

# Introduction to Climate Ethics

excerpts from chapters 1-2 of *Climate Matters*

by John Broome (2012)

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## Introduction

The Arctic is melting. The ice sheet that covers Greenland is thinning and sliding toward the sea. Air that has been warmed by the greenhouse effect melts its top surface; meltwater leaks through fissures to the ground; and there it lubricates and speeds the seaward flow of glaciers. Where glaciers meet the sea, warming water breaks up the ice at an increasing rate, which also speeds the glaciers.

At sea, ice floating on the Arctic Ocean is vanishing rapidly. The average area of sea that is frozen in summer has shrunk by about one-third since the 1970s. In the worst years so far—2007 and 2011—summer ice covered little more than half the area it covered in 1979, when satellite observation began. Its volume has diminished even faster than its area, because Arctic ice is thinning. The volume of summer ice in 2011 was estimated to be about a quarter of what it was in 1979.<sup>1</sup> Since floating ice shifts with the weather, a time is likely to come within only a few years when there is no ice at the North Pole.

In September a few decades from now, our rich, colorful planet will display to a traveler in space only one white polar ice cap instead of two. There could hardly be a more potent symbol of what human beings are doing to our climate than the destruction of one of the Earth's ice caps. It should teach us how large the unforeseen consequences of our acts can be. Since its cause is principally our burning of fossil fuel, it should make us fear what might be the next result of continuing in the same way. But avarice has overcome fear. The surrounding nations see the retreat of ice as an opportunity to extract from beneath the Arctic Ocean yet more supplies of oil and gas to burn. They are competing with each other for territorial rights, and already sending out rigs to drill in those dangerous waters.

The Arctic is especially sensitive to climate change for a simple reason. When sunlight falls on snow and ice, most of its energy is reflected back into space, but when sunlight falls on water, most of its energy is absorbed. So as the Arctic loses ice, it absorbs more heat, which in turn melts more ice. Global warming is amplified in the Arctic by this feedback. Arctic temperatures are increasing at about twice the global average rate. The Arctic is a bellwether for what is happening to the climate of the Earth as a whole.

As well as conspicuously signaling the climate's warming, the melting of the Arctic will itself have major effects on the rest of the world. Enough water is held as ice on Greenland to raise the sea level around the world by seven meters. If it melts, it will drown most of the world's biggest cities. Much methane is locked up in permafrost around and under the Arctic Ocean, and warming may release it. Methane is a very powerful greenhouse gas, which will further accelerate global warming. The Arctic also drives the circulation of

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<sup>1</sup> Data from the Polar Science Center, University of Washington, available at: <http://psc.apl.washington.edu/wordpress/research/projects/arctic-sea-ice-volume-anomaly>.

ocean water throughout the globe. Water at the surface of the far northern Atlantic is cold and salty. Because it is consequently dense, it sinks. In doing so, it pushes cold water south all the way along the bottom of the Atlantic and out into the Pacific and Indian Oceans. To replace it, warm water is drawn north from the Caribbean as a surface current in the Atlantic. The melting of Arctic ice will make the northern surface water less cold and less salty, so it is expected to slow the circulation of the oceans. This circulation transports vast amounts of heat around the world, and it affects the weather everywhere.

These global effects of Arctic warming are not expected soon. In particular, Greenland's ice will not completely melt for centuries. But in the meantime, the inhabitants of the Arctic itself are already experiencing the effects of a significant rise in temperature. Among those inhabitants are about four hundred thousand indigenous people, who live traditionally by hunting or by herding reindeer.<sup>2</sup> These people have contributed virtually nothing to climate change, but they are among the first to suffer badly from its consequences. They are relatively few in number, but soon innocent people all over the world will find their ways of life, and their lives too, similarly threatened.

Take as an example the Inuit people of Greenland and northern Canada. The Inuit and their ancestors have lived for thousands of years in the extraordinarily harsh conditions that prevail north of the Arctic tree line. They survive only by being delicately attuned to their environment. They need to predict weather reliably, and understand the habits of the animals they hunt. Now they find the weather strange and unpredictable, and the animals no longer behave as they did. These changes expose them to new difficulties and dangers.

For instance, it now rains in winter. Rain alters the state of the snow and can make it impossible to build an igloo for shelter. Hunters have died because they could not find good snow for protection in a storm. Ice moves unexpectedly so that a hunter may find himself cut off from land. Travel on ice is harder because ice does not stay so long on lakes and the sea. The presence of floating ice used to prevent waves from forming, but now that there is less ice, storms are more dangerous and make it harder to travel by sea. In summer, the surface of land above the permafrost turns to impassable bog, and the boggy season now lasts longer, so travel on land is harder, too. Where food is scarce, travel is vital.

The Inuit hunt caribou, whales, seals, polar bears, and other Arctic mammals, as well as birds and fish. By coating the ground in ice, winter rain prevents caribou from reaching the lichen they eat. Probably as a result, the population of Peary caribou, which inhabit Inuit territory, has fallen from tens of thousands to a few hundred. Floating ice is necessary to the Inuit's hunting. It forms an essential part of the habitat of polar bears and some species of seal. Female seals make lairs on the ice to give birth to their pups. Polar bears, which live mainly on seals, hunt for them along the edge of the ice and at the seals' breathing holes. As spring comes, floating ice retreats northward and separates from land, and now it does so earlier each year. So each year it becomes harder for Inuit hunters to reach their ice-borne prey.

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<sup>2</sup> The examples that follow are drawn from ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment* (Cambridge: Cambridge University Press, 2004).

Since polar bears breed on land, it becomes harder for them, too, to reach their prey. The bears are hungrier, and many turn to human settlements in search of food. Ironically, temporary “plagues” of these fearsome predators are adding to the dangers and difficulties of life in the Canadian Arctic. But it appears that in the longer run polar bears face extinction as the ice that supports them melts away. The Inuit will no longer be able to hunt for bears and seals. They will lose one of their main sources of food in their inhospitable land. Moreover, as the weather changes, the ice retreats, and they cannot hunt, their entire way of life is being eroded.

A document of the Inuit Circumpolar Conference reports:

Climate change is already threatening our ways of life and poses everyday, practical questions, such as when and where to go hunting, and when and where not to travel. ... There is very little time for indigenous peoples and the resources on which we depend to adjust and adapt. ... To Arctic indigenous peoples climate change is a cultural issue. We have survived in a harsh environment for thousands of years by listening to its cadence and adjusting to its rhythms. We are part of the environment and if, as a result of global climate change, the species of animals upon which we depend are greatly reduced in number or location or even disappear, we, as peoples would also become endangered as well.<sup>3</sup>

This danger to the Inuit has been imposed by the greenhouse-gas emissions of the developed world, in which they scarcely participate.

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All over the world and not just in the Arctic, the effects of climate change are being felt. Progressively more and more people will suffer as a result. Crops will be less successful, first in the tropics and later in temperate regions, making it harder to feed the world’s growing population. Famines and floods will become more frequent as dry regions of the Earth become drier and wet regions wetter. Water will become scarce in those vast, populous areas that are watered by the melting of mountain glaciers. Cities and low-lying farmland will drown. The harm done by climate change is likely to be very great.

The climate’s warming is being caused by humanity’s emissions of greenhouse gases,\* and humanity can slow it by reducing our emissions. It is widely recognized that we need to do so. ... The emergency is great, but the response has been feeble.

Even environmentalists are hesitant about some measures to reduce emissions. If climate change is to be brought under control, the world will have to derive much less of its energy from fossil fuels; yet alternative sources of energy are sometimes rejected for environmental reasons. In Britain, proposed wind farms have been disallowed because they threatened to intrude on beautiful landscapes. As a result of the nuclear accident at Fukushima, several countries, including Germany and Italy, have decided to wind up their

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<sup>3</sup> From a response to the ACIA *Arctic Climate Impact Assessment*, published at: <http://inuitcircumpolar.com>, under HOME > Activities & Initiatives > Climate Change—ARCHIVES > Responding to Global Climate Change.

\* Numerous gases contribute to the greenhouse effect, as chapter 2 explains. I use the term *greenhouse gas* to refer to them collectively.

nuclear power programs. The loss of nuclear energy— particularly in environmentally conscious Germany—is a serious setback to the project of slowing climate change.

The political processes that led to these decisions are not unbiased. The benefits of alternative energy are often less conspicuous than their costs. The harm done by climate change is insidious. Its progress till now has been so slow that we scarcely notice it, and its biggest harms will not emerge for many decades yet. Voters do not find the benefits of slowing climate change easy to discern, and vested interests, particularly the oil industry, work hard to conceal them. On the other hand, many of the costs are manifest: wind farms spoil the landscape as soon as they are built, and people are very frightened of nuclear leaks. So the costs and benefits are not equally visible in the political domain. ...

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Predicting the effects of greenhouse gas is extremely difficult because the causal system involved in climate change constitutes the entire surface layer of the Earth: the atmosphere, the oceans and continents, and the living things that populate them, all connected together through complex interactions. Predictions call for the combined efforts of physicists, chemists, ecologists, biologists, and social scientists. Because of the system's complexity, the conclusions they arrive at are inevitably uncertain.

Once the effects are predicted, setting a value on them is also very difficult, this time requiring the work of economists and moral philosophers. To give one example of the difficulty: among the problems is setting a value on human lives. Lives will be lost through climate change, in heat waves and famines, by disease and in other ways. Slowing climate change will have the effect of reducing this loss of life. The benefit of doing so needs to be taken into account along with other benefits. We have to consider how good it is to save lives. That is not an easy judgment to make.

All of that work is required to calculate the benefits of reducing emissions through alternative energy. Then we need to turn to the costs. The costs may be slightly more predictable, but valuing them is also very difficult. For instance, nuclear power carries the cost of disposing of its radioactive waste. No one has yet found a satisfactory way of doing this. Since nuclear waste will remain dangerous for hundreds of thousands of years, and it will kill people if it is not properly isolated from the human population, it potentially leads to costs far in the future that are large, hard to predict, and hard to set a value on.

So, decisions about alternative energy require extremely difficult comparisons of costs and benefits. To make these comparisons in practice requires data to be collected, methods of analysis to be developed, and complicated calculations to be done. Much of that work has to be delegated to economists. But the decisions cannot be left to them, because their work does not encompass all that is needed. Comparing costs and benefits means comparing values. It means weighing the good that can be achieved by some project—a nuclear power plant or a wind farm, say—against the badness of its costs and risks. Values underlie all the calculations of costs and benefits that economists engage in. But values do not lie within the scope of their particular expertise.

Values arise from moral principles, which need to be assessed by the rest of us. When you think about issues of climate change, you will have to rely on economists for their technical work, but you also need to bring your own judgment to bear in assessing the underlying values. Why should you do that? Because you are a citizen. Your government makes decisions about climate change and it negotiates with other governments about climate change, on your behalf. As a responsible citizen, you need to form a view about the moral principles it is working from.

This book aims to give you some guidance. By what right? I am a moral philosopher, and that means I have some experience in thinking through moral issues. Moral philosophers do not pretend to be any more moral than anyone else, but we are experts of a sort. We are practiced in accurate reasoning; we know the range of alternative moral ideas that are available; we know how to subject those ideas to rational testing; we can refute bad arguments; and we have a trained sensitivity to moral issues.

In this book, I do not claim to give you definitively correct views about the morality of climate change. Instead, I hope to give you materials for thinking through issues of climate change for yourself. I offer you ideas and ways of thinking about them. True, I shall tell you where I myself have got to in thinking about the questions. I shall sometimes express rather firmly the conclusions I have reached, and defend them energetically. But you must make your own judgments about my conclusions.

It turns out that the underlying moral principles make a great difference to the conclusions we should draw. They strongly influence the calculations of technical experts. Very different results emerge from applying different principles to technical calculations of costs and benefits. ...

This book takes up in some detail four specific issues about values. The first is how to take uncertainty into account. This is particularly an issue for climate change because its effects are so uncertain. ...

The second issue is how to compare harms and benefits that are widely separated in time. This too is particularly an issue for climate change, because the changed climate will persist for a very long time. Measures to control climate change will take decades to bear fruit. When a project is aimed at controlling climate change, its costs will generally be borne in the near future, whereas its benefits will not arrive for decades or centuries. How should we compare these costs and benefits? ...

I have already mentioned the third issue: how to set a value on human lives. Climate change will kill people in various ways. It will do so through climate disasters such as floods, storms, droughts, and heat waves. It will increase the range of diseases; it will make it harder to feed the world's population, and cause famines; it will drastically damage water supplies, and perhaps lead to wars. Many people are repelled at the idea of valuing human life as though it was a commodity. But since killing is one of the major harms that climate change will do, it does have to be taken into account somehow. ...

The fourth issue is population. To a large extent, climate change is caused by the growth of the world's population. In turn, climate change will affect the population. Most seriously, if the atmosphere warms more than we expect—as is very possible—its effect on human life may be catastrophic. There may be a major collapse of the world's population. How should we take account of that? Should we consider it a bad thing if the Earth loses some of its human population? Or would it perhaps be a good thing? Suppose in the extreme that humanity becomes extinct; how should we judge the badness of that event? ...

All these are questions of value or, to use a synonymous word, goodness. They are questions that arise when we try to assess the harm that climate change will do, and the merits of potential measures we might take to deal with it. "We" refers to our community—the people in our country or the world. The issues I have mentioned are issues for the community. In practice they are questions for governments, since governments make the large-scale decisions that are at issue. Just because they are questions for governments, we as individuals need to take a view about them in our role as citizens. That is why this book covers them.

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Climate change also raises questions about how we should act in our private lives. Many of us have already taken some steps to reduce our emissions of greenhouse gas. We have insulated our houses, bought hybrid cars, or put solar panels on our roofs. Some of us buy offsets when we travel and we turn off lights when we leave a room. Should we do more? Have we done too much? This book aims to help you answer this different range of questions about responding to climate change: questions not of large-scale government actions, but of the private actions of individuals. ...

#### WHAT WILL BE THE CONSEQUENCES OF CLIMATE CHANGE?

The effects of greenhouse gas emissions on living creatures including human beings are some further steps along the causal chain from their effects on the climate. They are therefore even harder to predict in detail.

It is also hard to identify what effects are already occurring. For example, species are becoming extinct at unprecedented rates, but ecologies are under such pressure from human exploitation of other sorts, such as overfishing and the felling of forests, that it is hard to know how much of this loss to attribute to climate change. Another example is the strong upward trend there has been in recent decades in the economic losses that have been caused by extreme weather. This is to be expected from climate change, since extreme weather is one of its predicted consequences, and indeed more extreme weather has been observed. However, at the same time the world's population has been growing in numbers and getting richer. This means that a storm or a flood is likely to do more harm just because there are more people and more property to be harmed. It is hard to tell how much of the increase in losses should be attributed to a worsening of the weather, and how much to the growth of population and wealth.

Still, the predictions in broad terms are clear. Warming of more than two or three degrees will badly impoverish nature. Many ecosystems will be damaged. About 20 to 30 percent of living species will be put at risk, and many more than that if temperatures rise as far as four degrees. Corals, which protect many coastlines, will be damaged by the warming and acidification of the oceans.

The damage to nature will directly harm human beings, since the quality of our surroundings is an important aspect of the goodness of our lives. But not all the predictions for human beings are bad. Some of the colder parts of the world will become more suitable for farming. In temperate areas such as northern Europe, a rise in temperature of a degree or two may increase crop yields. Also, since photosynthesis relies on carbon dioxide, increased concentrations of carbon dioxide act to a small degree as a sort of fertilizer.

However, the dominant effects on humans will be bad. Farming in the tropics will be damaged by any rise in temperature, and farming elsewhere by any rise of more than a degree or two. It will therefore become harder to feed the world's population. Dry areas will become drier and wet areas wetter, increasing the numbers of damaging droughts and floods.

Drought will be a particularly severe problem in Africa, where it is estimated that, even by 2020, between 75 and 250 million people will be suffering from increased water shortage caused by global warming. Drought will also particularly affect people who live in areas that derive their water from snowfall on mountain ranges, since the stocks of water held in snow and ice will diminish. This includes one-sixth of the world's population.

Coastal areas will be subject to flooding and erosion as the sea level rises. Some small island nations will have to be evacuated. River deltas are also especially vulnerable, since they are low-lying and often very populous. The combined delta of the Ganges and Brahmaputra rivers is home to 111 million people in India and Bangladesh. One study estimates that, by 2050, 3.43 million of them will be displaced by the rise in sea level and a further 4.7 million will be exposed to flooding during storm surges. In the past, storm surges in this delta have drowned hundreds of thousands of people. In the world as a whole by 2050, nine million people will be displaced from their homes in deltas.<sup>4</sup>

Global warming is expected to damage many people's health, and to kill many people. It will cause deaths through increasing malnutrition in impoverished areas of the world; the increasing number and severity of heat waves, floods, storms, fires, and droughts; increased diarrheal disease; increased respiratory diseases caused by poor air quality resulting from climate change; and the increased range of malaria, dengue, and other tropical diseases. ... One report predicts one million deaths a year caused by climate change from 2030 onward.<sup>5</sup> Warming of two degrees now seems almost inevitable, and we should certainly expect that degree of warming to kill hundreds of thousands of people

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<sup>4</sup> Jason P. Ericson et al., "Effective sea-level rise and deltas: cause of change and human dimension implications," *Global and Planetary Change* 50 (2006): 63–82.

<sup>5</sup> Climate Vulnerability Monitor 2010, published by DARA.

each year. Since the killing will continue for decades, tens of millions will be killed in total.  
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A significant feature of all these predictions is that climate change will harm the world's poor much more than it harms the rich. Its harms will fall particularly in the tropics and in Africa, where many poor people live. Moreover, the poor lack the means to adapt to climate change. Rich countries can afford to build sea walls, vaccinate their populations, plant drought-resistant crops, and install air conditioning; poor countries cannot.

#### HOW DOES THE AMOUNT OF HARM DEPEND ON THE AMOUNT OF EMISSIONS?

As human beings cause more and more greenhouse gas to be emitted, it does more and more harm. More than that: there is evidence that the increase in harm is more than proportional to the increase in the amount of gas. The more gas is emitted, the more harm is done by each extra tonne.

Emissions cause harm in two steps. First, emissions cause global warming. Second, global warming causes harm. There is evidence that each of these processes is more than proportional. ...

As global warming continues, various positive feedback processes kick in. There may also be "tipping points," where a slight rise in temperature sets in train a process that leads toward a new equilibrium for the climate.<sup>6</sup> For example, at some temperature it will become inevitable that Greenland will melt. Its melting will in turn warm the Earth, because at present the ice cover on Greenland reflects a lot of solar radiation back into space. Another example is that at some temperature it may become inevitable that the Amazon rain forest will die. That will release vast amounts of greenhouse gas, since the forest is a major carbon sink.

All this constitutes some evidence that global warming increases more than proportionately to emissions. Now I turn to the effect of the harm done by warming. There is evidence that this process too is more than proportional.<sup>7</sup> I shall mention just two examples. One is that a small amount of warming may make farming more productive in colder regions of the Earth, but this benefit will vanish once temperatures have risen by a degree or two. The other is that the damage done by storms increases as the cube of the maximum wind speed, and wind speeds themselves increase more than in proportion to the temperature of the sea.

In sum, we must expect that the harm done by emissions of greenhouse gas will increase more than in proportion to the emissions. This means, conversely, that if we reduce emissions, the first reductions will be the most beneficial, and each further reduction less so.

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<sup>6</sup> Timothy M. Lenton et al., "Tipping elements in the Earth's climate system," *Proceedings of the National Academy of Sciences of the United States of America* 105 (2008): 1786–93.

<sup>7</sup> The evidence is reviewed in chapter 3 of Nicholas Stern et. al., *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007), ch. 13.



I make this point as an antidote to the despair or apathy that descends on some people when they contemplate the horror of climate change. They think that nothing they can do as individuals is worth doing. It seems to them that even an individual country can do nothing worthwhile, unless it is a very big one. Only a global agreement can do any good, and a global agreement seems unattainable.

They are wrong. Every reduction in emissions is beneficial, and the first reductions are more beneficial than the rest. You do *more* good if you reduce your emissions while other people are not reducing theirs. Moreover, each reduction is well worthwhile. The beginning of chapter 5 gives some figures to indicate the amount of harm that is done by your individual emissions. The harm is significant, which means that you can bring significant benefits by reducing your emissions.

I do not mean to suggest that individual efforts can solve the problem of climate change. Most people will not voluntarily reduce their own emissions. Therefore the problem can only be solved by governments, which have means of ensuring that everyone's emissions are reduced. But although individuals' actions will not solve the problem, they can do a lot of good nonetheless.

Climate change differs from some other environmental problems in this respect. When a fishery is threatened, the catch must be reduced below some particular level to allow the population of fish to recover. It can be saved only if many fishermen reduce their catch together; an individual does no good by acting alone. Climate change is not like that. Each individual does good, and the first to act does more good than the rest. Nevertheless, the scale of the problem means we need everyone to act.