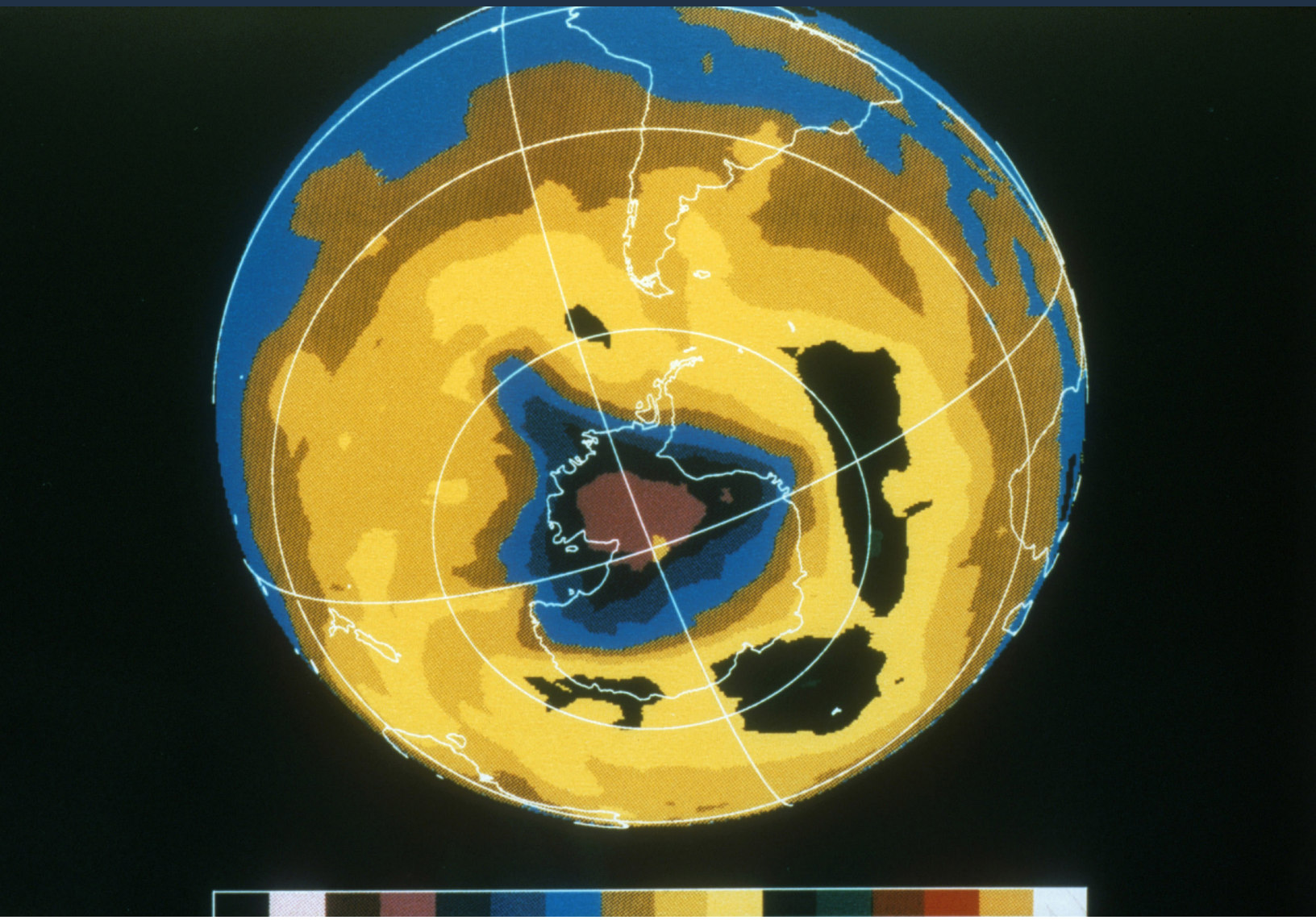


International Environmental Treaties Data Introduction

Hannah Ritchie and Max Roser, adapted by Bennett Sherry

Taking action to prevent climate change can seem daunting. But we do have examples of actions that have worked to identify and address environmental problems in the past.

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Climate change can feel overwhelming. However, we *can* address climate change. Humans can cooperate on a grand scale, working together across national borders to combat threats to our planet.

How do we know?

Well, we've done it before.[1]

In the 1980s, scientists noted that one of our planet's most vital systems was collapsing—the Ozone Layer. Since the late 1980s, the world has rapidly progressed. The Ozone Layer is recovering.

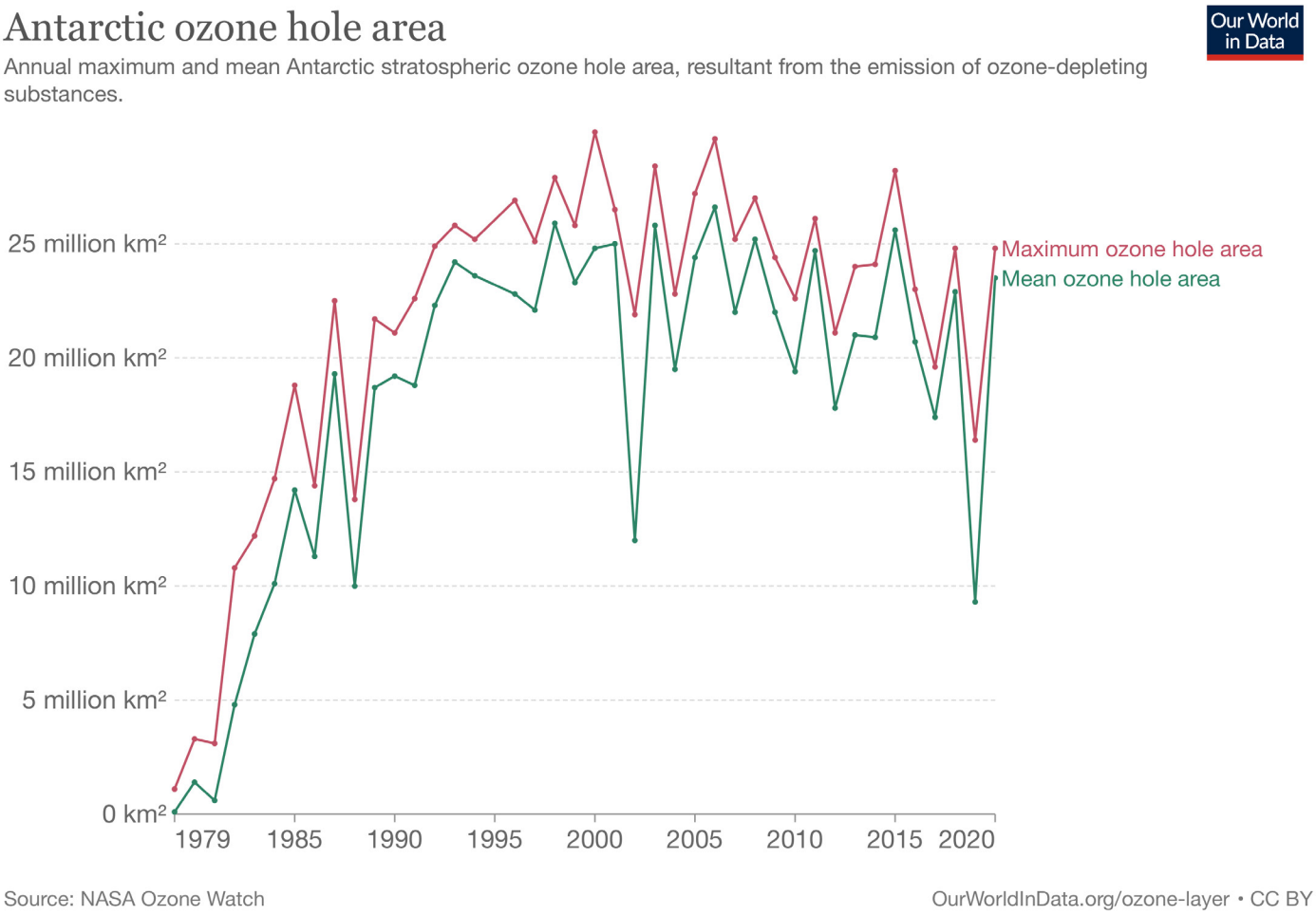
The Oh-No! Zone

The Ozone Layer is a layer of the Earth's atmosphere. It contains a high concentration of a gas called ozone (O_3). The Ozone Layer absorbs potentially dangerous ultraviolet (UV-B) radiation from the sun. Higher concentrations of ozone in the atmosphere are crucial. It ensures life on Earth's surface is not exposed to harmful concentrations of UV-B radiation. During the late 1900s, humans were increasing emissions of ozone-depleting gases. This posed dangers.

Chart 1 shows one of the effects of this trend: the growth of a hole in the Ozone Layer in the Southern Hemisphere. After 1979, there was a rapid increase in the Antarctic ozone hole area. Since the late 1990s, the ozone hole area began to stabilize. In 2018, NASA published its first results showing signs of ozone hole recovery. NASA is the U.S. space agency. That recovery was thanks to a decrease in ozone-depleting gases.

[1] If you'd like to dive deeper into this success story, checkout this article by Hannah Ritchie: https://www.worksinprogress.co/issue/how-we-fixed-the-ozone-layer/

Chart 1



Explore at: https://ourworldindata.org/grapher/antarctic-ozone-hole-area?country=~OWID_WRL By Our World in Data, CC BY 4.0.

What are ozone-depleting substances?

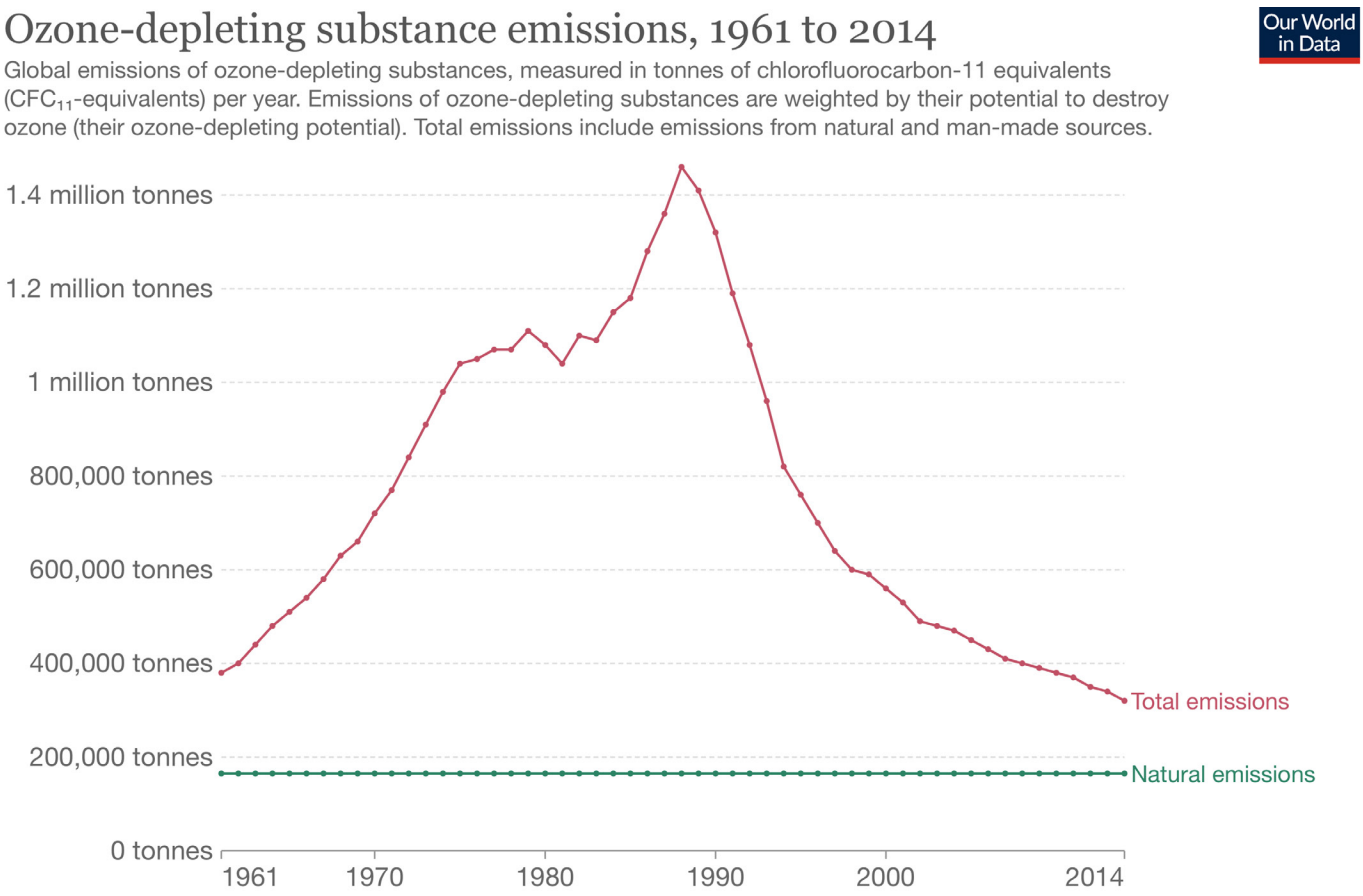
Let's start at the beginning.

Ozone occurs when three oxygen atoms bond together (O3). This creates a denser gas than normal oxygen (02). It can reflect radiation from the sun. However, it is much less stable than oxygen. The Ozone Layer can be broken down by man-made compounds that enter the upper atmosphere. Ozone-depleting substances (ODS) are halogen gases containing chlorine and/or bromine—which can break down ozone. There are many ODS.

These gases are emitted at the earth's surface. They are distributed by winds across the lower atmosphere. Then, they can be transported into the upper atmosphere (stratosphere). They can form highly reactive gases when exposed to sunlight. Then, they may destroy ozone.

ODS can be emitted from natural and human-made sources. They have occurred naturally throughout history. In Chart 2, we can see emissions of ozone-depleting substances from 1960 onwards. Natural emissions remained almost the same over this period, but total emissions rose dramatically between 1960 through to the late 1980s. Then they fell rapidly. By 2010, emissions had returned to 1960 levels. What explains these changes?

Chart 2



Explore at: https://ourworldindata.org/ozone-layer#total-emissions-of-ozone-depleting-substances By Our World in Data, CC BY 4.0.

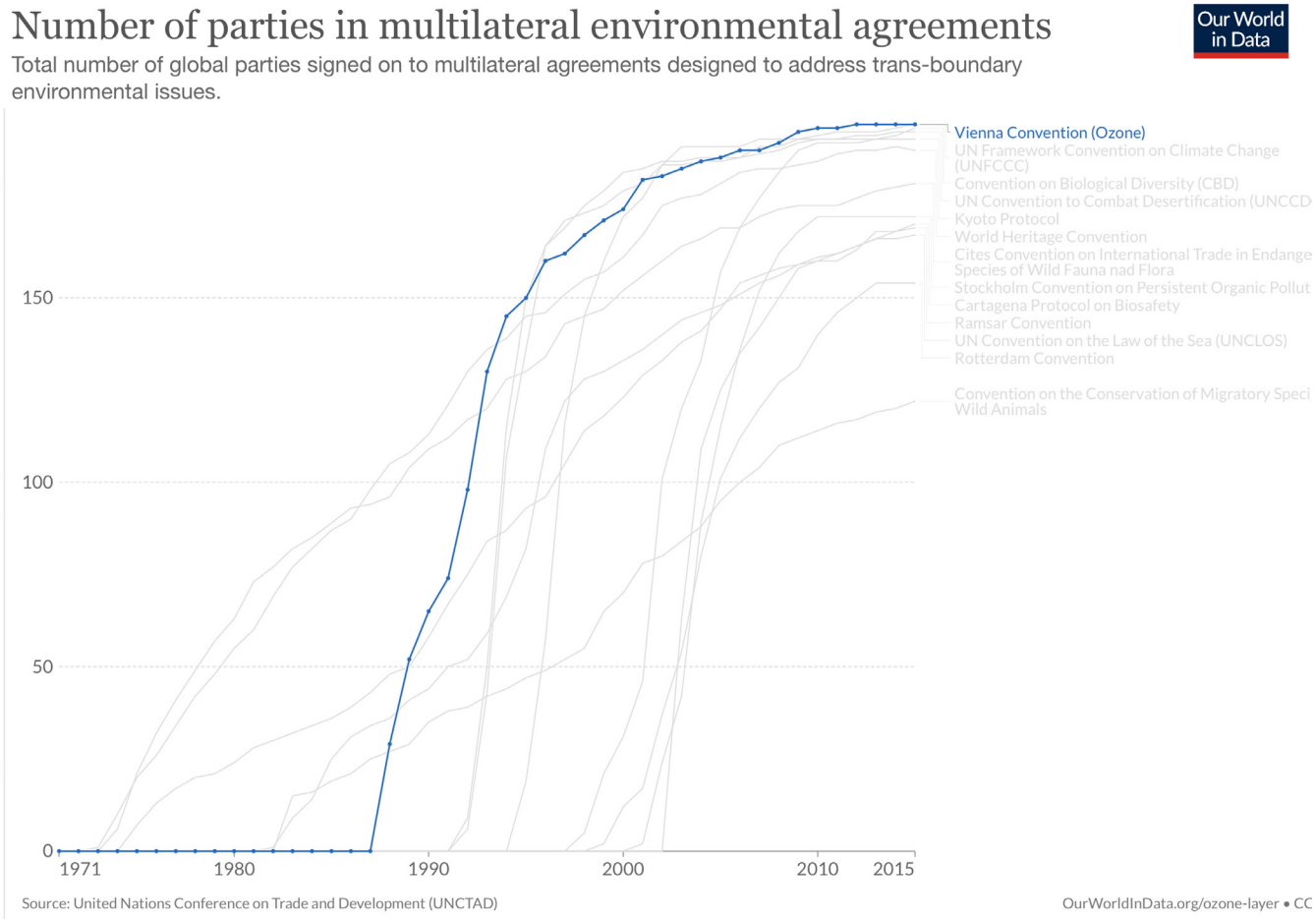
International Agreements

The rapid decline in emissions of ODS was driven by international agreements. People around the world recognized the danger of ozone depletion to human life. They made international agreements to eliminate the gasses that caused it. In 1985, several nations signed the Vienna Convention for the Protection of the Ozone Layer. Countries that signed it agreed to decrease ODS production.

In Chart 3, we can see the increase of countries signing on to the Vienna Convention. In 1988, there were only 29 nations that had signed the agreement. This reached 174 by 2000. In 2009, the Vienna Convention became the first of any Convention to achieve universal ratification. *Every nation on the planet* approved it.

The Vienna Convention did not require countries to take concrete actions on ozone protection. However, it laid the foundations for the adoption of another international agreement: The Montreal Protocol.

Chart 3

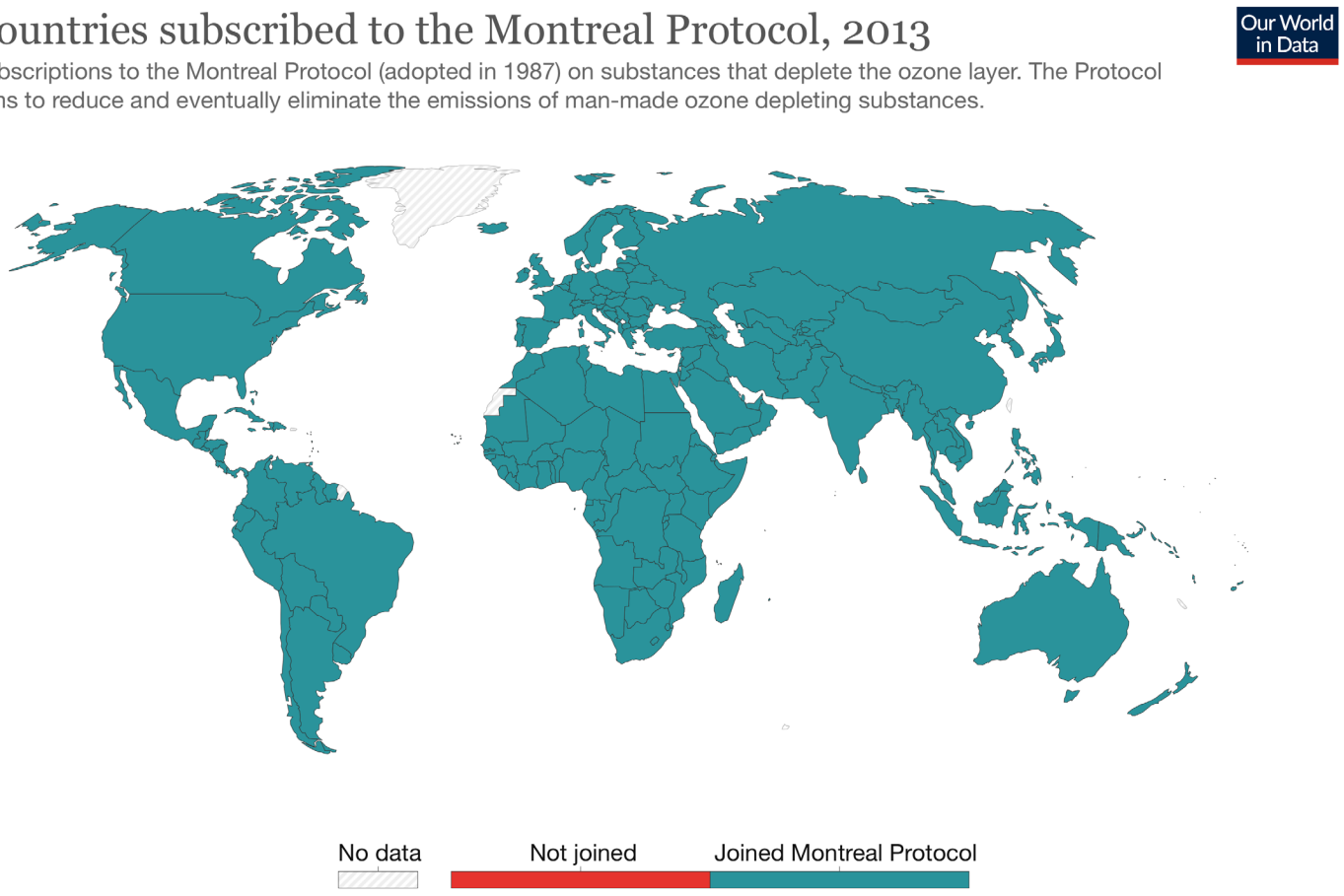


Explore at: https://ourworldindata.org/ozone-layer#vienna-convention-for-the-protection-of-the-ozone-layer By Our World in Data, CC BY 4.0.

The Montreal Protocol on Substances that Deplete the Ozone Layer is arguably the most successful international treaty in history. It was first agreed upon in 1987. The treaty entered into force in 1989.

Chart 4 shows how the Montreal Protocol was adopted across the world since 1987. The Protocol has also reached universal ratification. The Montreal Protocol has changed since 1987.

Chart 4

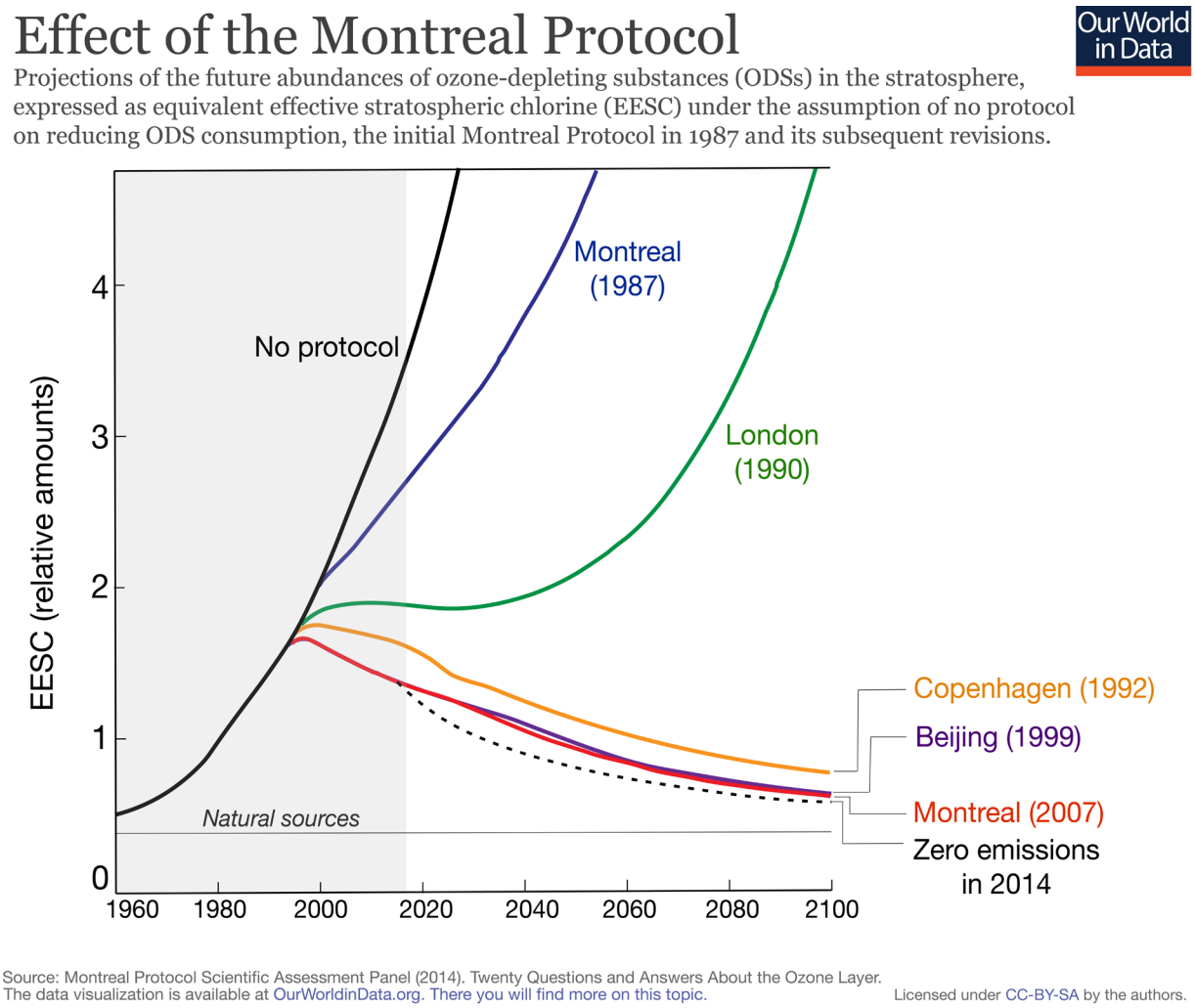


Explore at: https://ourworldindata.org/ozone-layer#montreal-protocol By Our World in Data, CC BY 4.0.

Impact of the Montreal Protocol

How important was the Montreal Protocol? Chart 5 shows what might have happened with ODS emissions without the protocol.

Chart 5



Explore at: https://ourworldindata.org/ozone-layer#impact-of-the-montreal-protocol By Our World in Data, CC BY 4.0.

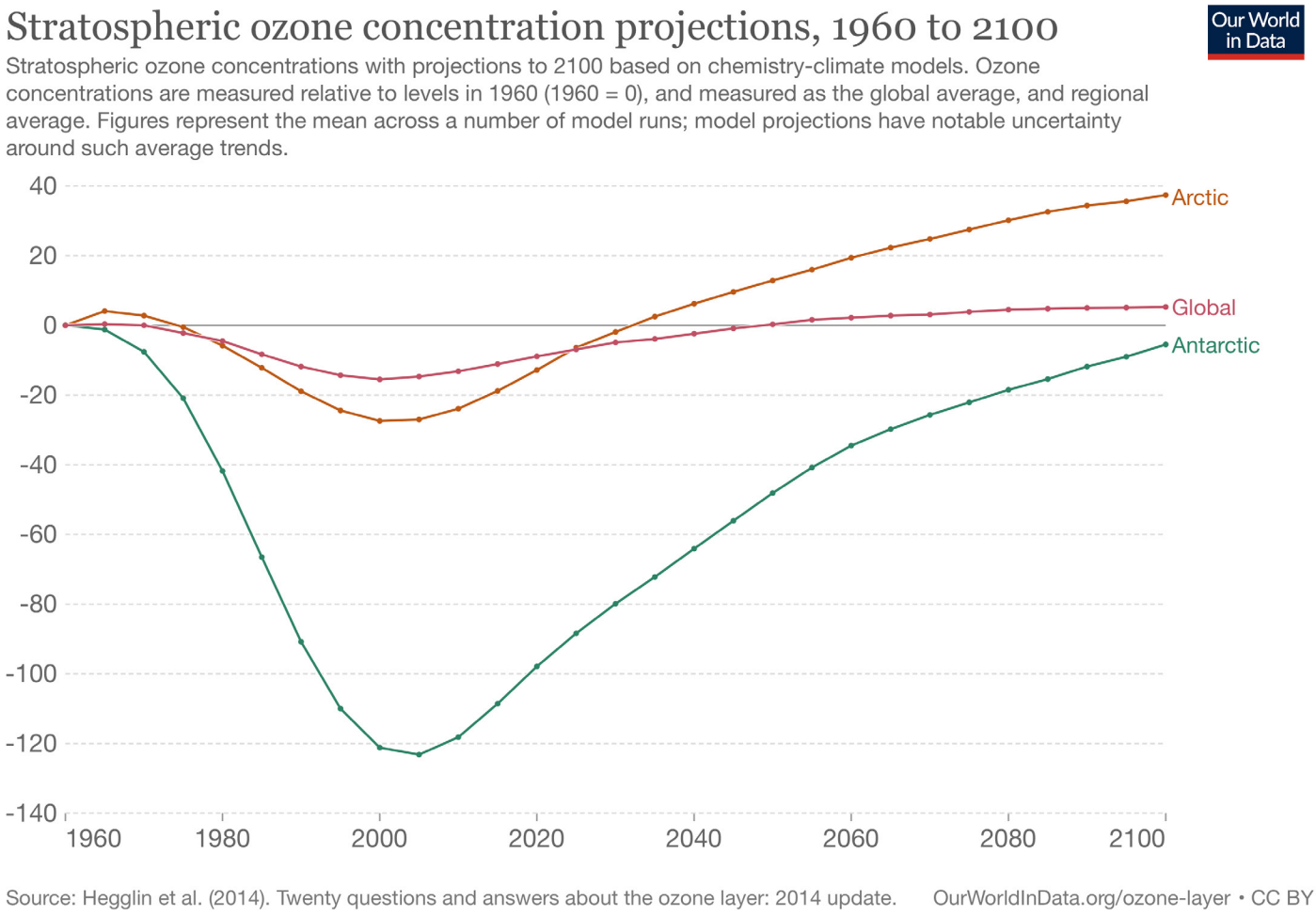
What if there were no protocols? It's likely that global ODS emissions would have continued to increase. Even under the initial Montreal Protocol, the restrictions would not have sufficiently reduced ODS emissions. Fortunately, changes were made.

The long road ahead

The Montreal Protocol and its updates have been a success in reducing ODS emissions. Emissions are decreasing. The Ozone Layer is showing signs of recovery. Yet, full recovery of the Ozone Layer will take decades. ODS can stay in the atmosphere for between 50 and 100 years.

Chart 6 shows historic levels and future predictions of recovery. Global ozone levels will return to 1960 levels around mid-century. Antarctica will probably recover much more slowly.

Chart 6



Explore at: https://ourworldindata.org/grapher/stratospheric-ozone-concentration-projections. By Our World in Data, CC BY 4.0.

The story of the Ozone Layer provides us with important lessons. International cooperation can successfully address the big problems posed by climate change.

Indeed, many nations have signed several such agreements. This includes the Kyoto Protocol and the Paris Climate Agreements. The Kyoto Protocol of 1992 committed countries to reducing their greenhouse gas emissions. The Paris Climate Agreements of 2015 aimed to keep global temperatures from rising significantly above pre-industrial levels.

However, few agreements have been so impactful as the Montreal Protocol. Swift action and universal adoption were important to success. Even with this cooperation, it will still take over a century to repair the damage. This highlights the urgency of tackling climate change. The longer we wait, the more severe and long-lasting the consequences.

Hannah Ritchie

Hannah is Senior Researcher and Head of Research at Our World In Data. She focuses on the long-term development of food supply, agriculture, energy, and environment, and their compatibility with global development. Hannah completed her PhD in GeoSciences at the University of Edinburgh.

Max Roser

Max is the founder and director of Our World in Data. He began the project in 2011 and for several years was the sole author, until receiving funding for the formation of a team. Max's research focuses on poverty, global health, and the distribution of incomes. He is also Programme Director of the Oxford Martin Programme on Global Development at the University of Oxford, and Co-executive Director of Global Change Data Lab, the non-profit organization that publishes and maintains the website and the data tools that make OWID's work possible.

Image credits

Cover image: False colour image of Antarctic ozone hole, 30 November 1992. NASA photograph. © Universal History Archive / Getty Images.

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