Nylon-6

Chemical and Environmental Justice Impacts in the Nylon-6 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 nylon-6 plays 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 nylon-6 manufactured in the United States for potential use in carpet.

Nylon is a type of plastic used in carpet fibers.[2] Carpet fibers can use different variations of nylon—nylon-6 and nylon-6,6—with nylon-6 being more common.[3,4] The choice of flooring material like carpet has many implications for environmental justice.

Habitable assessed the chemical hazard and environmental justice impacts of nylon-6 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 the six facilities identified as manufacturing nylon-6 for potential use in carpet fibers in the United States.[a,5–15] This research was conducted in 2024.

Key Findings:

- Nylon-6 is derived from fossil fuels and requires the use of many hazardous chemicals in the manufacturing process.
- 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.
- Nylon-6 production generates millions of pounds of related hazardous chemical waste, including releases to the air and water, each year.
- One of the facilities analyzed has a history of noncompliance with U.S. Environmental Protection Agency (EPA) regulations and was in significant violation for all of the previous 12 quarters.
- The combined communities surrounding nylon-6 manufacturing have higher percentages of Black and low-income populations than the U.S. overall.

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

CRITERIA FOR CHEMICAL AND ENVIRONMENTAL JUSTICE IMPACTS	FINDINGS ON NYLON-6
Avoid hazardous chemicals	Inputs are primarily fossil fuel-based. About a quarter of chemicals used as inputs for nylon-6 production (3 chemicals) are hazardous to human health. Almost half (5 chemicals) are highly reactive or flammable. About three-quarters (8 chemicals) are volatile. We identified one hazardous by-product. Nylon-6 itself is not considered hazardous.
Prevent accidents	Incidents at facilities throughout the nylon-6 manufacturing supply chain have injured workers and resulted in shelter-in-place orders for nearby communities.
Prevent pollution and waste	Facilities manufacturing nylon-6 for potential use in carpet in the United States report that they: • generate 2.3 million pounds of hazardous nylon-6-related chemical waste on average each year (combined); • release an average of 48,000 pounds of hazardous nylon-6-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 nylon-6 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	One of the nylon-6 facilities (17%) had significant violations of EPA regulations within the previous 12 quarters. That same facility had significant violations in every quarter.
Prevent disproportionate and cumulative impacts	Compared with the United States overall, the combined communities surrounding nylon-6 manufacturing facilities have a: • similar percentage of people of color (39% near nylon-6 facilities versus 40% in the U.S. overall); • higher percentage of low-income households (33% versus 30%); • lower percentage of limited English-speaking households (about 2% versus 5%); • similar percentage of children as the nation overall (22%). While the overall percentage of people of color living near nylon-6 facilities mirrors the nation overall, the specific racial composition of the combined communities reveals a significant disparity: Black residents make up 21% of these communities—nearly double the national proportion of 12%. Only three of the facilities studied report hazardous chemical releases to the EPA and all are located in communities with substantially higher percentages of people of color (47–61%) compared to the nation overall (40%). We further found cumulative impacts: • Cities with nylon-6 manufacturing facilities contain other industrial sites that release and/or manage hazardous chemicals—up to 25 in one instance—compounding the negative health impacts on those communities. • Two cities that we researched contain more than 20 other industrial sites. • In 2022, each individual city experienced collective releases of hazardous chemicals ranging from 2,000 pounds in one location to 3.6 million pounds in another. • The three nylon-6 facilities located in communities with substantially higher percentages of people of color than the nation overall are also located in the cities with the highest total hazardous chemical releases.

Research Details

EPA reports violations quarterly. Compliance data for nylon-6 facilities is from July 2024.

TRI analysis was based on data through the 2022 reporting year. Average annual releases and waste represent the most recent five years for which data was available at the time of the research (2018–2022).

Habitable used EJScreen version 2.3, including U.S. Census Bureau American Community Survey data for 2018–2022.

Sources specific to nylon-6 are included below and in the accompanying spreadsheet. See Habitable's Chemical and Environmental Justice Impacts Methodology for other sources used in our analysis.

a Habitable's analysis excluded companies/facilities where the nylon-6 was clearly marketed for metal replacement/ engineered nylon applications and there was no indication they have products that may be used for fiber/carpet. This means that some nylon-6 manufacturing in the U.S. is not captured in our analysis. The facilities included in this analysis are our best estimate of those facilities in the U.S. that are supplying nylon-6 for building materials—in particular, carpet. Some "chemical recycling" of nylon-6 to produce new nylon-6 does take place globally, but we identified no facilities in the U.S. currently doing this full process.

Sources

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