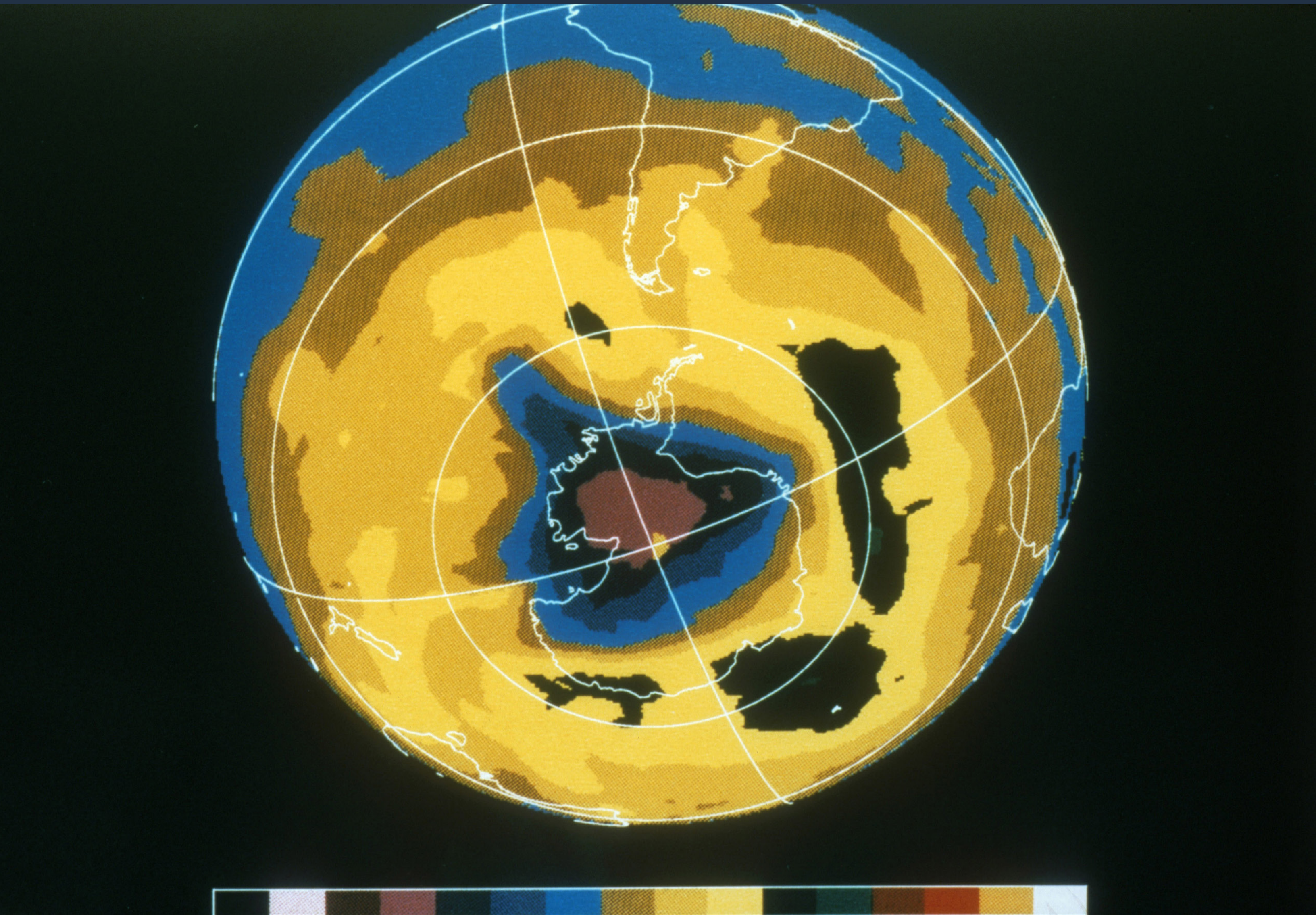


International Environmental Treaties Data Introduction

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.

1060L

Climate change can feel overwhelming. It's such a huge problem, and the solutions require so much hard work that it can make people try to ignore the problem. So, many people prefer to pretend the problem doesn't exist. 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 trend towards recovery of the ozone layer is among the most successful international collaborations in history.

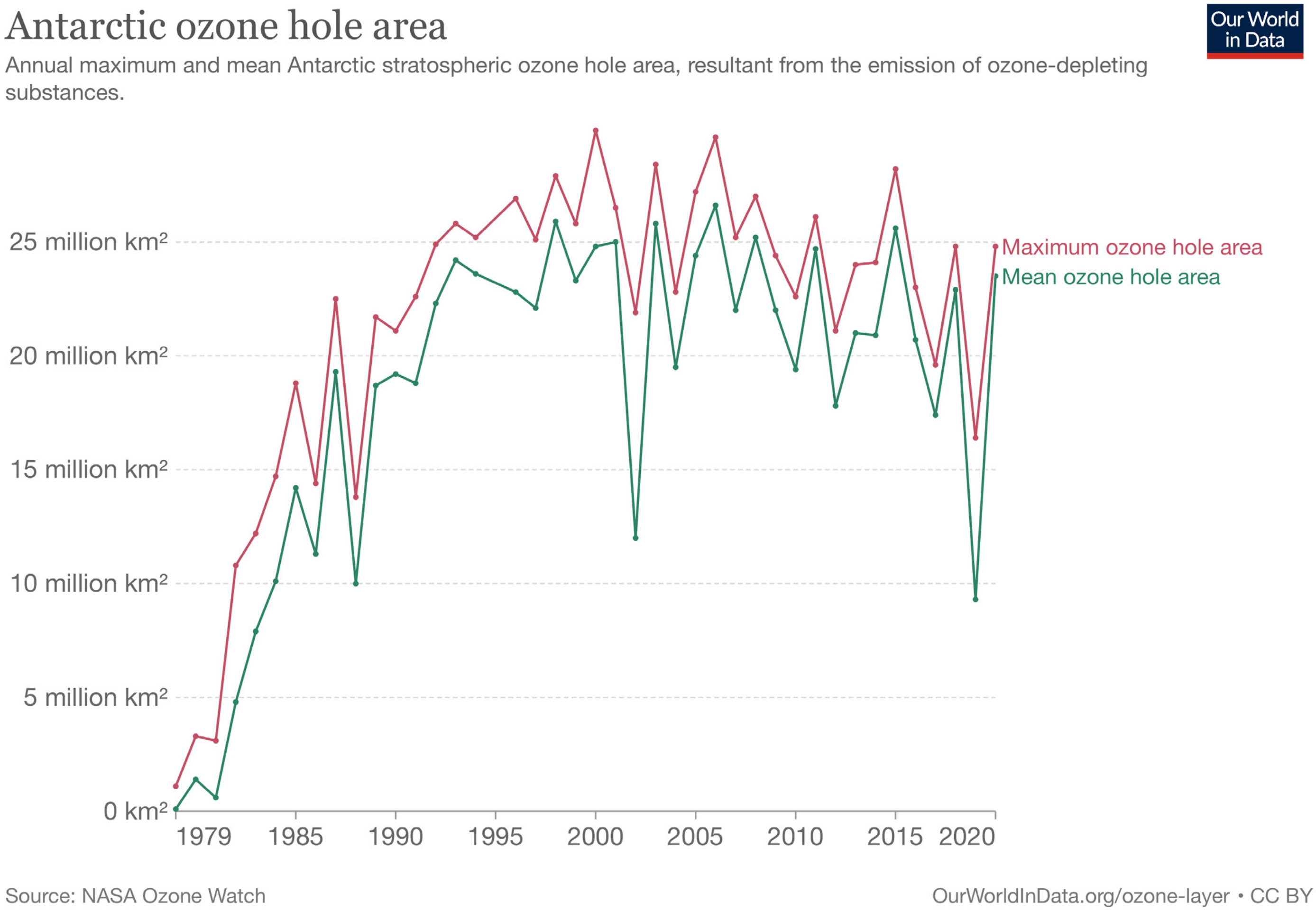
The Oh-No! Zone

The Ozone Layer is a layer of Earth's atmosphere containing 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 is crucial to ensure 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, reaching a maximum width of 30 million km2 in the early 2000s. Since the late 1990s, the ozone hole area began to stabilize between approximately 20 and 25 million km2. In 2018, NASA published its first results showing clear signs of ozone hole recovery. That recovery was largely 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?

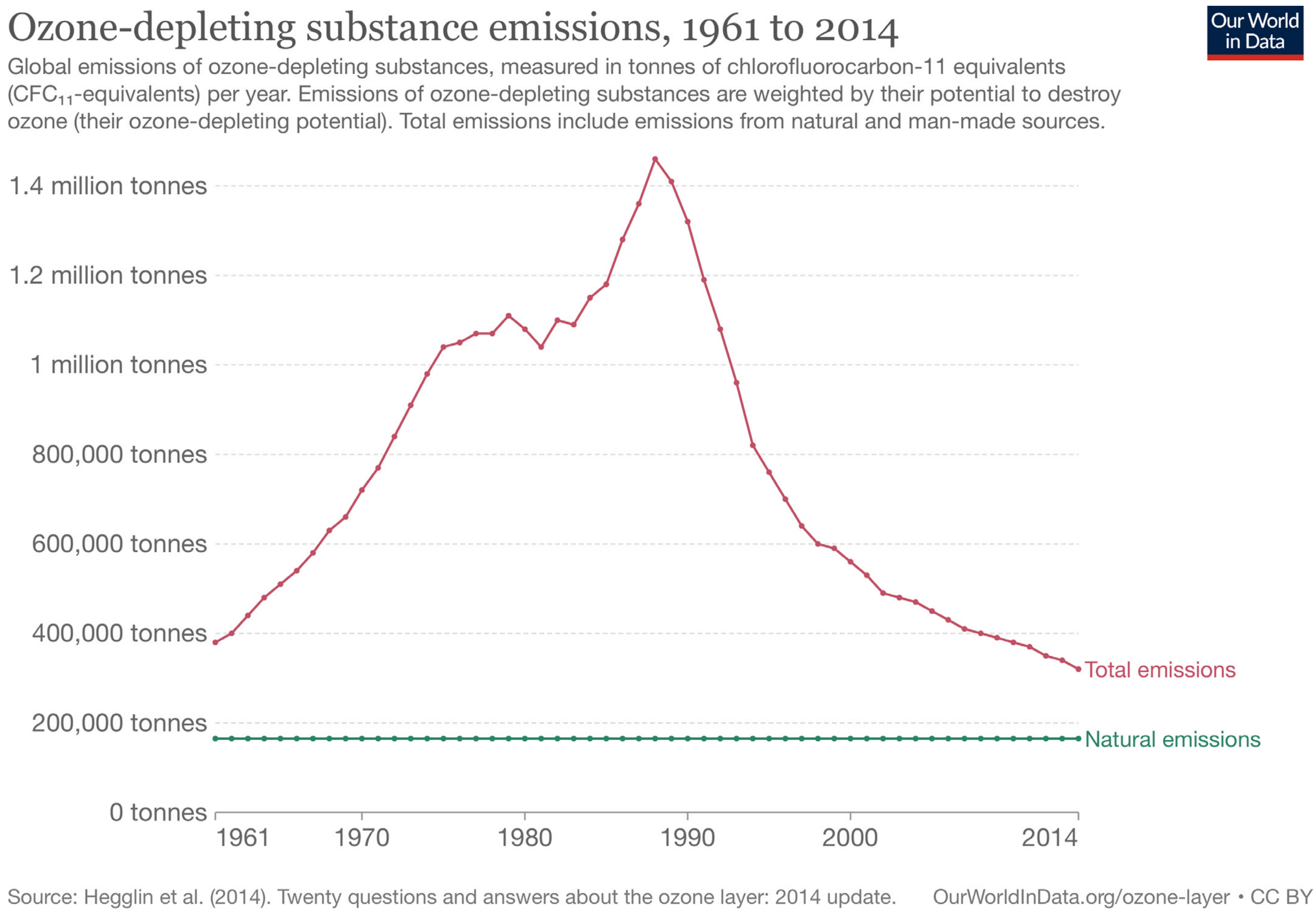
Let's start at the beginning.

Ozone occurs when three oxygen atoms bond together (O_3). This creates a denser gas than normal oxygen (O_2). It can reflect a lot of radiation from the sun. However, the atomic structure of ozone means that it's much less stable than oxygen. The Ozone Layer is vulnerable to being broken down by man-made compounds that enter the upper atmosphere. Ozone-depleting substances (ODS) are halogen gases containing chlorine and/or bromine, which have the potential to break down ozone in the stratosphere. There are a significant number of ODS.

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

ODS can be emitted from natural and human-made sources and have occurred naturally throughout history to some degree. In Chart 2, we can see emissions of ozone-depleting substances from 1960 onwards. You can see that 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 in the decades that followed. 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.

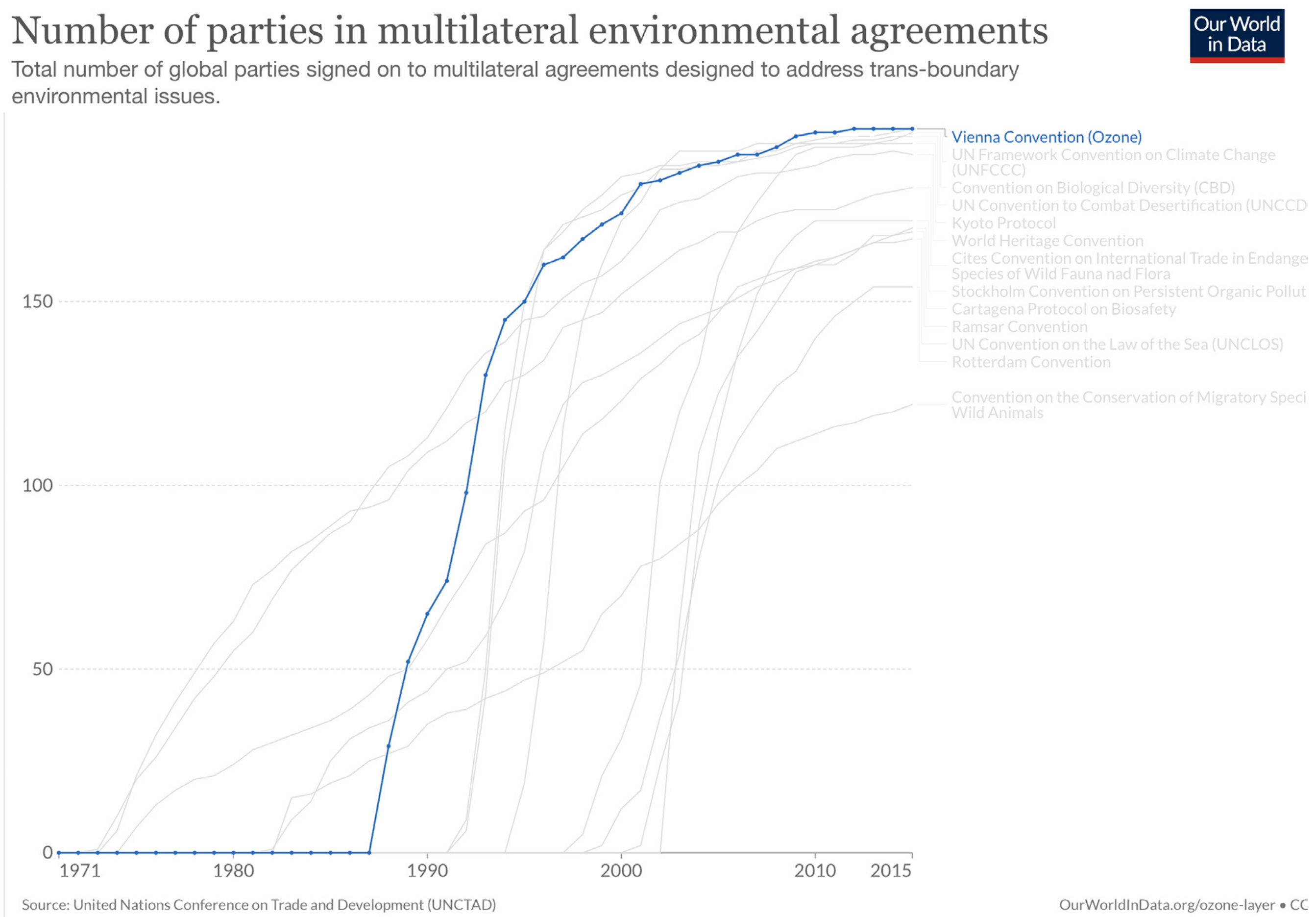
International Agreements

The rapid decline in emissions of ozone-depleting substances was driven by international agreements to phase out their production. 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. This treaty was an agreement by the countries that signed to decrease ODS production.

In Chart 3, we can see the gradual 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 when *every nation on the planet* approved it.

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

Chart 3

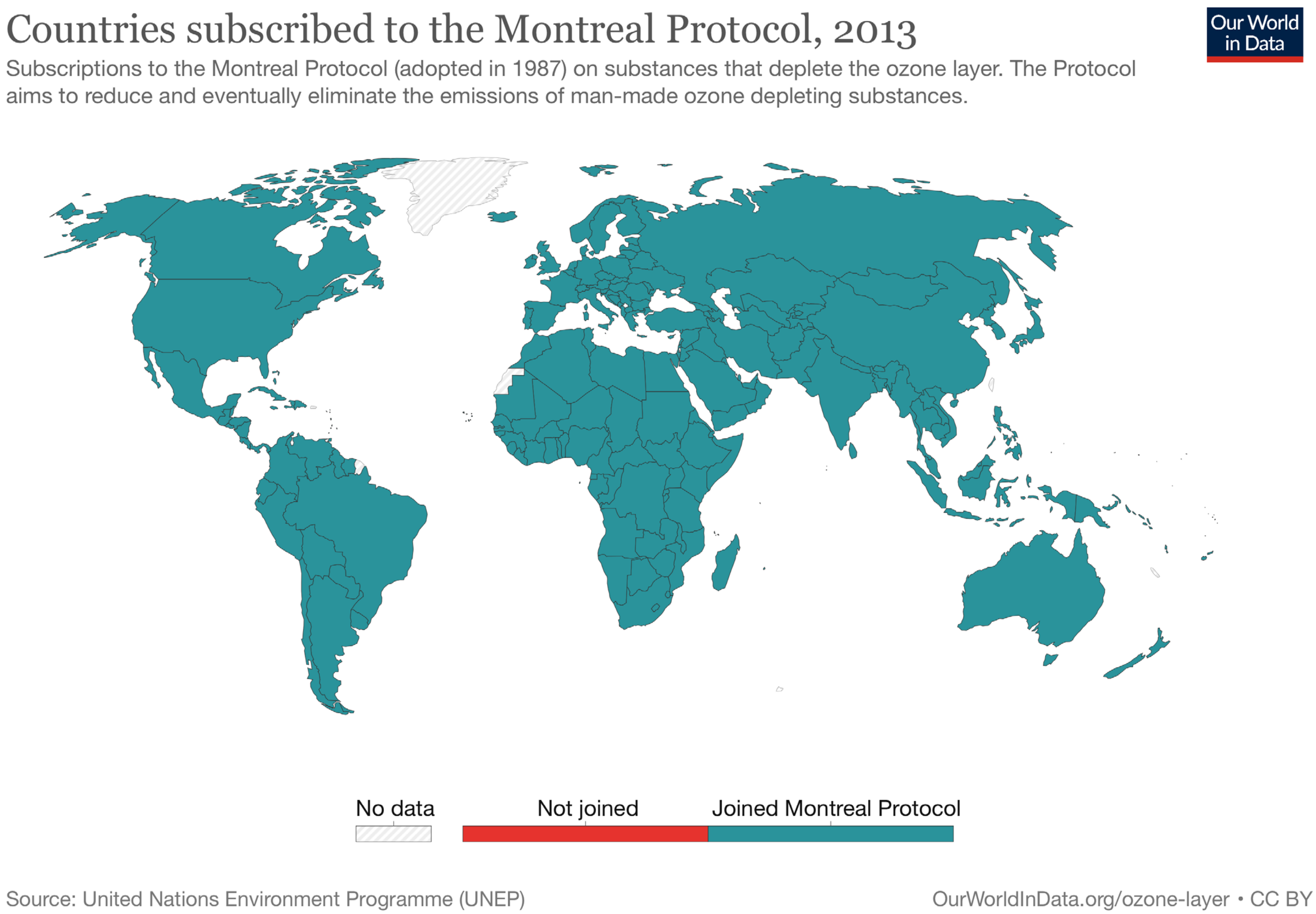


Explore at: https://ourworldindata.org/ozone-layer#vienna-convention-for-the-protection-of-the-ozone-layer By Our World in Data, CC BY 4.0.

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.

In the animated map of Chart 4, we can observe how the Montreal Protocol was adopted across the world since 1987. The Protocol has also reached universal ratification. Since its first draft in 1987, the Montreal Protocol has undergone further changes.

Chart 4

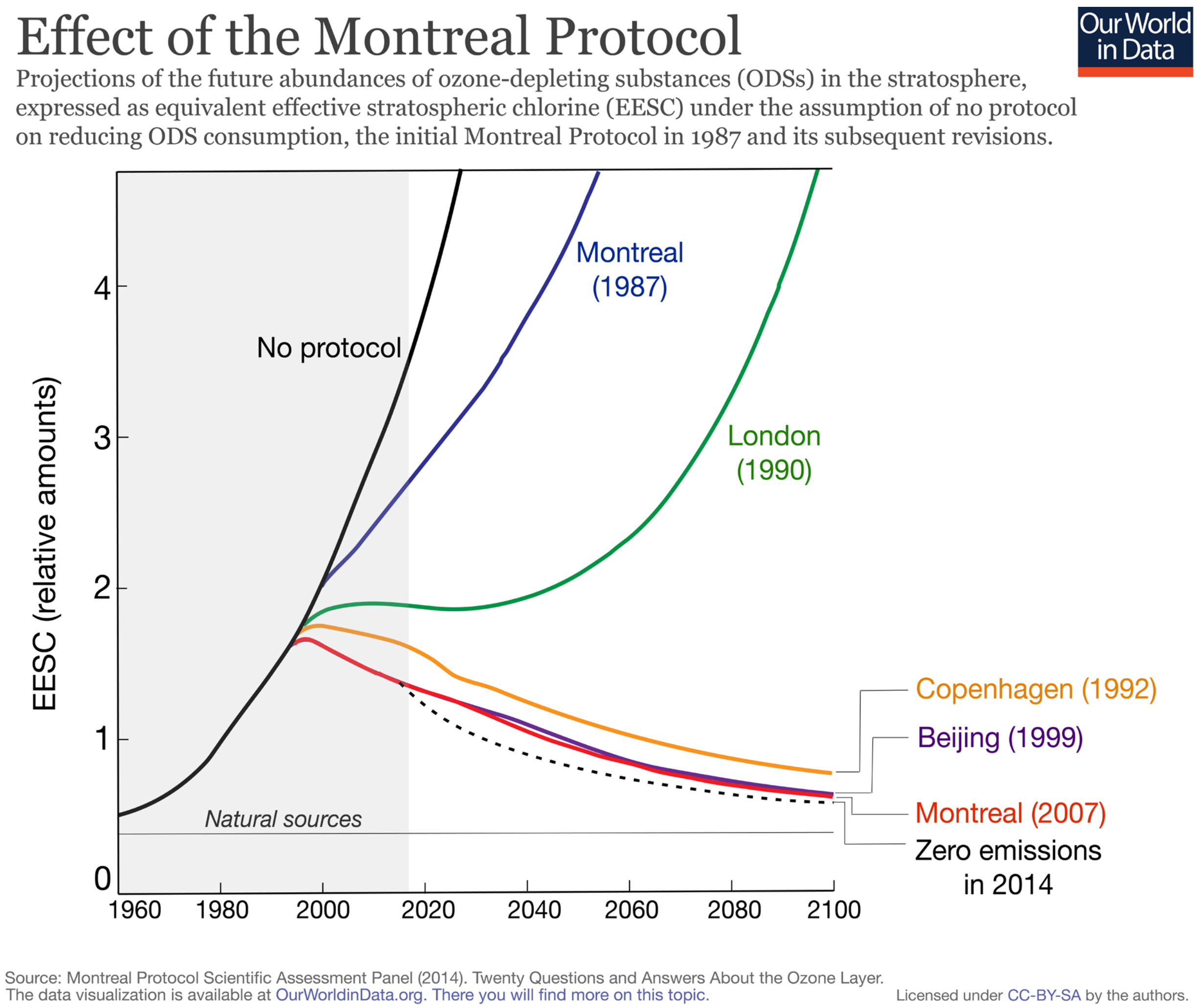


Explore at: https://ourworldindata.org/ozone-layer#montreal-protocol By Our World in Data, CC BY 4.0.

Impact of the Montreal Protocol

How critical was the Montreal Protocol? In Chart 5, we see various projections of historic and future concentrations of ODS under evolving protocol scenarios. These are mapped in relation to the assumption that there was no protocol.

Chart 5



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

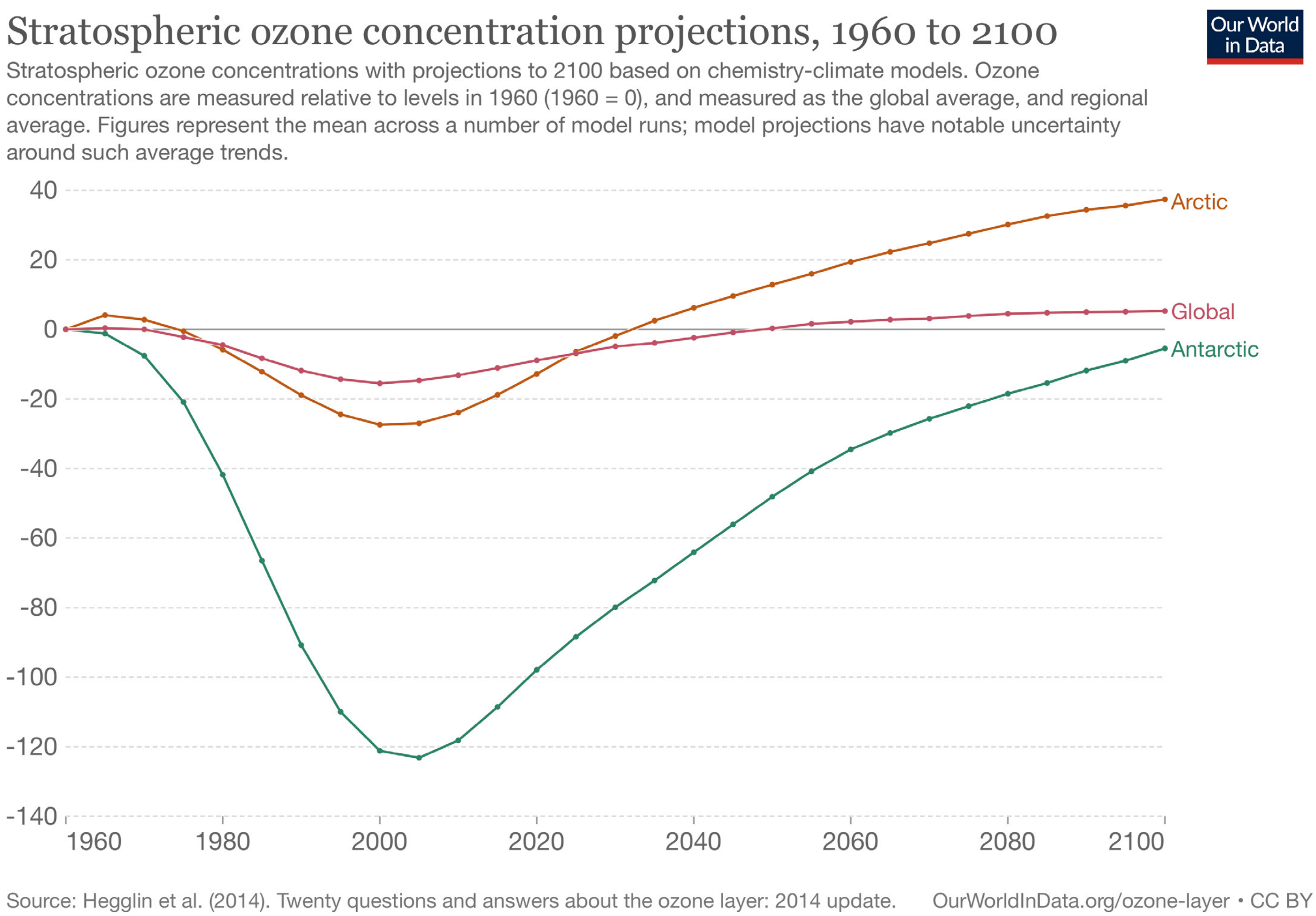
Had the Montreal Protocol not happened, it's likely that global ODS emissions would have continued to increase. Even under the initial Montreal Protocol, the restrictions would not have sufficiently reduced ODS emissions. Fortunately, there were subsequent revisions.

The long road ahead

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

Chart 6 shows historic levels and future projections of recovery in ozone concentrations through the year 2100. It projects that global ozone levels will return to their 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 and international attempts to protect it provide us with important lessons—and warnings. This history shows that international cooperation can successfully address the big problems posed by climate change and human impacts on the planet.

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.

Yet, few agreements have been so impactful as the Montreal Protocol. Swift action and universal adoption were important to the successes in this case. Even with this cooperation, it will still take more than 100 years to repair the damage done in just 30 years. This evidence 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.