

Big Question #3: I thought the greenhouse effect was natural? How can it be bad if it is natural?

We need to separate between the natural greenhouse effect and the human-enhanced greenhouse effect = the natural or 'good' greenhouse effect is artificially and unnecessarily intensified by humans (Figure 1). However, 'good' or 'bad' are value judgments and not really something that we can decide scientifically. Finally, there are many misconceptions about the greenhouse effect, especially regarding the connections between ozone and global warming.

[Slide Deck](#)

[Video](#)

[Quiz](#)

Total GHE = Natural GHE + Human-Caused GHE.

Please review the [Greenhouse Effect Cheat Sheet](#) and watch [How Do Greenhouse Gases Actually Work?](#) for a quick overview and summary.

1) Common Misconceptions about the Greenhouse Effect.

- [The Natural Greenhouse Effect vs. The Enhanced Greenhouse Effect: *What, how, and what's the difference?*](#)
- [Common Misconceptions about the Greenhouse Effect](#)

2) Case Studies - Examples - Links - Resources.

- Drive the [Greenhouse Effect Simulator](#) and see for yourself what happens when we add greenhouse gases to the atmosphere!
- [National Climate Assessment 2014 Appendix 4](#) (FAQ G)
- [National Climate Assessment 2014 Appendix 3 Climate Science Supplement: Supplemental Message 1](#) (Page 737-741, Figure 33.1)

3) Videos.

- [How Global Warming Works](#) (in under 5, 4, 3, 2, or 1 minute, UC Berkeley)
- [How Do Greenhouse Gases Actually Work?](#) (YouTube, 3:08 minutes)
- ["New Evidence" That CO2 Doesn't Cause Global Warming? I Don't Think So](#) (YouTube, 8:59 minutes)

4) Review Questions.

1. Explain the differences between the natural and human-caused greenhouse effect. What are the most important natural greenhouse gases? How are humans contributing to this natural effect?
2. The greenhouse effect is entirely caused by humans. Discuss the validity of this statement.
3. Explain the connections between the greenhouse effect and global warming.
4. List and explain the ways that humans are creating and enhancing the human-caused greenhouse effect.
5. The natural greenhouse effect is a good thing. Discuss the validity of this statement
6. Propose and explain an alternative analogy for the greenhouse effect that captures both the natural and human-caused greenhouse effect.
7. How can an incorrect analogy (such as the greenhouse effect) still be useful when learning about complex scientific concepts?
8. Why are O_2 and N_2 not greenhouse gasses?

5) Terms and Concept.

- Natural greenhouse effect
- Human greenhouse effect
- The main greenhouse gases (CO_2 , CH_4 , water vapor)

6) Discussion Topics.

- How can we do a better job teaching science to avoid some of the common misconceptions people have about the greenhouse effect and global warming?
- Why can't science tell you what is good or true?
- Discuss the greenhouse effect and global warming in terms of the important causes, processes, effects, and linkages.

Human Influence on the Greenhouse Effect

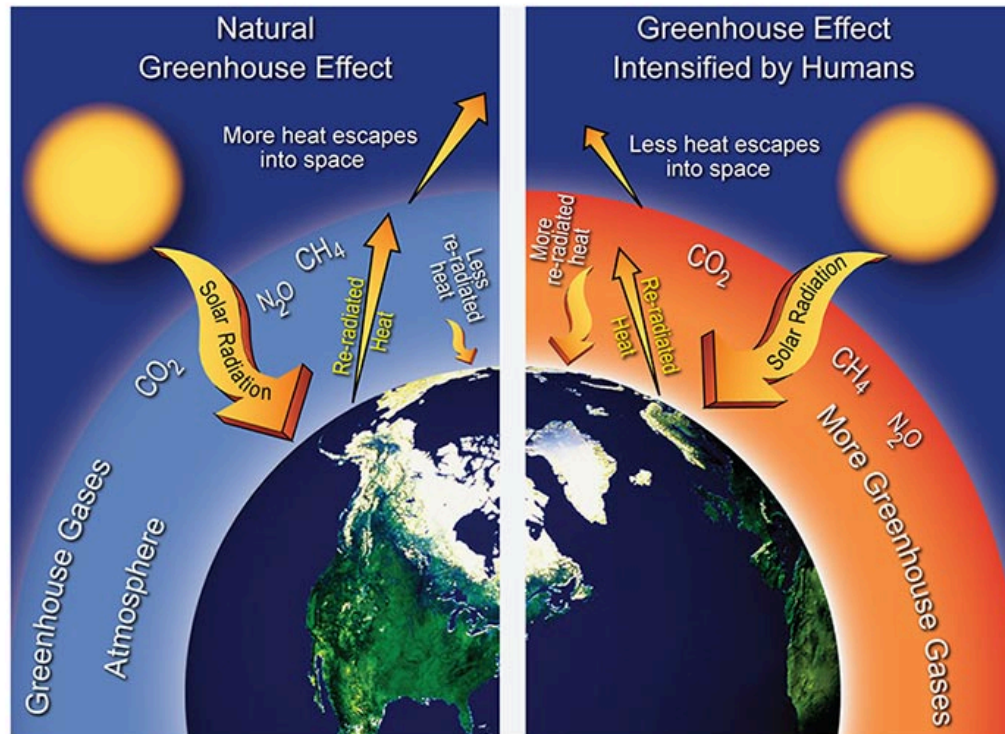


Figure 1. Left - Naturally occurring greenhouse gases - carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) - normally trap some of the sun's heat, keeping the planet from freezing. Right - Human activities, such as the burning of fossil fuels, are increasing greenhouse gas levels, leading to an enhanced greenhouse effect. The result is global warming and unprecedented rates of climate change.

Source: <https://nca2014.globalchange.gov/report/appendices/climate-science-supplement>

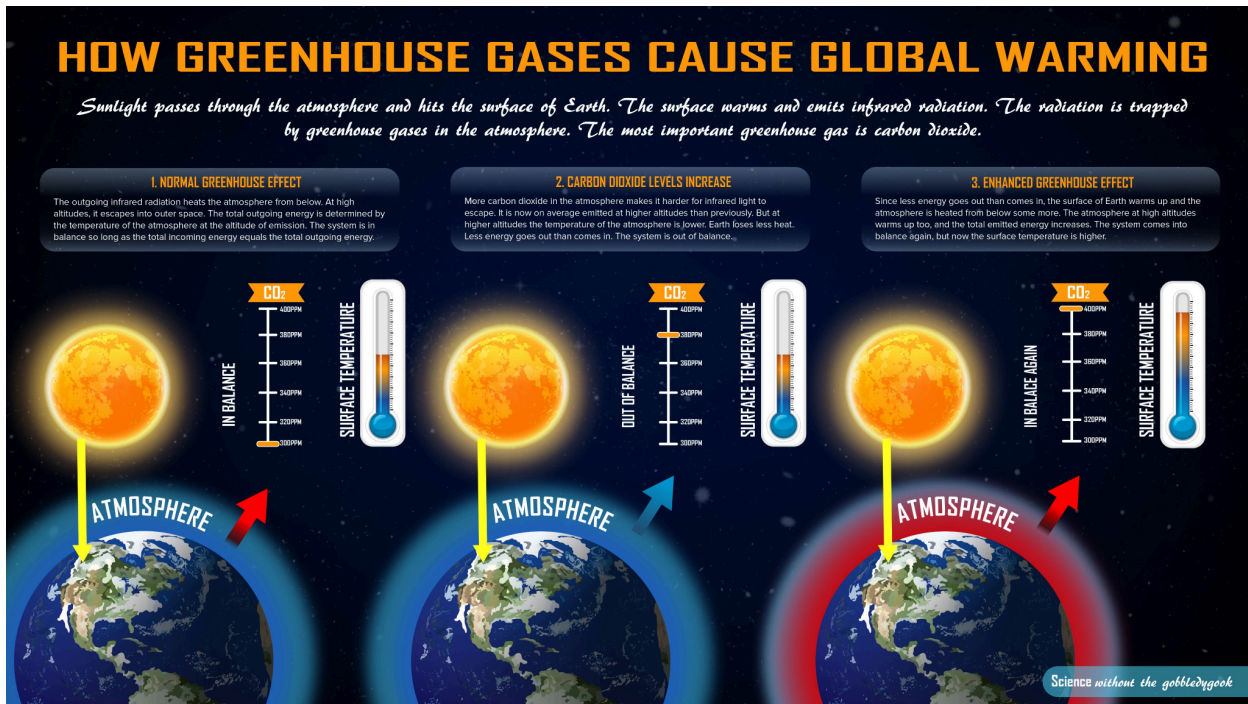


Figure 2. Excellent explanation of how the greenhouse effect actually works.

Source: Sabine Hossenfelder on Twitter @

<https://x.com/skdh/status/1622099529553018881/photo/1>, also available [here](#).