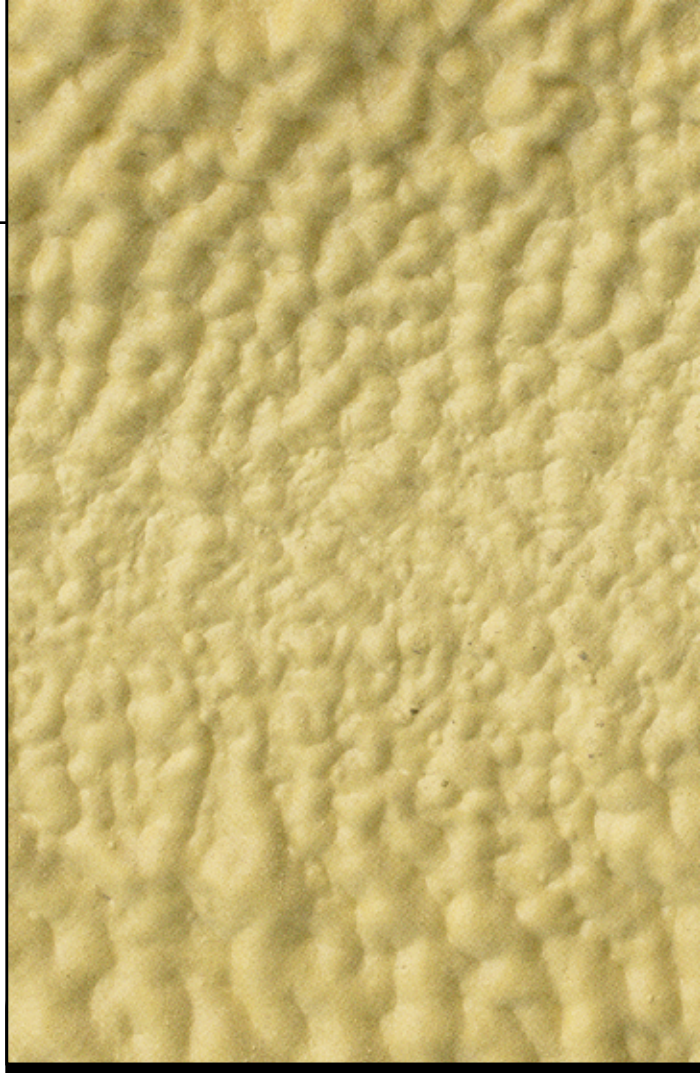

MDI

Chemical and Environmental Justice Impacts in the MDI Life Cycle

Many AEC professionals may not be aware that the building products they specify can have environmental justice impacts.

Product manufacturing often involves the use and release of toxic chemicals throughout the supply chain, impacting human and environmental health and contributing to environmental injustice.

As built environment practitioners seek to reduce the environmental justice harms caused by their material selections, understanding the role that MDI plays in polyurethane-based products can help raise awareness of potential impacts.

WHAT IS ENVIRONMENTAL JUSTICE?

The Environmental Justice Health Alliance for Chemical Policy Reform (EJHA) defines environmental justice (EJ) as a set of principles and a grassroots-led movement that "arose in response to the disproportionate exposure of communities of color and low-income communities to harmful pollution, toxic sites and facilities, and other health and environmental hazards."[1]

Read more about the **Principles of Environmental Justice**.

This study explored the chemical and environmental justice impacts of methylene diphenyl diisocyanate (MDI) manufactured in the United States.

You may be familiar with polyurethane through its use in many common building products, including spray polyurethane foam, polyisocyanurate insulation, and binders for composite wood, adhesives, sealants, and coatings.[2] A key component of polyurethane is a group of chemicals called isocyanates, of which methylene diphenyl diisocyanate (MDI) is one. MDI is used in spray foam insulation, which is prevalent in new construction and energy efficiency upgrades. While practitioners aim to make their buildings more efficient, they may run the risk of contributing to environmental injustice through the life cycle of their insulation.

Habitable assessed the chemical hazard and environmental justice impacts of MDI according to five criteria:

1 **avoid hazardous chemicals**
2 **prevent accidents**
3 **prevent pollution and waste**
4 **abide by environmental regulations**
5 **prevent disproportionate and cumulative impacts.**

Habitable's analysis included four facilities that manufacture most of the MDI made in the United States.[3–7] This research was conducted from 2021–2022.

Key Findings:

- MDI is derived from fossil fuels and requires the use of many hazardous chemicals in its manufacturing.
- Hazardous chemical incidents—such as fires, spills, and other nonroutine releases throughout the supply chain—have injured workers and resulted in shelter-in-place orders in nearby communities.
- MDI production facilities generate tens of millions of pounds of related hazardous chemical waste, including releases to the air and water, each year.
- Facilities that make MDI have a history of noncompliance with U.S. Environmental Protection Agency (EPA) regulations, with half the facilities studied in significant violation for all of the previous 12 quarters.
- The combined communities surrounding MDI manufacturing have a higher percentage of children, people of color, low-income households, and limited English-speaking households than the U.S. overall.

INFORMED

Learn more about Habitable's research process in our Chemical and Environmental Justice Impacts Methodology.

CRITERIA FOR CHEMICAL AND ENVIRONMENTAL JUSTICE IMPACTS	FINDINGS ON MDI
Avoid hazardous chemicals	Inputs are primarily fossil fuel–based. More than 90% of chemicals used as inputs for MDI production (11 chemicals) are hazardous to human health. Half (6 chemicals) are highly reactive or flammable. More than 90% (11 chemicals) are volatile. We identified one hazardous by-product. MDI itself is also hazardous.
Prevent accidents	Incidents at facilities throughout the MDI manufacturing supply chain have injured workers and resulted in shelter-in-place orders for nearby communities.
Prevent pollution and waste	Facilities manufacturing MDI in the United States report that they: • generate 47.7 million pounds of hazardous MDI-related chemical waste on average each year (combined); • release an average of 560,000 pounds of hazardous MDI-related chemicals into the air and water each year (combined). Some of this waste and these releases may be tied to other processes at these facilities. Some facilities do not perform all steps of MDI production on site. Releases of related process chemicals at other facilities in the supply chain are not included in this study.
Abide by environmental regulations	75% of MDI facilities had significant violations of EPA regulations within the previous 12 quarters. 50% of facilities had significant violations in every quarter.
Prevent disproportionate and cumulative impacts	Compared with the United States overall, the combined communities surrounding MDI manufacturing facilities have a: • higher percentage of people of color (59% near MDI facilities versus 39% in the U.S. overall); • higher percentage of low-income households (38% versus 33%); • higher percentage of limited English-speaking households (6% versus 4%); • higher percentage of children than the nation overall (30% versus 23%). We further found cumulative impacts: • Two MDI facilities are located in close proximity to each other, compounding the negative health impacts on that community. • Cities with MDI manufacturing facilities contain other industrial sites that release and/or manage hazardous chemicals—up to 28 in one instance. • One city that we researched contains more than 20 other industrial sites. • In 2019, each individual city experienced collective releases of hazardous chemicals ranging from 4 million pounds in one location to 15 million pounds in another.

Research Details

EPA reports violations quarterly. Compliance data for MDI facilities is from May 2021.

TRI analysis was based on data through the 2019 reporting year. Average annual releases and waste represent the most recent five years for which data was available at the time of the research (2015–2019).

Habitable used EJScreen version 1 (2020), including U.S. Census Bureau American Community Survey data for 2014–2018.

Sources specific to MDI are included to the right and in the accompanying spreadsheet. See Habitable's Chemical and Environmental Justice Impacts Methodology for other sources used in our analysis. More background on MDI can be found in the full case study.

Sources

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