



This is the print version of the [Skeptical Science](#) article '[Toxic heavy metals leach out from solar panels and pose a threat to human health](#)', which can be found at <http://sks.to/solarmetals>.

Are toxic heavy metals from solar panels posing a threat to human health?

What The Science Says:

The Massachusetts Department of Energy Resources has assessed that there is little, if any, risk of chemical releases to the environment during normal use, and that all materials in a solar panel are "insoluble and non-volatile at ambient conditions," and "don't mix with water or vaporize into air."

Climate Myth: Toxic heavy metals leach out from solar panels and pose a threat to human health

"Studies have shown the heavy metals in solar panels namely lead and cadmium, can leach out of the cells and get into groundwater, as well as affect plants." ([Emily Chantiri, 2023](#))

Roughly 40% of new solar panels in the United States and 5% of new solar panels in the world contain cadmium¹, but this cadmium is in the form of cadmium telluride, which is non-volatile, non-soluble in water, and has 1/100th the toxicity of free cadmium². Most solar panels, like many electronics, contain small amounts of lead³. However, the Massachusetts Department of Energy Resources (DER) has assessed that "because PV panel materials are enclosed, and don't mix with water or vaporize into the air, there is little, if any, risk of chemical releases to the environment during normal use."⁴ The Massachusetts DER has further assessed that, even in the unlikely event of panel breakage, releases of chemicals used in solar panels are "not a concern."

All materials in a solar panel are "insoluble and non-volatile at ambient conditions," and "don't mix with water or vaporize into air." Moreover, they are encased in tempered glass that not only withstands high temperatures, but is also strong enough to pass hail tests and is regularly installed in Arctic and Antarctic conditions. It is theoretically possible that, when exposed to extremely high heat exceeding that of a typical residential fire, panels "could emit vapors and particulates from PV panel components to the air." But that risk is limited by the fact that "the silicon and other chemicals that comprise the solar panel would likely bind to the glass that covers the PV cells and be retained there." When a cadmium telluride panel is exposed to fire of an intensity sufficient to melt the glass on the panel, "over 99.9% of the cadmium [is encapsulated in] the molten glass." Furthermore, a 2013 analysis found that, even in the worst-case scenarios of earthquakes, fires, and floods, "it is unlikely that the [cadmium] concentrations in air and sea water will exceed the environmental regulation values."⁵

One peer-reviewed study in the *Journal of Natural Resources and Development* (A. Robinson & Meindl 2019) found it unlikely for lead or cadmium to leach into the soil from functional solar panels. Measuring heavy metal concentrations in the soil at various distances, researchers found no significant differences in lead or cadmium concentrations directly underneath solar panels, compared to soil 45 or 100 feet away. The study further found that "lead and cadmium were not elevated in soils near PV systems and were far below levels considered to be an imminent or future danger to environmental health."⁶

Although the study did find higher levels of selenium in soil directly underneath solar panels, the study noted that the presence of selenium was possibly a "result of the cement used in construction," rather than leaching from the panels themselves. In addition, the study noted that even the highest selenium concentrations observed were below the EPA's risk threshold for mammals. Finally, the study noted that fly ash, a product of coal combustion "commonly disposed of in landfills and as a soil amendment in agriculture," contains significantly higher concentrations of lead (40x), cadmium (1.1x) and selenium (4x) than the soil samples taken directly underneath the solar panels in the study area.

Footnotes:

- [1] [Polycrystalline Thin-Film Research: Cadmium Telluride](#) Nat'l Renewable Energy Laboratory, May 2022 and [Taking Cadmium Telluride Technology to the Next Level](#) US-MAC (last visited March 25, 2024).
- [2] [Health and Safety Impacts of Solar Photovoltaics](#) NC Clean Energy Technology Center, May 2017
- [3] Mark Hutchins, [The weekend read: A lead-free future for solar PV](#), PV Magazine, Oct. 26, 2019
- [4] Massachusetts Department of Energy Resources et al., [Questions & Answers: Ground-Mounted Solar Photovoltaic Systems, 10-11](#) (Jun. 2015)
- [5] Yasunari Matsuno, [Environmental risk assessment of CdTe PV systems to be considered under catastrophic events in Japan](#), First Solar, Dec. 1, 2013
- [6] U.S. Environmental Protection Agency, [Ecological Soil Screening Level](#) (2018), (last updated May 3, 2023)

This rebuttal is based on the report "[Rebutting 33 False Claims About Solar, Wind, and Electric Vehicles](#)" written by Matthew Eisenson, Jacob Elkin, Andy Fitch, Matthew Ard, Kaya Sittinger & Samuel Lavine and published by the [Sabin Center for Climate Change Law](#) at Columbia Law School in 2024. Skeptical Science sincerely appreciates Sabin Center's generosity in collaborating with us to make this information available as widely as possible.

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