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Technology was the key factor in saving the ozone layer

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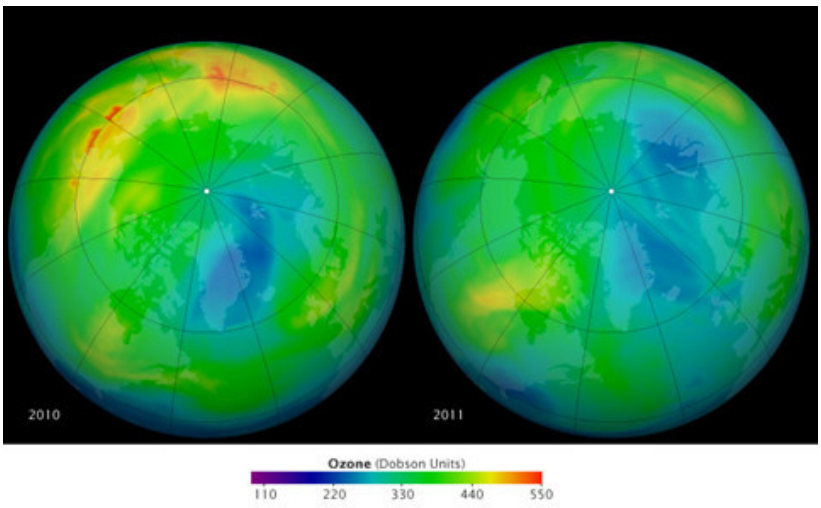
中文版本

Technological advances on CFC alternatives helped to "grease the skids" for policy action, creating a virtuous circle that started long before the Montreal Protocol was signed.



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Twenty five years ago, the Montreal Protocol on Substances that Deplete the Ozone Layer was introduced for signature by nations around the

world. Since that time, the treaty has become arguably the most successful international environmental success story in history. It may also be the one which historians and policy analysts have argued about the most in an effort to draw lessons relevant to the climate debate.

Conventional wisdom holds that action on ozone depletion followed the following sequence: science was made certain, then the public expressed a desire for action, an international protocol was negotiated and this political action led to the invention of technological substitutes for chlorofluorocarbons.

Actually, each chain in this sequence is not well supported by the historical record.

Public opinion not an important factor driving action

In a poll taken in the United States in December 1987 and January 1988, the time frame when the US government was considering the treaty, the issue of ozone depletion ranked fourteenth on a list of 28 environmental problems. At the time, fewer than 50% of Americans expressed "serious concern" about the issue, falling behind concerns about issues such as farm runoff and contaminated tap water.

Even so, the United States had signed on to the Montreal Protocol several months before this and ratified the treaty a few months later. The fact that public opinion on ozone depletion was not particularly intense compared to other environmental issues provides compelling evidence that an issue does not have to be a top public priority for significant action to occur. Although the data on public opinion of the ozone issue are not comprehensive, they are strongly suggestive that policy action occurred in the context of a public that was no more concerned about ozone depletion in the late 1980s than has expressed concern about climate change for at least the past decade.

This conclusion is backed up more generally through systematic analyses of public opinion and policy action. For instance, a recent study by Paul Burstein of the University of Washington looked at 36 policies for which opinion data were available and found that Congress acted in the direction of public support only in 50% of the cases, with public opinion having a much stronger influence on Congress in the direction of that opinion when it opposed an action rather than when it supported an action.

More broadly, according to the official UN history of the ozone issue, there were exceedingly few news stories on ozone depletion in the United States, China, the United Kingdom and Soviet Union from 1977 to 1985, when much of the policy framework for the issue was developed. The *New York Times* had about 20 stories in 1982, and in no other year were there that many stories (cumulatively) in 10 different leading newspapers during that period.

In short, action on ozone depletion occurred despite the lack of public pressure or even much awareness of the issue.

Scientific uncertainty not an obstacle to action

In 1974, Mario Molina and Sherwood Rowland published a seminal paper in *Nature* in which they argued that chlorofluorocarbons posed a threat to Earth's ozone layer. Ironically, CFCs were long considered to be a useful industrial chemical for a wide range of applications, including refrigeration, because of their inert properties. Molina and Rowland's work suggested that these chemicals were not as inert as previously thought and could pose risks.

Following the publication of their paper, the US Congress went to work almost immediately, initiating hearings before the end of the year. The White House, under President Gerald Ford, set up the Inadvertent Modification of the Stratosphere (IMOS) Task Force, which concluded that "fluorocarbon releases to the atmosphere are a legitimate cause for concern" and recommended that "the federal regulatory agencies initiate rulemaking procedures for implementing regulations to restrict fluorocarbon use."

Congress proceeded incrementally, first dealing with nonessential uses for CFCs, that is, those for which there were readily available technological substitutes, and putting off until later the more difficult issue of essential uses, those for which no substitutes were available. Policymakers had decided that action on the problem of ozone depletion could not wait until scientists reached consensus about the nature of the problem, its causes, and its future impacts. Decisions would have to be made in the face of uncertainties and ignorance – where even uncertainties were unknown.

As Congress made decisions about the chemicals implicated in ozone

depletion in the late 1970s and early 1980s, the science of ozone depletion actually became more uncertain, as scientists began to understand the many complexities of the issue. In 1982, the National Academy of Sciences released a report suggesting that the threat of ozone depletion was perhaps less than previously thought, which was seized upon by some in Congress to argue against regulation of CFCs.

There were plenty of people who were sceptical about the magnitude of the ozone problem who were buoyed by fundamental uncertainties in the science. But the focus on implementing "no-regrets" policies – those that made sense anyway, regardless of how scientific uncertainties broke in the future kept the attention away from science and on policy options. Such an approach contributed to the invention of substitutes for CFCs, making political action all the more easier, as the justifications for action hinged less and less on scientific certainties and more on economic benefits.

Scientific uncertainty is often raised as a reason for inaction or as an obstacle to overcome in the political process. The history of ozone depletion tells that uncertainty need not be an obstacle to effective action

Technology enabled political action

In the late 1970s, DuPont was the world's major producer of CFCs, which it calls Freon, with 25% market share. In 1980, the company patented a process for manufacturing HFC-134a, the leading CFC alternative, after identifying it as a replacement to Freon in 1976. Immediately before and after the signing of the Montreal Protocol, DuPont had applied for more than 20 patents for CFC alternatives. Du Pont saw alternatives as a business opportunity. "There is an opportunity for a billion-pound market out there," its Freon division head explained in 1988. Du Pont's decision to back regulation was facilitated by economic opportunity – an opportunity that existed solely because of technological substitutes for CFCs.

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Technological advances on CFC alternatives, really starting in the 1970s, helped to grease the skids for incremental policy action creating a virtuous circle that began long before Montreal and continued long after. Of course, the looming threat of regulation certainly helped motivate the search for alternatives. In her excellent book on ozone depletion policy, *Ozone Discourses*, Karen Litfin explains: "The issue resembles a chicken-and-egg

situation: without regulation there could be no substitutes but, at least in the minds of many, without the promise of substitutes there could be no regulation."

Viable "technological fixes" can help make it easier for regulations to be put into place, and the history of ozone regulations bears this out.

The three lessons offered here provide a starkly different reading of the ozone experience from the one which has been adopted by many advocating for action on climate change. Imagine what the climate issue would look like if it were not focused on messy public debates over science in an effort to force political regulations to stimulate new technologies. What if, instead, the focus was on technology first? It worked in the case of ozone, so why not climate?