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SCIENCE

Do we know enough about the health risks of new semiconductor factories?

The Biden administration needs to conduct more thorough environmental reviews, advocates contend.

By **Justine Calma**, a senior science reporter covering energy and the environment with more than a decade of experience. She is also the host of **Hell or High Water: When Disaster Hits Home**, a podcast from Vox Media and Audible Originals.

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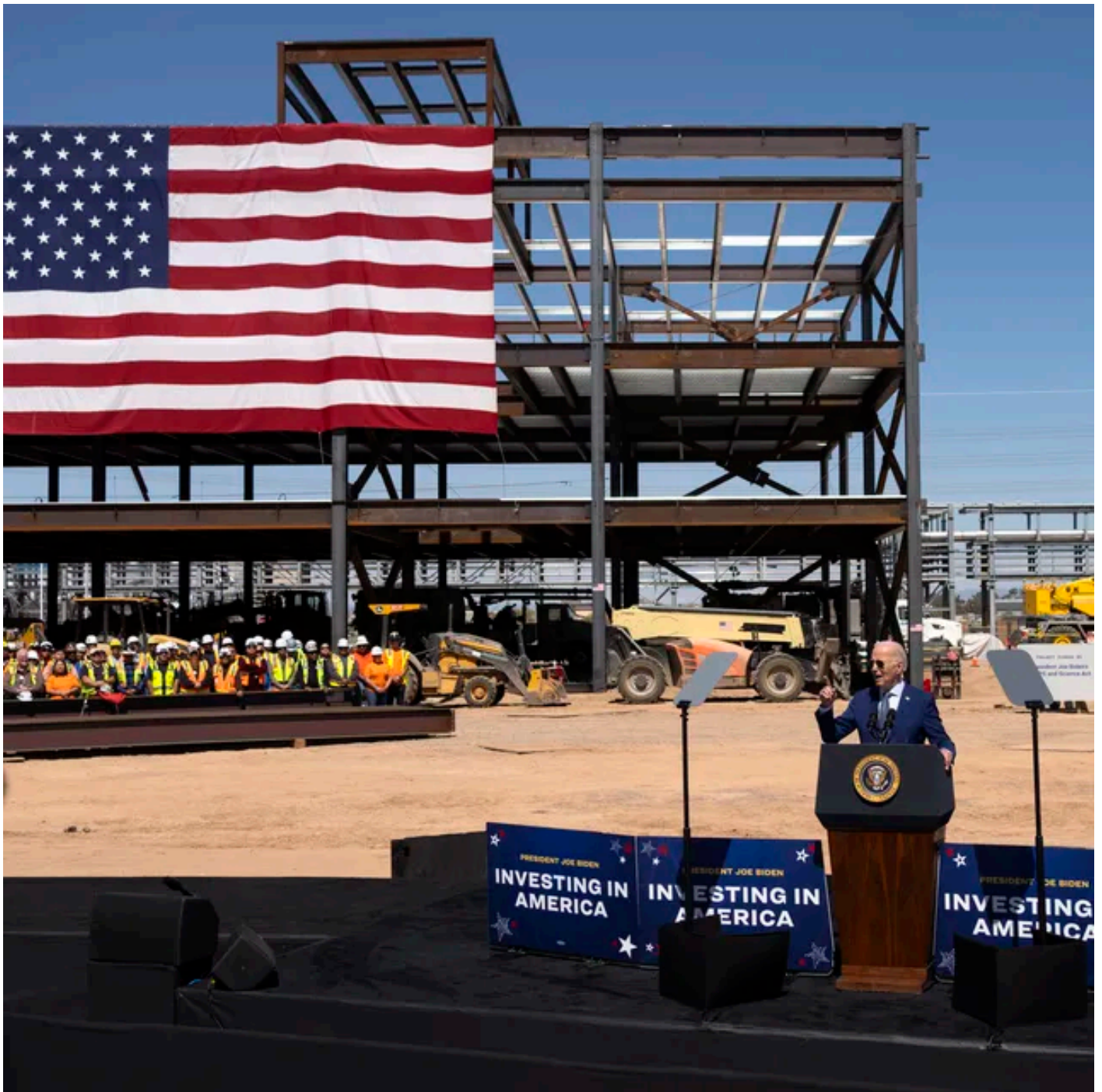
President Joe Biden gives a speech at the Intel Ocotillo Campus on March 20th, 2024 in Chandler, Arizona.   Photo by Rebecca Noble / Getty Images

Having pumped billions of dollars into building the next generation of computer chip factories in the US, the Biden administration is facing new pressure over the health and safety risks those facilities could pose. Environmental reviews for the new projects need to be more thorough, advocates say. They lack transparency around what kinds of toxic substances factory workers might handle, and plans to keep hazardous waste like forever chemicals from leaching into the environment have been vague.

A coalition of influential labor unions and environmental groups, including the Sierra Club, have since submitted comments to the Department of Commerce on draft environmental assessments, saying that the assessments fall short. The coalition's comments flag lists of potential issues at several projects in Arizona and Idaho, including how opaque the safety measures that manufacturers will take to protect both workers and nearby residents are.

"We aren't objecting to the existence of these plants. We know that they're going to have to use hazardous substances."

The groups don't want to stop the projects from moving forward, they say. Their aim is to make sure that the industry avoids missteps it made when the US used to make a lot more semiconductors. America's first generation of semiconductor factories, or fabs, left Silicon Valley pockmarked with toxic Superfund sites that are still being cleaned up decades later. That's why they say it's crucial to assess the environmental risks now and give communities a chance to weigh in on new fabs springing up across the nation.

"We aren't objecting to the existence of these plants. We know that they're going to have to use hazardous substances. Obviously, we're pushing for substitutes when they can, but one of our biggest problems is the lack of transparency," says Lenny Siegel, executive director of the Center for Public Environmental Oversight (CPEO).

Federal dollars come with strings attached

Siegel is part of CHIPS Communities United, a coalition that has formed over the past year working to hold semiconductor manufacturers accountable to communities where they set up shop. The group is also spearheaded by some big-name unions including Communications Workers of America, United Auto Workers, and the International Brotherhood of Electrical Workers.

The coalition has formed at a pivotal time in the US. The CHIPS and Science Act, which passed in 2022, created $52.7 billion in funding for chip manufacturing. That's supposed to help build up a domestic supply chain for computer chips in high demand for everything from cars and gaming to AI. As of June, more than half of that money had been distributed to eight companies building factories in 10 states. Private companies have committed an additional $395 billion to new semiconductor and electronics manufacturing in the US since 2021, according to the Biden administration.

If a company accepts federal funds, it can be subject to added environmental regulation on top of any local rules it has to follow at a construction site. A bedrock environmental policy in the US is the National Environmental Policy Act (NEPA), which requires federal agencies to conduct environmental reviews of major projects and share its findings with the public.

If NEPA applies, the agency will initially put together a document called an environmental assessment to determine if there could be "significant" environmental effects. If it finds no significant impact, then the review process ends. But if it deems there to be significant risks, it has to prepare a more detailed environmental impact statement and open up the process for more public engagement.

"There's no guarantee"

So far, the Department of Commerce has released draft environmental assessments for three specific project sites: Micron's plans in Boise, Idaho, as well as Intel's and TSMC's facilities in Arizona. All three drafts generally describe potential environmental effects as minor or stipulate that there would be "no significant effects" — as long as there are controls in place. (The jargon they use is "best management practices," or BMP.)

CHIPS Communities United isn't convinced. It submitted comments to the Department of Commerce calling on it to craft a more robust environmental impact statement for each of the projects. One of the key things they're calling out is that there isn't enough transparency on what those best management practices are and how they'd be monitored or enforced.

"These are huge projects, and they will have an environmental impact. The draft environmental assessments make assumptions about what is going to be done to mitigate those impacts, but there's no guarantee that those mitigations will be carried out," Siegel says.

Computer chips have a toxic history

A longtime activist, Siegel also served as mayor of Mountain View, California, in 2018 — where chip factories contaminated soil and water sources before manufacturing started to move abroad. Santa Clara County, where Mountain View is located, has more Superfund sites than any other county in the US. Arsenic, chloroform, and lead are just a few of the many hazardous substances that leached into groundwater and are still being cleaned up at old manufacturing sites.

Today, manufacturers use an ever-evolving chemical cocktail when making computer chips. The industry has taken strides to prevent pollution and replace certain substances that have been linked to miscarriages and other health risks. But toxicologists say the chemical mix is often changing faster than it takes to suss out the potential dangers. To make things harder, companies generally don't like to share what kinds of chemicals they're using, protecting them as trade secrets despite pressure from advocates to notify workers of the substances they're handling.

"We also want to see workers empowered in the facilities, not just to know what they're working with, but to have a voice in health and safety protocols, to have the right to stop production if things are dangerous," says Judith Barish, coalition director for CHIPS Communities United. "And we want to know that workers won't be retaliated against if they speak out."

Forever chemicals have become a bigger concern lately with chip manufacturing. That encompasses thousands of different kinds of per- and polyfluoroalkyl substances (PFAS) that were used for years to make all kinds of products, from fabrics to nonstick pans, more durable. The US is just starting to craft regulations for the most common kinds of PFAS now, but there are still thousands of other forever chemicals for which there are no mandated exposure limits. Scientists are still scrambling to understand how exposure affects the human body, but there's

already evidence that high exposure can increase the risk of certain kinds of cancer, liver damage, high cholesterol, and some reproductive health issues. The semiconductor industry has also created its own PFAS consortium to study the chemicals and minimize pollution.

How to get rid of forever chemicals is another area of active research since they earned their name by being particularly hard to destroy. It's no surprise that CHIPS Communities United is worried about how new semiconductor fabs will handle hazardous waste, including PFAS. All three draft assessments conclude that hazardous materials on-site pose "no significant effects" — but only if those so-called best management practices take place.

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CHIPS Communities United wants to know how exactly those practices would be implemented. When it comes to forever chemicals, the assessments for TSMC and Intel say that the companies will separate PFAS from other waste streams and send it to off-site disposal facilities. What happens once those chemicals are off-site still worries the coalition. PFAS has been known to leak from landfills and even persist in the air after being incinerated.

A more detailed environmental impact statement for each of the proposed projects can help fill in the gaps, they contend. It'll also give nearby communities more opportunities to weigh in on what kinds of solutions they'd like to see. Beyond that, they'd also like to see manufacturers enter into legally binding community benefits agreements. They also say that the Commerce Department should stipulate specific environmental and health protections in contracts with companies.

Those kinds of agreements can go a long way in the absence of up-to-date regulations. New federal rules for PFAS focus on drinking water rather than wastewater. And most chemical exposure limits set by the Occupational Safety and Health Administration (OSHA) haven't been updated since the 1970s. OSHA says on

its website that its exposure limits "are outdated and inadequate for ensuring protection of worker health." Attempts to update them have repeatedly faced quick backlash from industry leaders and lawmakers with a deregulatory agenda. Proposed rules for cutting down greenhouse gas emissions are similarly in peril after several Supreme Court rulings and the prospect of another Donald Trump presidency. The coalition is also concerned about how these new fabs will keep their climate pollution in check. How much water these facilities will use is another point of contention, especially in places like Arizona that grapple with worsening drought. The comments CHIPS Communities United sent to the Department of Commerce for plants being built by Intel, Micron, and TSMC cover a range of issues, including climate change and air quality, hazardous substances and waste, and the cumulative effects of building multiple manufacturing facilities near each other.

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"In the absence of enforceable, transparent requirements to address such impacts, the applicant's promise to address the impacts does not eliminate them," the coalition's responses to Micron and Intel projects say.

Intel declined to provide an on-the-record response to *The Verge*. It's building two new chip factories and updating an existing fab at its Ocotillo campus in Chandler, Arizona. TSMC, which is building three new semiconductor fabs in Phoenix, didn't respond to requests for comment. Micron is building a new 1.2-million-square-foot fab at its headquarters in Boise. In an email to *The Verge*, Micron said that questions regarding the draft environmental assessment should be directed to the CHIPS Program Office (CPO) within the Department of Commerce.

"We posted the draft [environmental assessments] for public comment to provide transparency and facilitate the public's input in this process. CPO will carefully consider all public comments received during the comment period as we work to

finalize the NEPA process," CHIPS communications director, Geoff Burgan, said in a statement.

In other words, the Department of Commerce has to take all of these concerns into consideration as it finalizes its environmental reviews. That in itself is what makes federal review under NEPA a powerful tool. Last year, there was a failed attempt to exempt new chip factories from NEPA altogether.

"We believe that the people who work in the plants and live nearby have a right to know what they're using," Siegel says. So do others trying to figure out where to build a new home or childcare center, he adds. "People and planners need to have this information."

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