing carbon tax fails the urgency test. Moreover, a low-carbon tax provides little money for the massive research needed, and whether desired innovations would result is uncertain. Pielke argues that the carbon tax should be set at the highest price politically possible. Agreed. However, that would be zero in the current US ‘Make America Great Again’ administration. It would also yield zero monies for research in countries where the tax would have to be revenue-neutral to be accepted. Furthermore, it is hard to find the climate equivalent of Eisenhower building a small stretch of highway that motivates the population to pay taxes to build more.

When a Canadian province fought a national carbon tax in its supreme court, the latter concluded it is not a tax in a legal sense but instead a regulatory charge on emissions where revenues are not grabbed by the national government but rather returned to individuals and businesses in the province where it is raised. Hence, instead of using the scary word ‘tax’, one suggestion is to use labels that are more acceptable: ‘charge’, ‘levy’, ‘fee’, or ‘fine for pollution’.

Whether government regulations and taxes are acceptable to the population depends on the sociopolitical context. During the Second World War, high taxes were imposed, the ‘government enacted – and Americans accepted – price controls. … Gasoline was severely regulated, and a speed limit of 35 miles per hour was imposed nationally to reduce gas and rubber consumption’ (Safran Foer 2019: 8). This illustration demonstrates that acceptability of taxes and regulations depends on the gravity and immediacy of the crisis.
Another possibility that could be popular would be for governments to subsidize retrofits of residential, commercial and public buildings to decrease fossil-fuel use for heating, air conditioning, and increase energy efficiency. Resistance to deep retrofits is usually based on the upfront costs, and if these were subsidized, then they would be financially beneficial for owners after a few years. Installing heat pumps where electricity is based on a low-carbon primary source and thermal retrofits to improve insulation could reduce fossil-fuel use. Together with mandated codes for new buildings, this would decrease emissions significantly, since about 13% come from buildings. Retrofits would have the co-benefit of increasing jobs to do the work. However, they would be expensive for governments, which would try to ensure additionality, namely finance the cost only if the retrofit would not be done without a subsidy.

**Divestment**

The fossil-fuel industry is arguably the wealthiest to have existed. Its investors and shareholders profited from this carbon-polluting industry. There are now attempts to decelerate extraction and combustion by divesting from that industry. The best known promoter of divestment is former Bank of England governor Mark Carney (Carbon Tracker 2015). The prototype was the successful divestment campaigns that contributed to bringing down South Africa’s apartheid regime. Divestment is supported by (i) moral reasoning that fossil-fuel combustion degrades the environment future generations will need, and (ii) financial arguments that such investment will lose value as dangers of fossil-fuelled climate change become increasingly recognized (Flannery 2015: 105–112), much like what happened to investment in asbestos companies. If climate-protection legislation is enacted, the decline in value will be accelerated. However, such legislation is uncertain because divestment is opposed by powerful fossil-fuel lobbies. The institutions divesting have typically been environmental organizations and religious groups, which do not have much money invested. Student organizations have attempted to convince university administrators to divest their endowment funds. The best-known case was at Harvard where a student
Referendum was held, 1300 faculty and alumni signed a petition, and the president’s office was occupied twice (Rowe et al. 2016). The administration staunchly opposed divestment from fossil fuels, which bring high returns, so it had limited success. Investors who discount danger snap up the underpriced shares thereby counteracting divestment by the few investors with climate foresight (Willis 2019: B1, B5). Divestment has a role to play in mitigating carbon pollution, but it has limitations.

**Lawsuits Against Carbon Pollution**

Litigation concerning harm undermined the asbestos industry and was instrumental in keeping asbestos stored safely in the ground. Litigation is having similar success in regulating cigarettes and the tobacco industry. Although at its beginning stages, litigation to compensate harm by the fossil-fuel industry and act as a deterrent to future harm could be part of mitigating the fossil-fuelled climate crisis. In the Deepwater Horizon case, lawsuits ‘reduced the company’s value by about $30 billion – a good example of the legal liability system operating to internalize some of the external costs that BP generated …. with BP agreeing to pay $18.7 billion in damages to the federal government and its agencies, and another $5.6 billion in damages to the various states affected’ (Heal 2017: 56). Environmental lawyers (Wood 2013) have formulated a general legal argument based on the public trust doctrine. They contend all citizens have a constitutional right to a livable environment, and a democratic government has a duty to protect it. Specifically, that includes water, forests, wildlife, air and the atmosphere. They argue that it refers to preventing future harm and repairing past damage threatening future generations. This is the legal basis of ongoing lawsuits. However, litigation is expensive, slow, and has unpredictable results. Courts awarded $5 billion in punitive damages against Exxon for its 1989 Valdez oil spill in Alaska, the largest oil spill ever, but the company has been appealing ever since and the money has not been paid.
Reducing Consumption Practices

A technically simple solution to the fossil-fuelled climate crisis would be to use less fossil fuels even if they are not replaced by low-carbon energy. More generally, reducing overall consumption would mitigate most environmental problems. It would diminish the threat of a draconian exclusion from consumption for future generations (read grandchildren) forced upon them by global warming caused by the present generation’s excessive consumption of carbon polluting fossil fuels. Speth (2009: 115–116) argues that the ‘powerful forces driving the clash of economy and environment thus will continue, and that makes it necessary to address those forces – growth, consumerism, corporate behavior among them. So it makes very good sense to question economic growth and the growth imperative. Right now and for the foreseeable future, there’s a trade-off: economy versus environment’. Carbon emissions are closely related to economic growth: when it is strong, so are carbon emissions. Global economic growth was relatively strong in 2017, and the International Energy Agency documented that 1.6 million more barrels of oil were combusted daily in 2017 than in 2016, which increased emissions and gave incentives for even more extraction.

Thus, one suggestion is to practice a bold cultural change of what is called ‘degrowth’ (Klein 2014). Economic growth would no longer be the goal; instead, new social practices would enable populations to live well where consumption of material resources, especially fossil fuels, would be sharply reduced. In plain English, this implies conservation, economic contraction instead of growth, downsizing production, and eliminating perceived entitlements to which the population has become accustomed. Advocates of degrowth and post-growth argue it would lead to greater well-being by pursuing happiness in terms of more time spent on family and community relations, nature, art, etc. It ‘envi-sions major changes in values, lifestyles, and human behavior. It involves a deep change in social values – away from ever-increasing material consumption and toward close community and personal relationships, social solidarity, and a strong connection to nature’ (Speth 2009: 44). Enjoy nature in a nearby park rather than travelling to a distant nature
reserve, visit local art galleries rather than the Louvre, see local attractions instead of the world. Decreasing consumption of fossil fuels implies decreasing consumer goods, often transported long distances in fossil-fuelled cargo ships, trains, transport trucks, etc., and reducing travel practices in automobiles, planes, and cruise ships, which are increasing elements of consumption in the modern world. To be effective, degrowth needs to be done collectively rather than be only an individual choice by a few ecological saints.

Aviation is one area where reduction of fossil-fuelled social practices is the only remedy for its contribution to the climate crisis for the foreseeable future. Presently, there is no technological alternative to jet fuel to power planes for rapid, comfortable flights. Commercial aviation is currently experiencing rapid growth globally, resulting in more carbon emitted into the atmosphere. Degrowth would change this. Flying for pleasure would be curtailed. Conferences would be transformed: jet-fuelled participation would be replaced by tele-conferences; ideas would travel, but not people. The young climate activist Greta Thunberg’s transatlantic trips highlighted that an important cause of climate change consists of combusting jet fuel. Her extreme example could motivate less flying. Will people be inspired by Thunberg’s actions, or will they dismiss her as a cute kid saying nice words and doing courageous actions?

Carolan argues in favour of a circular, sharing economy where people would be ‘unburdened’ by ownership. Although there would be more time free from work, the desire to ‘get away’ would be reduced, with associated reductions in driving, flying, cruising, etc., and hence in emissions. Very little would stay the same in this social reorganization of ‘consuming collaboratively; working less; taxing bads/rewarding goods; democracy; creating walkable communities; making repairable goods; enforcing antitrust laws; a maximum wage (and on and on)’ (Carolan 2014: 208). He adds that ‘we have to realize that freedom ultimately requires restraint’ (Carolan 2014: 183) by consuming and wasting less, but this does not rest entirely on sacrifice (Carolan 2014: 169).

Limiting consumption and economic growth have appeal in theory, but have had little success in practice, and remain utopian. In the
half-century since *Limits to Growth* (Meadows et al. 1972) and *Over- shoot* (Catton 1980) were published, global consumption and economic growth have accelerated. Furthermore, increasing consumption and economic growth have been central to raising populations out of extreme poverty, for example in China. It is problematic to convince populations to reduce consumption of fossil fuels because they perceive it as sacrificing things they need or enjoy. It goes against the trend to greater consumption whether it be the poor acquiring air conditioning, the affluent combusting jet fuel to enjoy intercontinental tourism, and both using energy-glutton, carbon-emissions-intensive computer servers for data storage, social media mobile devices, etc. Reducing consumption is strongly resisted by powerful, prosperous corporations and countries, by the middle class everywhere, and by poor countries and the poor in developed countries who see in economic growth a solution to their economic problems. Pielke (2010: 219) contends that ‘for the foreseeable future, efforts to reduce emissions through a willful contraction of economic activity are simply out of the cards. Countries around the world – rich and poor, North and South – have expressed a commitment to sustaining economic growth, and these commitments are not going to change anytime soon, no matter how much activists, idealists, or dreamers complain to the contrary’. There is little chance that degrowth will be implemented at the scale and timeliness needed to deal with the urgent fossil-fuelled climate crisis. Typically degrowth is involuntary, occurs only by means of recessions (USA 2008), wars (Iraq, Syria), civil unrest (South Sudan, Venezuela, Nigeria), pandemics (USA, Brazil, Italy, Spain 2020), and causes much suffering.

Nevertheless, restraint concerning fossil-fuelled social practices and fossil-fuel consumption is needed to mitigate global warming, especially with regard to aviation. Fly when necessary, but limit flying for pleasure. If restraint is not practiced, then faith that a technological carbon-free alternative to jet fuel can be found is relied upon, but it is nowhere in sight.
Compassion and Moral Suasion Impelling Actions

Another solution would be to develop compassion, empathy, and a cosmopolitan orientation (Roberts and Parks 2007; Beck 2015). This would involve an appeal to the better angels of humanity and to altruism. ‘At present, there is already a strong movement for realization of a third generation of human rights, which includes the right to a safe environment’ (Kahn and Roberts 2013: 137). Human rights, empathy, and ethics to deal with the fossil-fuelled climate crisis are certainly worth promoting and maximizing. A concept of ‘ethical energy’ could be defined as energy that has the least harmful impact on future generations and vulnerable poor countries. Unethical energy would be defined as that type which results in proportionately more greenhouse-gas emissions and hence greater adverse consequences for others. By this definition, wind, solar, and other types of low-carbon energy would be the most ethical, whereas coal, heavy oil from Venezuela, and oil from Alberta’s tar sands would be the most unethical, as shown in Table 2.1 of Chapter 2. However, ethics confronts interests and ingrained habitus, and has had limited success in environmental matters. In the USA, where Kahn and Roberts are located, a strong movement in 2016 elected Donald Trump, who increased carbon polluters’ privileges and de-emphasized compassion, empathy, cosmopolitan orientations, and a safe environment. Those virtues can be hoped for, but mitigating fossil-fuelled climate change should not have to depend on them.

Protecting and Growing Forests

The greenhouse effect can be mitigated by drawing down carbon from the atmosphere. The growth of tropical forests is particularly effective at withdrawing atmospheric carbon and sequestering it in trees, roots, and other vegetation. Much of this will be done by nature’s processes if those forests are protected. Brazil dramatically cut deforestation rates in the Amazon, and was restoring the forest, at least until Bolsonaro was elected president in 2019. Hawken’s (2017: 114–116) team estimates
that protection and restoration of tropical forests over the next thirty years can draw 61 gigatonnes of carbon dioxide out of the atmosphere. Temperate forests are not as good at withdrawing carbon, but are still good. Over the same period, if protected and restored, they can withdraw 22.6 gigatonnes (Hawken 2017: 128–129). Afforestation is the term used for creating new forests in areas where there were none for fifty years because of pasture lands, mining, etc. Planting forests there can result in a new sink drawing down 18 gigatonnes of carbon over the next thirty years (Hawken 2017: 132–134).

**Offsetting**

Despite deficiencies of offsetting indicated in Chapter 4, it has an important role to play for compensating emissions from social practices for which there is no alternative to fossil fuels in the current state of technology, such as aviation. For example, Swiss researchers calculated that a return flight between New York and London covering 11,100 km results in 1.8 tonnes of greenhouse gases per passenger in economy class, which is 3800 pounds or 20 times the weight of an average 190-pound passenger, and the offsetting cost would be US$54 if spent in developing countries (Myclimate 2020). This would not be an exorbitant increase in the ticket price of a return flight between New York and London. The equivalent estimate for more spacious business class shared by fewer passengers was 3.4 tonnes of greenhouse gases per passenger, which is 6800 pounds and the offsetting cost would be US$103. Even more spacious first class would produce 5.3 tonnes of greenhouse gases per passenger or 10,600 pounds and the offsetting cost would be US$160. Tickets are presently cheap because the cost of damage to the environment is not included in the price and is left to be paid belatedly by others in the form of costly global warming and extreme weather. Since there were over 4 billion passengers flying in the world in 2019 and the number is growing, aviation's contribution to fossil-fuelled global warming and its related costs are enormous. If offsetting were included in the price of tickets, it would provide a huge increase in financing for
mitigating fossil-fuelled climate change, for example not only afforestation but also financing solar energy in poor southern countries to replace coal thereby mitigating global warming and benefiting everyone everywhere. Note that if spent in wealthy countries with high labour costs, the same mitigation benefits of offsetting would add twice as much to the ticket price.

Offsets should be certified to ensure they result in additional emissions reductions that would not have occurred without them. Most importantly, offsets should be mandatory and increased to include the full cost of damaging emissions rather than being voluntary and tiny, as done presently for aviation. Offsetting that finances additional solar and wind energy and energy efficiency retrofits are better than planting trees because a wildfire or logging can put all the carbon back into the atmosphere (Suzuki and Hanington 2017: 234–237). Monies raised could be used to finance (i) the replacement of fossil-fuel-powered electricity generation by low-carbon energy and (ii) the transition to electrical vehicles, networks of charging stations, and especially (iii) research into improving the storage of emissions-free energy. This would increase the price of plane tickets, result in a decrease in air traffic, and mitigate aviation’s contribution to fossil-fuelled climate change, but it would face considerable opposition. Hence, effective offsetting has been shelved and token voluntary offsetting persists. This needs to be changed.

State offsetting is already being done by Norway, which is using part of its oil wealth to finance afforestation in developing countries, thereby compensating some emissions from its North Sea oil. In 2008, Norway agreed to pay Brazil $1 billion to reduce its rate of deforestation of the Amazon rainforests 75% by 2015; Brazil achieved the goal and received Norway’s payment. Since states that base their economies on oil extraction are unlikely to keep the oil in the ground, offsetting is a needed alternative, with social democratic Norway being an exemplary role model. However, there is resistance in most oil extracting and consuming countries to sending money abroad because it reduces profits, royalties, and jobs.
Educating Girls

Global warming must not be mitigated by keeping people in extreme poverty. Economic growth of poor countries is necessary. But imagine the global warming impact if poor countries, with their high populations and birth rates, reached the same per capita level of fossil-fuel consumption as wealthy ones, for example, if Madagascar’s annual emissions of 0.1 tonnes per person increased to the American rate of 18 tonnes (Hawken 2017: 81). Hence Hawken (2017: 78–82) argues that educating girls and family planning constitute important means of restraining emissions and mitigating global warming.

Governance

Far from government and market action being mutually exclusive, a government cap on emissions or carbon tax is needed to harness the market to solve this urgent global problem. Apparent market-based remedies are actually hybrid market-state solutions. Government regulations forcing polluters to reduce emissions, or prohibiting the worse carbon-polluting practices and types of fossil fuels, is also necessary (Jaccard 2018). Currently, coal-fired power provides 40% of the world’s electricity. ‘A dramatic change of course is required if the world is to avoid a climate-change disaster. And, of course, dramatic shifts require decisive government action – to limit coal use and encourage new technologies by putting an effective price on carbon. Otherwise cheap, dirty coal, with its vast already-built and paid-off infrastructure, will prevail’ (Flannery 2015: 186). The closing of coal-fired electricity generation by the Ontario government reduced greenhouse-gas emissions and had co-benefits of decreasing urban smog, air pollution, and fatalities among asthma sufferers. Harvey and Orbis (2018: 12) documented that ‘a strong building code that continuously strengthens over time and has a strong monitoring and enforcement mechanism, as in California, can dramatically reduce energy use and emissions. And we know fuel economy standards for vehicles, when designed well, can dramatically improve fuel efficiency’. Germany increased its use of renewable
energy for electricity through government-mandated feed-in tariffs by reverse auctions where the lowest bid wins the supply contract. To reduce emissions, governments ‘removing subsidies for fossil fuels is the first step – though still widely ignored. Next, policymakers must incorporate the cost of externalities, such as adding a carefully derived social cost of carbon or setting a carbon cap’ (Harvey and Orbis 2018: 18). Government action is required to promote densification of cities to reduce commuting emissions, construct dedicated bicycle lanes to foster this carbon-free transportation, build rapid mass transit and high-speed electric rail to reduce short-haul plane travel and jet-fuel emissions, improve fuel-efficiency standards, etc. (Flannery 2015: 91–92). Harvey and Orbis (2018: 300) assessed the efficacy of government policies to reduce greenhouse-gas emissions. In a country that cannot afford electrified subways, they documented how bus rapid transit on dedicated lanes and high-density development near stations decreased automobile use and emissions in Bogota, Columbia. Some remedies require changes in cultural aesthetics. Governments could paint the infrastructure and its roofs white so that the sun’s rays would be reflected back into space, which many southern European countries do to some extent (Flannery 2015: 137). Governments promoting vegetarianism and best practices management of livestock would also reduce emissions (Flannery 2015: 152).

Conservative governments, called different names in different countries, are typically the most reluctant to mitigate fossil-fuelled climate change. Nevertheless, the urgency of the fossil-fuelled climate crisis requires that all forms of governance act to mitigate it, rather than having left-wing governments acting then having it undone by right-wing ones. And conservative governments have mitigated climate change in some cases. Angela Merkel’s conservative Christian Democrats led the way with wind and solar energy by innovating feed-in tariffs. UK Conservative governments pushed forward wind energy. In France, Macron’s government is not left-wing nonetheless attempted to implement carbon taxes. In the USA, international agreements were implemented during Republican regimes to phase out CFCs to diminish ozone layer depletion, leaded gasoline was banned under Reagan, and George H. W.
Bush initiated cap-and-trade to alleviate acid rain. In 1988, the Canadian Conservative Party held the first international meeting on climate change.

Most remarkable is the 1989 speech before the United Nations General Assembly by the icon of conservatism, Margaret Thatcher, best known for promoting individual rights, free markets, deregulation, etc. ‘The problem of global climate change is one that affects us all, and action will only be effective if it is taken at the international level. It is no good squabbling over who is responsible or who should pay. … Put in its bluntest form: The main threat to our environment is more and more people and their activities. The land they cultivate more intensively. The forests they cut down and burn. The mountainsides they lay bare. The fossil fuels they burn. The rivers and seas they pollute. The result is that change in future is likely to be more fundamental and more widespread than anything we have known hitherto. Change to the sea around us, change to the atmosphere above, leading in turn to change in the world’s climate, which could alter the way we live in the most fundamental way. … There will be no profit or satisfaction for anyone if pollution continues to destroy our planet’ (quoted in Reguly 2020: B4). She called for a framework convention on climate change, which she branded ‘a good conduct guide for all nations’. Her knowledge of science, having studied chemistry at Oxford, likely explains her early awareness of the danger of global warming, since its source is the chemical reaction of carbon with oxygen. Unfortunately, conservatives ignored Thatcher’s climate warnings. The American Republican Party long denied anthropogenic climate change, attacked the science, and refused to change fossil-fuelled social practices (Jacques et al. 2008; Dunlap and Jacques 2013; Dunlap et al. 2016). Conservatives everywhere should heed Thatcher’s ‘good conduct guide’ to mitigate climate change, otherwise little progress will be made given the swings in democratic electoral politics.

Every country has to lower its carbon pollution through legally binding, enforced international agreements between governments, which would amount to Paris Agreements plus sanctions for recalcitrants. An international rules-based governance order mandating carbon pollution
restraint is necessary. The key concept is disproportionately (Freudenburg 2006): countries that are disproportionately high per capita emitters have the most responsibility to lower their emissions; otherwise wealthy, high-emitting, low population countries like Canada will blame poor, populous countries like India as an excuse for keeping emissions high. High per capita emissions, wealthy societies like Luxembourg (CDIAC 2018) need to lead in reducing their emissions, even if they account for a small percentage of overall emissions, because they are disproportionately causing harm to future generations.

**Transcending Capitalism as We Know It**

Speth (2009: 116) argues that ‘the planet cannot sustain capitalism as we know it’. His solution is to reinvent the political economy constructing ‘America the possible’ (Speth 2012: xiii) by transforming the capitalist market and politics, decreasing consumption and inequality, simple living, respecting nature, and pursuing happiness in non-material pleasures. ‘The future described herein rests on massive change that will be realized only if the American people insist on it. So the book is more about what can be than what will be’ (Speth 2012: preface). It is true that capitalism, as we know it, has engendered the fossil-fuelled climate crisis, must be transformed, and political economy reinvented (Foster, Clark, and York 2011). But what will that involve?

A leap into the unknown of massive change can be done quickly in theory, but its implementation in the messy real-world of power, interests, and practices is likely too slow, too partial, and too problematic for the urgent climate crisis. It would probably have less chance of success than a merely good solution. Harvey and Orbis (2018: 63) argue that a ‘highly abating and perfectly designed policy is not worth pursuing if there is no chance it can be implemented’. Speth’s proposal resembles that of Bernie Sanders, which even primary voters in the American Democratic Party did not accept. That a massive change of capitalism ‘will be’ in practice in the urgent time frame required for dealing with the climate crisis is a long shot.
Speth is not suggesting replacing ‘capitalism as we know it’ with socialism ‘as we know it’. But it is a misleading comparison to contrast the worst excesses of capitalism with the best ideals of theoretical socialism which has never existed. What does his proposed transformation of the market consist of? Ambiguity is an escape hatch in Speth’s theory. His proposal might consist of a utopia never before seen and likely will not be seen. Or the transformation of ‘capitalism as we know it’ could mean implementing ‘capitalism as we don’t know it in America’, namely social democratic capitalism inspired by the Nordic model. It could consist of improving and scaling up real-world political systems that have been the best performers in mitigating environmental problems, monopolization, exclusion, and inequality of opportunity, thereby reducing social closure. That would be social democracy.

A Social Democratic Proposal

Fairbrother notes that neo-Marxist approaches see no significant reduction in externalities unless the capitalist market is abolished, and that ecological modernization (Mol et al. 2009; Sonnenfeld 2009) is based on vague, questionable indicators of improvement (for critiques see York and Rosa 2003; York 2012; York and McGee 2016). Fairbrother (2016: 380) argues that ‘an externalities perspective focuses on the political question of why the state may or may not take regulatory action against externalities in a given case’. This converges with the focus of closure theory on specific political action to mitigate exclusion, monopolization, and environmental problems. Such political action is typically, though not uniquely nor always, accomplished through social democratic governance.

Evidence demonstrates that social democracy is the governance with the best environmental performance record, including for reducing greenhouse-gas emissions (Germanwatch 2012, 2019; Yale University 2012, 2018; CDIAC 2018). Minimizing monopolization of wealth and mitigating exclusion, which are more characteristic of social democracy than of other forms of governance, has been extended to future generations and poor countries by reducing impacts on the environment
they will need. This involves a more cosmopolitan orientation, as Beck (2015) recommended, and greater empathy for others distant in time or space. Social democracy has the best record of creating institutions, values, and social practices that foster equality of opportunity, inclusion, environmental justice, and intergenerational justice.

For example, states with large oil reserves typically elect conservative governments opposed to carbon taxes and restraints on carbon pollution. Oil extraction has become the principal basis of prosperity for Norway, but it is done in social democratic ways that obtain the most value for the least emissions. Norway formed a state-owned company to exploit this resource so that it would benefit all Norwegians. It allowed private companies to exploit North Sea oil only by paying huge royalties (75%), and created a sovereign wealth fund of savings to benefit future generations. It introduced carbon taxes to decrease emissions and promote technological innovations, built an electric transit network, and financed reforestation of Brazil’s and Indonesia’s tropical rainforests to offset Norway’s carbon emissions. This is not as good for mitigating fossil-fuelled global warming as keeping its oil in the ground under the sea. Nonetheless, it is the best any major oil extracting country has done. There is a need to learn from Nordic social democracies, notwithstanding that their collectivist values are not easily transferable to individualistically oriented states, such as the USA.

Social democracy is the form of governance most closely related to inclusionary solutions deduced from the social closure theoretical framework. That framework takes radical analyses into account, such as those of Speth (2009, 2012), but redirects them towards real world, social democratic resolution of fossil-fuelled climate change holding inequalities and processes of monopolization in check, especially fossil-fuel oligopolies. For the urgent crisis of fossil-fuelled climate change, it stresses the need for prompt implementation of solutions.
Energy Futures Under the Threat of Climate Change

The fossil-fuelled climate crisis has been caused socioeconomically, will have socioeconomic consequences, and will need socioeconomic remedies if it is to be mitigated.

Three possible outcomes of the crisis are foreseeable.

a. A dangerous fossil-fuelled global warming energy future
One possibility is that societies, prodded on by fossil-fuel industries, refuse to change their fossil-fuelled social practices. Emissions continue to exceed carbon withdrawals and more and more carbon is transferred from ground to sky. Impact science’s warnings of future harm are discounted. High-carbon emitting countries legitimate their pollution by claiming it is pointless to stop because other countries will continue theirs. Near-term economic benefits are enjoyed, with faith future generations will implement just-in-time technological solutions even though the present generation has not. Societies believe they can adapt to anything nature throws at them, be resilient, and ride runaway global warming, which is like assuming there is no need to close the faucet because adaptation can succeed by mopping up the overflow from the bathtub. This constitutes a failure of foresight, a race to the bottom, and the incubation of disaster. The biggest danger is that fossil-fuelled global warming unleashes second-order global warming by nature’s dynamics and uncontrollable climate change. Even if societies belatedly stop emissions, the evil genie is out and vicious feedback forces of nature are let loose. Insufficient mitigation is a possible energy future, with future generations paying the environmental costs of previous generations’ refusal to pay the full cost of their fossil-fuelled social practices. Foresight requires that this possible energy future not be dismissed in order to take action to avoid it.

b. A safe, low-carbon energy future based on reduced consumption
There is awareness that if this generation does not reduce consumption voluntarily, runaway climate change will impose it on future generations. Moral considerations replace individualistic orientations with
cosmopolitan ones of caring for future generations and poor countries. Wealth is shared with poor societies. Consumption willingly decreases, especially fossil-fuel consumption and corresponding social practices. People drive less, fly less, cruise less, cremate less, use less cement, less air conditioning, less social media servers, etc. The emphasis is on enjoying non-fossil-fuelled pleasures and nature, sights, sports, art galleries, and the like near home. Urban sprawl and commuting are decreased by choosing to live near work in dense cities, like Seoul and Amsterdam, and raising children in apartment blocks rather than in detached houses with a yard. Reduced consumption means economic growth stops and degrowth begins, but sharing work avoids unemployment, and people need less money because travel and consumption decrease. Fossil fuels remain safely underground. Opposition from fossil-fuel industries and states is overcome. The aspirations of Beck (2015), Speth (2009, 2012) and Klein (2014) become reality. This bold massive change mitigates global warming. Unless catastrophic consequences become visibly imminent as in wartime, this energy future is unlikely to occur because it will be perceived as incurring major sacrifices of social practices people enjoy. By the time consequences become grave, it will be too late to undo the accumulation of carbon pollution in the sky, as Giddens states.

c. A safe, low-carbon energy future with growth

The full cost of fossil fuels is paid upon purchase because governments impose a price on carbon pollution through taxes, cap-and-trade, or regulations. This incentivizes using solar, wind, tidal, hydro, and geothermal energy, and provides financing for technological innovations improving energy storage, electric vehicles, and low-carbon energy. Emissions are decreased to the level of carbon withdrawals. Most fossil fuels remain safely stored underground. Internationally enforced agreements ensure compliance by all nations. Although costly to pay the hitherto unpaid externalized costs of fossil-fuel combustion, this option consists of only sacrificing cheap fossil fuels. Carbon-free energy, which may become cheap in the future, replaces them. There would be little sacrifice of consumption and social practices, with social media servers, air conditioning, and transportation powered by carbon-free energy. Economic growth continues with global warming mitigated. Although technically challenging and facing opposition from consumers who have a sense of
entitlement to cheap fossil fuels, as well as from fossil-fuel industries and states, it is the most promising possibility to replace the dangerous fossil-fuelled energy future with a safe, low-carbon energy future.

Which of these energy futures will predominate is presently unforeseeable because of uncertainties concerning whether decision-makers and populations will respond (i) with foresight to the well-documented fossil-fuelled global warming or (ii) by discounting the danger.

Foresight or Discounting Danger?

Researchers documented that prior to disasters there is typically a period where signs of danger are discounted, which they call a ‘failure of foresight’ resulting in the ‘incubation’ of ‘man-made disasters’ (Turner and Pidgeon 1978). Scientific evidence indicates that humanity is incubating the slow onset, cumulative global catastrophe of fossil-fuelled climate change. It is largely imperceptible by the senses and risks closing off resources and opportunities to groups distant in space and time from those causing the problem. The objective of this book has been to analyse this dangerous incubation and assess solutions in order to enhance foresight and promote socioeconomic practices in harmony with nature’s dynamics.

Analyzing the depth and gravity of the fossil-fuelled climate crisis and translating the findings of science into words and analogies understandable by non-scientists will hopefully encourage low-carbon social practices, including voting practices. Hope, as opposed to blind faith in a last-minute technological cure-all, rests on evidence-based assessments. None of the solutions and remedies appraised in this chapter and book is perfect, and all have varying gradations of value. A whole range of solutions was assessed to indicate the value, limitations, and possibilities of each so that they could be used appropriately and in combination to meet this multifaceted challenge. Mitigation has to occur quickly because the longer climate change worsens, the more draconian the required solution. To accomplish this and promote carbon-free energy, the polluter
pays principle has to be implemented in terms of users of fossil fuels paying their full cost by including the cost of harm they cause in their price. This will make low-carbon energy more competitive and finance its development to the long-run benefit of everyone.

I resist the temptation to end the book with a pre-determined happy conclusion or an apocalypse. Human agents choosing their social practices individually and collectively in a structure of social and biophysical constraints will determine which result prevails. This is not as emotionally satisfying as enunciating perfect solutions in the abstract, but it is the only candid conclusion. The priority given to foresight versus discounting danger will determine the outcome of the fossil-fuelled climate crisis and its creeping threat to the sustainability of the beneficial habitat for humanity.

Note

1. Note that discounting here is used in the broad sociological sense rather than in the technical way economists use the concept. See Heal (2017: 145–149) for a good discussion of its use in environmental economics.

References

Beck, U. 2015. Emancipatory Catastrophism. Current Sociology 63 (1): 75–88.
Carbon Tracker. 2015. Mark Carney warns Investors Face Huge Climate Change Losses. 30 September. https://carbontracker.org/mark-carney-warns-investors-face-huge-climate-change-losses/. Accessed 15 April 2020.
Carolan, Michael. 2014. Cheaponomics: The High Cost of Low Prices. Abingdon, UK: Earthscan.
Catton Jr., William R. 1980. Overshoot: The Ecological Basis of Revolutionary Change. Urbana and Chicago: University of Illinois Press.
CDIAC. 2018. Carbon Dioxide Information Analysis Center. U.S. Department of Energy. Berkley. cdic.Ess-dive.lbl.gov.
Dunlap, Riley E., and Peter J. Jacques. 2013. Climate Change Denial Books and Conservative Think Tanks: Exploring the Connection. *American Behavioral Scientist* 57: 699–731.

Dunlap, R., A. McCright, and J. Yarosh. 2016. The Political Divide on Climate Change: Partisan Polarization Widens in the U.S. *Environment Science and Policy for Sustainable Development* 58 (5): 4–23.

EPA. 2017. Causes of Climate Change. *United States Environmental Protection Agency*. https://19january2017snapshot.epa.gov/climate-change-science/causes-climate-change_.html. Accessed 17 April 2020.

Fairbrother, Malcolm. 2016. Externalities: Why Environmental Sociology Should Bring Them. In *Environmental Sociology* 2 (4): 375–384.

Flannery, Tim. 2015. *Atmosphere of Hope: Searching for Solutions to the Climate Crisis*. New York: Atlantic Monthly Press.

Foster, John Bellamy, Brett Clark, and Richard York. 2011. *The Ecological Rift: Capitalism's War on the Earth*. New York: Monthly Review Press.

Freudenburg, W. 2006. Environmental Degradation, Disproportionality, and the Double Diversion. *Rural Sociology* 71 (1): 3–32.

Germanwatch. 2012. *CCPI The Climate Change Performance Index Results 2012*. http://germanwatch.org/klima/ccpi.pdf. Accessed 5 November 2012.

Germanwatch. 2019. *CCPI: The Climate Change Performance Index Results 2019*. https://germanwatch.org/sites/germanwatch.org/files/CCPI-2019-Results-190614-WEB-A4.pdf. Accessed 22 September 2019.

Harvey, Hal, and Robbie Orbis. 2018. *Designing Climate Solutions: A Policy Guide for Low-Carbon Energy*. Washington, DC: Island Press.

Hawken, Paul. 2010. *The Ecology of Commerce: A Declaration of Sustainability*, rev. ed. New York: Harper Business.

Hawken, Paul. 2017. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. New York: Penguin.

Heal, Geoffrey. 2017. *Endangered Economies: How the Neglect of Nature Threatens Our Prosperity*. New York: Columbia University Press.

IPBES. 2019. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. *Global Assessment Report on Biodiversity and Ecosystem Services*. Bonn: IPBES. https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf. Accessed 10 April 2020.

Jaccard, Mark. 2018. Divisive Carbon Taxes Are Much Ado About Nothing. *The Globe and Mail*, 15 December: O4.
Jacques, Peter, Riley E. Dunlap, and Mark Freeman. 2008. The Organization of Denial: Conservative Think Tanks and Environmental Scepticism. Environmental Politics 17: 349–385.

Kahn, Mizan R., and J. Timmons Roberts. 2013. Towards a Binding Adaptation Regime: Three Levers and Two Instruments. In Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World, ed. Susanne C. Moser and Maxwell T. Boykoff, Chapter 8. London: Routledge.

Klein, Naomi. 2014. This Changes Everything: Capitalism vs the Climate. New York: Simon & Schuster.

Latin, H. 2012. Climate Change Policy Failures. Singapore: World Scientific Publishing.

Meadows, Donella, Dennis Meadows, Jorgen Randers, and William Behrens. 1972. The Limits to Growth. New York: Universe Books.

Mol, A.P.J., D. Sonnenfeld, and G. Spaargaren. 2009. The Ecological Modernisation Reader: Environmental Reform in Theory and Practice. London: Routledge.

Munro, Margaret. 2019. Green Screen: A Planetary Conscience in Every Phone? There Should Be an App for That. Globe and Mail, 26 October: O3.

Mycclimate. 2020. My Climate: Shape Our Future. Zurich: Foundation Myclimate. https://co2.myclimate.org/en/portfolios?calculation_id=3492359&localized_currency=USD. Accessed 30 April 2020.

Nordhaus, William. 2013. The Climate Casino: Risk, Uncertainty, and Economics for a Warming World. New Haven: Yale University Press.

Pielke Jr., Roger. 2010. The Climate Fix. New York: Basic Books.

Ragan, Chris. 2019. Borrowing Policies Is Canada’s Best Policy. Globe and Mail, 12 August: A11.

Reguly, Eric. 2020. Trump’s Davos Talk Shows He’s No Thatcher. The Globe and Mail, 22 January: B4.

Roberts, J. Timmons, and Bradley Parks. 2007. A Climate of Injustice: Global Inequality, North-South Politics, and Climate Policy. Cambridge, MA: MIT Press.

Rowe, James, Jessica Dempsey, and Peter Gibbs. 2016. The Power of Fossil Fuel Divestment (and Its Secret). In A World to Win: Contemporary Social Movements and Counter-Hegemony, ed. William R. Carroll and Kanchan Sarker, 233–249. Winnipeg: ARP Books.

Safran Foer, Jonathan. 2019. We Are the Weather: Saving the Planet Begins at Breakfast. New York: Farrar, Strauss and Giroux.
Sonnenfeld, D. 2009. Contradictions of Ecological Modernisation. In The Ecological Modernisation Reader, ed. A. Mol, D. Sonnenfeld, and G. Spaargaren, 372–390. Abingdon: Routledge.

Speth, James Gustave. 2009. The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Sustainability. New Haven: Yale University Press.

Speth, James Gustave. 2012. America the Possible: Manifest for a New Economy. New Haven: Yale University Press.

Stern, Nicholas. 2009. A Blueprint for a Safer Planet. London: Random House.

Suzuki, David, and Ian Hanington. 2017. Just Cool It: The Climate Crisis and What We Can Do. Vancouver and Berkeley: Greystone Books.

Thornes, John. 2010. Atmospheric Services. Issues in Environmental Science and Technology 30: 70–104.

Tong, Ziya. 2019. The Reality Bubble: Blind Spots, Hidden Truths, and the Dangerous Illusions that Shape Our World. Toronto: Penguin.

Turner, B., and N. Pidgeon. 1978. Man-Made Disasters. London: Wykeham.

Wagner, Gernot, and Martin Weitzman. 2015. Climate Shock: The Economic Consequences of a Hotter Planet. Princeton: Princeton University Press.

Willis, Andrew. 2019. The Future Is Plastics: Murray Edwards, Li Ka-Shing Add to Oil Patch Holdings as Others Flee. Globe and Mail, 7 July: B1, B5.

Wood, Mary Christina. 2013. Nature’s Trust: Environmental Law for a New Ecological Age. New York: Cambridge University Press.

Yale University. 2012. EPI Environmental Performance Index 2012. http://epi.yale.edu. Accessed 8 November 2012.

Yale University. 2018. EPI Environmental Performance Index 2018. https://epi.envirocenter.yale.edu/epi-country-report/CAN. Accessed 22 September 2019.

York, R. 2012. Do Alternative Energy Sources Displace Fossil Fuels? Nature Climate Change 2 (6): 441–443.

York, R., and J.A. McGee. 2016. Understanding the Jevons Paradox. Environmental Sociology 2 (1): 77–87. https://doi.org/10.1080/23251042.2015.1106060.

York, R., and E. Rosa. 2003. Key Challenges to Ecological Modernization Theory. Organization & Environment 16 (3): 273–288.