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REPORT FACT SHEET

Air quality, health, and economic impacts of SAIL Bokaro steel plant in India

Introduction

Across India, air pollutant levels regularly breach guideline levels set by the World Health Organization (WHO) (Jaganathan et. al, 2025), to the extent that it is consistently ranked as one of the most polluted countries in the world (IQAir 2025). A study published in 2021 suggested that industries are responsible for 21 to 38% of $PM_{2.5}$ and 23 to 37% of PM_{10} pollution in India (Ganguly et.al, 2021).

The steel industry is classified as one of the 17 highly polluting industries in India (CPCB). India currently has a capacity of 205 million tonnes of steel per year (MTPA) and plans to add another 100 MTPA by 2030 (Ministry of Steel, 2017). In early 2025, Global Energy Monitor (GEM) reported that 113 MTPA of 152 MTPA iron worldwide is produced through emissions intensive blast furnaces (BF); and 135 MTPA of the 155 MTPA crude steel capacity uses basic-oxygen furnace (BOF). India also accounts for 57% of all coal-based BOF steelmaking capacity under development globally. (Astrid-Grigsby-Schulte et. al., 2025).

The Steel Authority of India Limited (SAIL) alone accounts for 13% of the total crude steel capacity in India, with India's government holding a 65% equity in the company as of December 2025.

Bokaro Steel Limited (hereafter referred to as BSL), located in Bokaro, Jharkhand, is one of the oldest steel plants in India operated by SAIL. The plant has a capacity of 5.25 MTPA and produces crude steel using the BF-BOF route. Extensive use of coal and metallurgical coke in this process renders this route highly polluting and emission intensive.

Key findings

This health impact assessment has found clear scientific evidence that BSL has severely damaged the environment, public health, and the economy in its vicinity.

In our annual estimates using the limited data available for stack emissions, pollution from BSL caused approximately **168 (112-246) adult deaths and a loss of USD 79 (50-116) million, or INR 6.4 (4.0-9.5) billion in 2023 alone**.

The plant uses highly polluting reactor fuels including coal and coke and lacks adequate air pollution control measures in several of its stacks. The plant's technology configuration is representative of most integrated steel plants in India, therefore offering broader relevance for the overall sector.

Both pregnant women and newborns are at risk due to emissions. The emissions from the plant led to an estimated 273 (84–475) low birthweight births and 284 (137-301) preterm births.

Impact of stack emissions from Bokaro Steel Limited on the health and economy of the country *Includes confidence interval range of values
Low birthweight births
273 (84–475)
Pre-term births
284 (137-301)
New cases of asthma in children
25 (5-59)
Death among adults
168 (112-246)
Work absences (sick leave days)
123,000 (104,000-141,000)

The emissions severely compromise the respiratory health of children. Twenty-five (5–59) new cases of asthma are estimated to occur in children for each year of operation of the plant.

The air pollution from the plant can also be linked to 123,000 (104,000-141,000) days of work absences due to air pollution-related health issues. These absences represent lost productivity, disrupted workflows, and reduced economic output across multiple sectors.

Lack of data transparency and weak standards: There are no national standards for SO_2 emissions from facilities like sinter plant, mill zone, and refractory material plant in India, despite them being recognised as sources of SO_2 emissions.

BSL was also found to have old and obsolete air pollution control technology in several of its stacks for its sinter plant — the single most polluting source in the plant's total emissions.

Moreover, there is no clear evidence of any control measures for SO_2 and NO_X — both of which make the largest contribution to $PM_{2.5}$ exposure and health impacts associated with the plant.

Transport of pollution: in the immediate vicinity of the plant, BSL increases annual mean pollution concentrations by more than 1.2, 0.6, and 1.5 µg/m^3, respectively. This suggests that the steel plant is damaging for local communities.

Air pollution also has long-range impacts — $PM_{2.5}$ persists in the atmosphere for one to two weeks, meaning that it doesn't only affect local communities, but also the wider region. For instance, in cities nearby, such as Ranchi, BSL leads to increases in $PM_{2.5}$, NO_2, and SO_2 of 0.15, 0.05, and 0.2 µg/m^3, respectively. Overall, we find that the steel plant degrades air quality in both the local area, as well as in downwind regions.

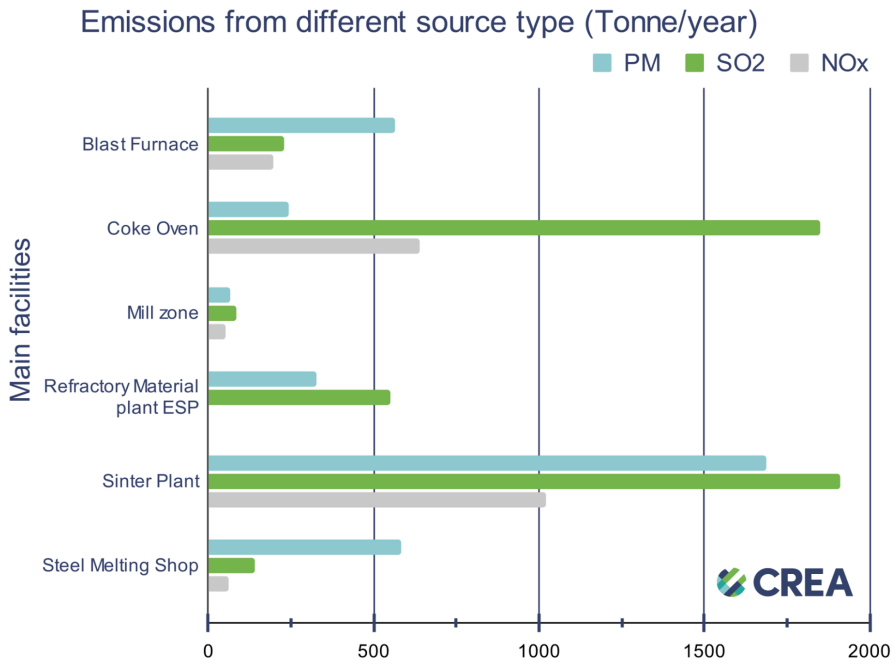

Figure 1 — BSL emissions by source type (tonne/year)

Methodology

In this study, we perform a health impact assessment (HIA) of the air pollution from BSL. To achieve this, stack emissions from different facilities within BSL — the sinter plant, coke oven, refractory material plant, blast furnace (BF), and steel melting shop (SMS) — from April 2023 to March 2024 have been used to understand the health and economic impact of the industry in its vicinity. Next, we simulate pollutant concentrations in the surrounding atmosphere by using an industry-standard air pollution model (Sicre et al., 2000). Finally, we estimate health outcomes and economic costs by combining pollutant exposure with CREA's detailed, globally implementable HIA framework (Myllyvirta, 2020), which is updated continuously based on the latest science. The general HIA approach and specific functions and data sources are all widely used by scientists and governments worldwide (Eionet Portal, 2021; EPA, 2011; Zhang et al., 2019), and are based on scientific information that has been established through the use of scientific research. It's important to note that only $PM_{2.5}$ and NO_2-associated health impacts are calculated. Health endpoints for both pollutants are calculated based on estimations from multi-pollutant models and are additive.

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This fact sheet draws from the 'Air quality, health, and economic impacts of SAIL Bokaro steel plant in India', report, published by the Centre for Research on Energy and Clean Air (CREA) in February 2026.

Find the full methodology and complete reference list in the report, which is available here.

The Centre for Research on Energy and Clean Air (CREA) is an independent research organisation focused on revealing the trends, causes, and health impacts, as well as the solutions, to air pollution. CREA uses scientific data, research, and evidence to support the efforts of governments, companies, and campaigning organisations worldwide in their efforts to move towards clean energy and clean air.

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