Climate Change: Overview of the Argument

This section of the book looks at many details of the argument over climate change. I begin with an overview from my perspective as an economist.

The Coordination Problem

We would like to have a society where things worth doing get done, things not worth doing don't get done. Translated into the language of economics, we would like people to take those actions, and only those, whose benefits are larger than their costs, where both benefit and cost include everything of value to people.[1] There are two approaches to doing that, one of which doesn't work.

The obvious approach is the centralized one: Have someone in charge of figuring out what everyone should do and making them do it. That might work for a very small group of people, a football team trying to win a game or a small firm. But as the size of the group expands it becomes harder and harder for the person at the top to know what everyone else is doing and should be doing and make them do it. On the scale of a country that approach works catastrophically badly, as demonstrated by, among other experiments, the Soviet Union. It would work still less well on the scale of a planet.

The alternative, the approach that scales, is the decentralized one. Set things up so that each person receives all the benefits of his acts and bears all the costs. If you can do that, then the act that is best for each is also best for all, so the information and the calculation get spread across the whole society, each individual knowing the parts relevant to him and acting on them.

It cannot be done perfectly but one can come closer than one might think. In a market economy, at least a simplified model of one, individuals buy their inputs at a price that fully compensates the seller for giving them up, sell their output at a price that fully reflects its value to the buyer, hence the difference between revenue and cost is both profit for the individual and net benefit for the society. Prices transmit both information and the incentive to act on it; the fact that steak is expensive both tells me that other people have to do a lot of work to produce it and makes it in my interest to only eat it if I really like it, if my benefit at least balances their cost. A full explanation of how this works requires at least a semester of price theory. One of my books, *Hidden Order: The Economics of Everyday Life*, was written to substitute for such a course.[2]

For the purposes of this chapter, what matters is not how it works but how it doesn't work, situations in which the decentralized approach of the market gives the wrong answer.[3]

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[1] This is a very short description of a very complicated issue. Longer explanations of the concept, economic efficiency, can be found several of my books, including *Price Theory*, *Hidden Order*, *The Machinery of Freedom* and *Law's Order*.

[2] *Hidden Order* is available from Amazon.com as an inexpensive kindle or a not very expensive paperback. It was written by taking an earlier book of mine, *Price Theory: An Intermediate Text*, and rewriting it to be read by an interested layman rather than a student in a course. Price Theory can be read for free online,

[3] The general term is market failure. Externalities are the form of market failure most relevant to climate change and similar issues.

Externalities

You are running a steel mill. To get iron ore, you have to pay someone enough to cover the cost of mining it. To turn it into steel, you have to pay workers enough so they are willing to work for you. Unfortunately, your mill also produces air pollution, making people who live downwind of you cough. That is a cost you do not have to pay for so gets left out of your calculation of how much steel to produce, how to produce it, and what price to sell it for. You might find making steel profitable even if the total cost, including the cost born by downwind neighbors, was greater than the value of the steel to your customers, measured by what they are willing to pay you for it.

For other examples, consider a college student playing loud music when other students in the dorm want to sleep, an airplane rattling the windows of houses below the flight path as it comes in to land, someone with a cold — or Covid — going to a party. A sufficiently wise government might be able to fix the problem, get us back to a system where things are done if and only if they are worth doing, by appropriate regulations. Doing that is hard because it replaces the decentralized market system that scales with a centralized command system that doesn't. Most of the time, for the sort of minor externalities that are associated with many ordinary activities, it is not worth doing. For larger externalities it might be. Two issues where doing so encounters problems are population and climate.

Population

I first encountered the issue almost sixty years ago, at a time when population growth played the same role in popular discourse that climate change does now, the impending catastrophe that, in the view of everyone who mattered, required drastic action to prevent. I got involved when I was asked to write for the population council a piece on population growth looking at the issue from the standpoint of someone generally in favor of the market system.

The question was what externalities were associated with the decision to have a child, so I tried to estimate them. The externalities I have discussed so far are all negative, costs produced by one person's actions that someone else has to bear. But there are also positive externalities, benefits instead of costs. If a student in the dorm room next to mine plays music I like when I am trying to fall asleep that is a positive externality — I like to fall asleep to music. Basic research in medicine produces a positive externality in the form of knowledge of how to cure diseases. When I repaint my house I produce a positive externality for my neighbors, who get a prettier view out of their windows. If my action produces a negative externality I may do it even when, considering all costs and benefits, it is not worth doing. If it produces a positive externality I may fail to do it even when it is.

What if the same action produces both positive and negative externalities? That is the case for population growth. Your child may become a criminal and impose costs on my children. He may become a novelist or musician and produce works that my children enjoy. He will probably go to a public school, imposing costs on the taxpayers who pay for it, but after he graduates he will pay taxes for the school he is no longer going to, reducing the cost to other taxpayers. He will produce a wide variety of costs and benefits for other people.

The conventional wisdom of the time looked only at the costs and concluded that we would be better off if everyone had fewer children. I tried to look at both costs and benefits, negative and positive externalities, and add them up. If costs were much larger than benefits, as most at the time believed, we would be better off with less population growth than would result from individuals

freely choosing how many children to have, if benefits were larger than costs, with more. One case implies that governments should try to hold population growth down, perhaps by subsidizing birth control or giving tax benefits to childless couples or, for a more extreme but unfortunately real case, making it illegal for any couple to have more than one child. The other implies the opposite. And if costs and benefits were roughly equal, making the net externality zero or close, there would be no reason for governments to interfere in either direction.

I tried to list all of the externalities I could think of and try to make rough estimates of their size. My conclusion was that I could not sign the sum, that the estimates were too uncertain to know whether additional population was, on net, a good or bad thing.

I published my paper in 1972 and I still don't know. What I do know is that the conventional wisdom of the time was wrong, because it claimed not only that the net externality was negative but that it was large. The book *The Population Bomb*, published by Paul Ehrlich in 1968, confidently predicted unstoppable mass famine in the 1970's, hundreds of millions of people starving to death due to overpopulation. It sold millions of copies. Not everyone agreed that things were that bad but everyone, at least as perceived by educated opinion at the time,[4] agreed that population growth was going to be a major problem making poor countries poorer.

The famine did not happen. Calories per capita in poor countries went up, not down. Extreme poverty fell sharply. That does not prove the net externality was positive — perhaps population growth made us a little worse off but the effect was outweighed other factors such as technological progress. But it was not as negative as the expert opinion of the sixties and seventies claimed, since what happened was the opposite of their predictions.

And Climate

Climate change raises the same question. It will have both positive and negative externalities. The question is whether the net effects will be positive or negative and how large.

There are two approaches to answering that question. The first is to ask whether there are general reasons to expect climate change along the predicted lines, a gradual increase in average temperatures due mainly to increased CO2 in the atmosphere, to have net negative effects. The second is to look at specific externalities, make some rough estimate of their size, and add them up.

There is only one reason I can see to expect net negative effects *a priori* from change — that change in either direction is presumptively bad because current human activity is optimized against current conditions. Farmers grow crops suited to the climate where they are growing them; a change in climate will require a costly change in what they grow and how they grow it. Houses are designed for the climate they are built in and located in places not expected, under current circumstances, to flood. Putting it in economic terms, we have born sunk costs based on the current environment and a change in that environment will eliminate some of the quasi-rents that we expected as the return from those costs.

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[4] The major exception at the time was Julian Simon, whose book *The Ultimate Resource* argued that people, not farmland or natural resources, were the key resource, that additional population brought additional output. Mouths come with hands attached.

This is a real argument against rapid change. But global warming so far has been about a degree C a century. If the IPCC projections are correct it is getting more rapid, perhaps several degrees over the next century. That is about enough to raise Minnesota to the current temperature of Iowa. Over a century most farmers will change the crop they find it most profitable to grow multiple times for other reasons. If average temperatures are trending up, those changes will include a shift towards crops better suited to slightly warmer weather. Over a century, many houses will be torn down and replaced; if sea level is rising, houses currently built on low lying coastal ground will be rebuilt a little farther inland — not much farther if we are talking, as the IPCC estimates suggest we should be, about a rise of only two or three feet. The presumption that change is bad is a very weak one for changes as slow as those we have good reason to expect from global warming.

At least for humans. Humans can adapt to change by growing different crops, adding air conditioning to their houses. Other species do it by evolution or by changing their range. That could be a problem for species such as trees that have long generations, hence slow evolution, and cannot easily shift their range. It could be a problem for aquatic species currently adapted to the current pH of the ocean, since increased CO2 absorbed by the ocean will lower its pH.[5]

That problem aside, it is hard to see any reason *a priori* to expect climate change to make us worse off. The earth and its climate were not designed for our convenience, so there is no good reason to believe that their current state is optimal for us. We are not designed for the current climate — over our species history, climate has varied by considerably more than the changes being predicted for global warming. Currently, humans live and prosper over a range of climates much larger than the range that we expect the climate at any particular location to change by.

That brings us to the other approach to answering the question, trying to identify the externalities from climate change. The question for population was in what ways does my decision to have another child make other people better or worse off. The question for climate change is in what ways does my decision to do something that effects climate, such as burning fossil fuels, make other people better or worse off.

The popular discussion of this issue mostly takes it for granted that all the important effects are negative and their net effect very negative. To see how plausible that is, it is worth sorting effects — negative, positive, ambiguous — and trying to get some idea of their size.

Effects

There are at least four predictable effects of climate change that are unambiguously negative: sea level rise, more frequent extreme heat, stronger cyclones, and reduction in ocean pH. There are at least four effects that are unambiguously positive: expansion of habitable areas towards the poles, less frequent extreme cold, fewer cyclones, CO_2 fertilization. There are at least two effects that are ambiguous, might make us better off, might make us worse off: longer growing seasons and increased rainfall. We do not know enough to put all of these on a single scale, in part because they have different sorts of costs, but we can try to compare positive and negative effects that produce costs or benefits of similar sorts.

The first step is to specify the amount of climate change being considered — pretty obviously, raising Earth's temperature by 100°C would have dire effects. My estimates are for effects by the

[5] The process is usually described as acidification. That is technically correct but misleading since the ocean is currently basic. Lowering its pH makes it less basic, more nearly neutral.

end of the century, and are based on IPCC projections, about 3°C increase in average global temperature and one to three feet of sea level rise, both relative to current values.

Start with sea level rise. That it will happen is a pretty safe assumption and has already been observed. How big is the effect?

On average, the U.S. Atlantic coast shifts in by about a hundred feet for every foot of sea level rise. So a meter of sea level rise, towards the high end of the IPCC estimate for the end of the century, shifts the coastline in by about a hundred meters, inconvenient if your house is located ten meters from the high tide mark but invisibly small on any save a very large scale map. The effect will be larger in some places, smaller in others, depending on the slope of the coastal land. For a more detailed answer, take a look at the Flood Maps website. It lets you set the amount of sea level rise then see the effect on the map. It isn't perfect, for reasons some of which are discussed on the site, but it does let you zoom in on the coastline and see how large the effect of any level of sea level rise. Compare the map at 0 meters to the map at 1 meter. Even in Bangladesh, usually offered as a country where sea level rise will be catastrophic, the effect is almost invisibly small. The same is true for Miami. I have not looked over the entire world, but the only place I could find where a meter of sea level rise had a large effect was the Nile delta. Another way of looking at the question is to ask how much land is lost due to coastlines shifting in. In Chapter XXX I calculate an estimate of a little more than twenty thousand square kilometers.

Compare that to the direct effect of warming on usable land area. Human land use at present is limited by cold not, with rare exceptions, by heat — the equator is populated, the poles are not. As global temperatures increase, temperature contours in the north shift towards the pole. In Chapter XXX I calculate that the increase in land warm enough for human habitation is a littler more than ten million square kilometers. That is more than twice the area of the U.S. — and about five hundred times my estimate of the loss due to sea level rise. The calculations on which both figures are based are given in the chapter and are simple enough that you can check them for yourselves to see if you find my conclusions plausible.

Decreases in extreme cold and increases in extreme heat can be compared in terms of their effect on temperature-related mortality. There are two reasons to believe that the net effect is a reduction, not an increase. The first is that, at present, cold-related mortality is much larger than heat-related — about fifteen times as large globally according to a study published in *Lancet*[6] in 2015. The second is that climate change is projected to increase minimal temperatures in cold regions by much more than maximal temperatures in hot regions.

CO2 is an input to photosynthesis. Increasing its concentration substantially increases the yield of many, but not all, crops — the major exception is maize. On the other hand, it reduces the concentration of some nutrients. Both effects are discussed in more detail in Chapter XXX.

That leaves one definitely negative effect and two potentially negative for which I have so far been unable to come up with estimates. Decreasing ocean pH is a predictable result of more CO2 in the atmosphere that can be expected to have negative effects on some aquatic life, but I have not seen any plausible estimates of the size of the effect. Making cyclones a little stronger and a little less

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[6] Mortality risk attributable to high and low ambient temperature: a multicountry observational study, *Lancet*, Volume 386, ISSUE 9991, P369-375, July 25, 2015.

common will have both positive and negative effects. So will changes in weather patterns, probably an increase in both total rainfall and the frequency of very heavy rainfall. More rainfall means more water to fill reservoirs and feed crops, more heavy rainfall may lead to more frequent floods. In addition to these predictable effects, there are a variety of others, both positive and negative, that might happen but cannot be predicted to happen.

My conclusion, as in the case of population, is that the size of the externalities is too uncertain to sign the sum, to tell whether the net effect of climate change is to make us better or worse off. That is not the current orthodoxy. You will have to decide for yourself, when you finish this section of the book, whether you agree.

Matt Ridley

The decreasing temperature differential between the tropics and the Arctic may actually diminish the volatility of weather a little.