



Beyond the Chimney: Can Brick Kiln Pollution Reach Kashmir's Soil, Water and Food Chain?

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Brick kilns are an important part of the construction industry, but their environmental footprint may extend far beyond the places where bricks are manufactured. Smoke, ash, dust and the handling of raw materials can affect the surrounding environment. In agricultural areas, the key question is whether these activities can influence soil quality, water resources, fodder and food crops. This issue deserves particular attention in Kashmir, where agriculture and livestock farming remain closely connected to rural livelihoods. When brick kilns operate near agricultural land, assessing environmental quality requires more than looking at visible smoke. Scientific monitoring of soil, water, vegetation and agricultural products can help establish whether pollutants are accumulating and whether they pose a measurable risk.

What does recent research tell us?

A systematic review published in *Environmental Research* in 2024 examined 104 studies on brick kiln pollution and health. Of these, 74 were conducted in South Asia. Particulate matter, sulphur dioxide and carbon monoxide were among the most frequently investigated pollutants. The review also found that traditional kiln technologies generally produced higher particulate matter and carbon monoxide emissions than improved designs. However, the authors noted that limitations in study quality and exposure measurements made some health conclusions less certain. Evidence from Jammu and Kashmir is particularly relevant. A 2024 study published in *Environmental Research* analysed 200 soil samples from 50 sites in Jammu district. The researchers reported average concentrations of approximately 37.04 mg/kg for lead and 1.91 mg/kg for cadmium. Their pollution assessments suggested moderate contamination by these metals according to certain indices, although the overall Pollution Load Index remained below one. The study also identified variations in some soil parameters with distance from brick kilns. These findings are important because they demonstrate why pollution assessment should use multiple indicators. A favourable overall index does not automatically mean that every metal, every location or every possible exposure pathway is free from concern. Groundwater evidence is more nuanced. Another 2024 study investigated groundwater at 43 brick kiln sites in Jammu district. The researchers found that the overall Pollution Load Index remained below one and reported that lead, cadmium and nickel were below the analytical detection limits used in that investigation. They recommended continued monitoring to maintain groundwater quality.

Together, these regional studies show that the effects of brick kilns should not be assumed to be identical across different environmental compartments. Soil and groundwater can show different patterns, and the results from Jammu cannot automatically be applied to individual locations in Kashmir.

How could pollutants move from kilns to agricultural products?

The movement of contaminants through the environment is a process that needs to be investigated step by step.

1. Soil: Particles released during fuel combustion, brick firing, raw-material handling and transport may settle on nearby land. Some metals can persist in soil, although their mobility and availability depend on soil pH, organic matter, mineral composition and other environmental conditions.

2. Water: Rainfall and surface runoff may carry deposited particles into nearby water bodies. Groundwater contamination, however, depends on factors such as geology, soil permeability, drainage and the chemical form of the contaminant. The presence of a kiln alone does not establish that groundwater has been contaminated.

3. Fodder and grain: Plants may take up certain elements through their roots, while dust can also settle on their surfaces. Metal concentrations in fodder and grain depend on the element, plant species, soil conditions and local exposure. Measuring soil concentrations alone cannot establish the amount entering edible plant tissues.

4. Livestock: Cattle may be exposed through contaminated fodder, drinking water, soil ingestion and inhalation of airborne particles. The degree of exposure depends on the source, duration and bioavailability of the contaminants.

This pathway is scientifically plausible, but each link requires evidence. A metal detected in soil should not automatically be described as having entered milk, animal blood or human tissues.

What needs to be done?

Several practical steps can strengthen environmental protection and future research:

- Conduct periodic testing of soil, irrigation water, fodder and grain in areas surrounding brick kilns.
- Record sampling distances, wind direction, kiln activity, fuel type and seasonal variation.
- Use validated analytical methods, appropriate quality-control procedures and detection limits.
- Compare measured concentrations with relevant standards for the specific environmental or food matrix.
- Assess dietary and livestock exposure using actual concentrations and realistic intake estimates.
- Encourage cleaner kiln technologies, dust control and responsible handling of ash and raw materials.

A 2024 review of toxic metals and metalloids in food also emphasised the importance of monitoring contaminants across the food chain and implementing measures that reduce exposure.

Conclusion

Brick kiln pollution should not be judged by smoke alone. Its wider environmental significance depends on what is deposited, where it travels, how much becomes biologically available and whether people or animals are exposed at concerning levels. Recent studies from Jammu district provide a useful starting point for research in Kashmir, but they do not settle the question for every locality. Systematic measurements from soil to agricultural products and biological samples are needed to establish the actual extent of any environmental impact. For Kashmir, the goal should be evidence-based prevention: protecting productive land, maintaining safe water resources and ensuring that environmental monitoring keeps pace with industrial activity.

References

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