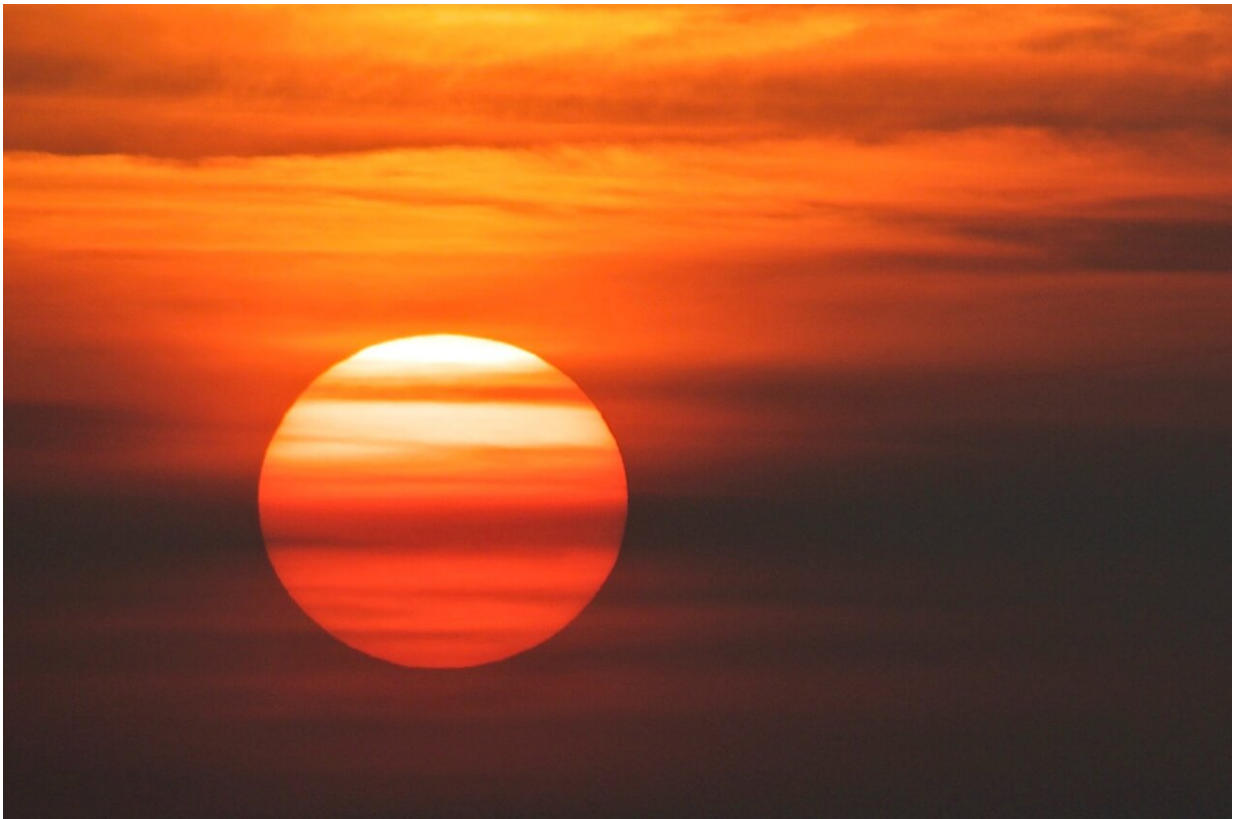


Why dimming the sun would be an effective tool in the fight against climate change

December 7 2023, by Peter Irvine



Credit: Unsplash/CC0 Public Domain

It's becoming increasingly clear that we will fail to meet our climate goals. We were already at [1.26°C](#) of warming in 2022 and are on track to blow through [1.5°C in the mid-2030s](#). Research even suggests that

current climate policy will lead to [more than 2.5°C](#) of warming by the end of this century.

Warming of this magnitude would devastate vulnerable communities and ecosystems around the world. It's time we consider something radically new that could stop [climate change](#) in its tracks.

After powerful volcanic eruptions, like Tambora (Indonesia) in 1815 and Pinatubo (Philippines) in 1991, [global temperatures dip](#) for a few years. Major eruptions create a hazy layer of microscopic particles in the upper atmosphere that last for several years, dimming the sun temporarily. We could copy this effect to fight [climate](#) change.

The Earth is warmed by the sun, but it is [kept warm by greenhouse gases](#) that trap the heat our planet gives off. The warming effect of our CO₂ emissions could be countered by creating a persistent, artificial haze like those seen following major volcanic eruptions. Research has found that we would only need to dim the sun [by around 1%](#) to cool the planet by 1°C.

This may sound unlikely. But every engineering assessment to date has concluded that it would be [feasible and relatively cheap](#) to do using a fleet of high-flying jets to release reflective particles into the upper atmosphere.

So we could dim the sun—but should we?

Cooling the planet would work

Dimming the sun wouldn't perfectly reverse climate change. The sun's warming effect is strongest during the day, in the summer and at the Tropics, whereas greenhouse gases warm everywhere and at all times.

However, we could create [an even cooling effect](#) across the world by adjusting where we release the particles. Research suggests that such an approach would [greatly reduce climate risks](#).

Rising temperatures really matter. Species around the world are [on the move](#), tracking familiar temperatures polewards as the planet warms up. But many won't be able to keep pace with the changing climate and others have nowhere to go, so extinctions are [projected to increase](#).

We are also seeing [extreme heat](#) that is edging closer to the [absolute limits of the human body](#), putting lives at risk and limiting outdoor work.

As the planet heats up, warmer air is drawing more moisture from the soil in dry times, and dumping more out at once when it rains. This is making dry regions drier, wet regions wetter, and is [intensifying both droughts and floods](#) across the world.

Dimming the sun would offset this effect. But it would still alter global wind and rainfall patterns.

Research indicates that this would mean smaller rainfall changes overall. However, [a small minority of places](#) could see more pronounced changes in rainfall compared to what they would face under climate change. Climate models disagree on the details of regional rainfall changes, so it's unclear at this stage which regions would see the greatest change.

Blocking some sunlight [would also be an effective](#) way of keeping icy parts of the world frozen. Rising temperatures are causing the Antarctic and Greenland ice sheets to melt at an accelerating rate, [driving up the global sea level](#). Climate change is also thawing permafrost (frozen soil that stores vast amounts of carbon) leading to the [emission of more](#) of methane and CO₂.

Side effects

Although dimming the sun could keep the Earth cool, it would not deal with the root of the climate problem: the buildup of CO₂ and other [greenhouse gases](#) in the atmosphere. CO₂ not only warms the planet, it also [acidifies the ocean](#), making it harder for corals and other creatures to form their shells. Dimming the sun wouldn't change this.

It would bring about some side effects as well. This hazy layer of particles would make the sky [a little whiter](#). And if we copy volcanic eruptions by releasing sulfate particles to the upper atmosphere, then we'd also be adding to [the acid rain problem](#).

These particles could impact [the ozone layer](#) too, which protects us from harmful UV rays. Research suggests that adding more sulfate particles to the [upper atmosphere](#) would [delay the slow recovery](#) of the ozone hole.

These side effects are a concern. But they pale in comparison to the impacts of climate change. A [recent study](#) found that the benefit of reduced extreme heat for [human health](#) could outweigh the health impacts of these side-effects by more than 50 to 1.

Paul Crutzen, who [won a Nobel prize](#) in 1995 for solving the chemistry of the ozone hole, was well aware of these side effects but nevertheless argued that we should start taking the idea of dimming the sun seriously. In an article from 2006, [he stressed](#) that it would be best to cut CO₂ emissions rapidly so that we wouldn't need to consider dimming the sun at all. However, [he lamented](#) that "currently, this looks like a pious wish."

Symptoms matter

It's becoming increasingly clear that this "pious wish" isn't coming true. Since Crutzen's 2006 article, [CO₂ emissions](#) have surged by more than 15%. We just aren't cutting emissions fast enough to prevent climate change from wreaking terrible damage.

Dimming the sun would not address the root cause of the climate disease, and we must keep pushing to cut emissions, but a growing body of evidence suggests that it would work surprisingly well at treating the symptoms.

However, this is not so surprising. Ice melts when it is warm, hotter air carries more moisture and heat has a direct impact on life. We are far from knowing enough to recommend dimming the sun today, but if countries don't start taking this idea seriously we may miss a valuable opportunity to reduce the risks of climate change.

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