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Forever, Unlimited

Why India sets no limit for PFAS, the 'forever chemicals', why no standard is not the same as no exposure, and how listing them would begin to protect the people who carry them

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FOR STANDARD SETTERS, WATER UTILITIES, THE JAL JEEVAN MISSION, POLLUTION CONTROL BOARDS, FOOD REGULATORS, JOURNALISTS, AND ANYONE WHO COOKS ON A NON-STICK PAN

ABSTRACT

What are PFAS, and are they in India's water? Is there a limit? And who decided? PFAS, the 'forever chemicals', are the coatings in non-stick pans, stain- and water-repellent fabrics, grease-proof food wrappers and firefighting foam; many break down very slowly and build up in people, animals and the environment. The United States now limits two of them in drinking water to four parts per trillion each, and the European Union limits the sum of 20 to 0.10 µg/L. India sets no limit at all. We verified this instrument by instrument: the national drinking-water standard, the packaged-water regulation, the food contaminants regulation and the Jal Jeevan Mission's testing framework contain no PFAS parameter, and the Central Pollution Control Board told the National Green Tribunal in 2024 that 'there is no standard prescribed for PFAS in drinking water'. Under the Stockholm Convention, India accepts new chemical listings one by one; it has accepted seven, and not PFOS, PFOA or PFHxS. Meanwhile, researchers have found PFAS in seven rivers of southern India, in groundwater in Assam, in sediments of the upper Ganges and Chennai's Cooum, and among 55 PFAS-based pesticides tracked on Indian grapes. Forty-two years after methyl isocyanate escaped a pesticide plant in Bhopal, India still counts chemical harm after it happens: the Supreme Court's record carries three death tolls for that night, from 2,660 to 5,295, and the Act that empowers environmental standards came after the leak, not before it. The paper argues that no standard is not the same as no exposure: a country without a limit records no exceedance, and so produces no evidence that it needs one. It recommends an interim limit, a finished test method, PFAS testing in state laboratories starting where exposure is likely highest, and acceptance of the Stockholm listings, and it sets out every claim with the source read to verify it.

KEYWORDS

PFAS; PFOA; PFOS; forever chemicals; drinking water; IS 10500; Stockholm Convention; opt-in; regulation by list; India; Global South; tail-end; Tailwinds

COMPANION PAGE

Pesticide Central

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Argument

What are PFAS, and are they in India's water? Is there a limit? And who decided? These are the questions a reader asks on first hearing the phrase 'forever chemicals', and India's standards answer the second one plainly: there is no limit.

This paper makes three claims. First, India regulates PFAS in drinking water, bottled water and food not at all, and this is a verified absence, not an oversight of search. Second, the absence is a product of governance by list: India accepts additions to the Stockholm Convention's list of persistent pollutants one by one, and it has not accepted PFOS, PFOA or PFHxS. Third, no standard is not the same as no exposure. PFAS have been found in Indian rivers, groundwater, sediments and on food, and a country without a limit records no exceedance, so its silence is read as safety.

The paper opens in Bhopal. India's worst chemical disaster began at a pesticide plant, with a gas whose full composition was never known, a death toll the Supreme Court's own record gives three ways, and a law that came after the harm. PFAS are a slower, quieter case of the same pattern, and India still has the chance to write the limit before the count.

1

Bhopal, forty-two years on

On the night of 2 to 3 December 1984, a runaway reaction in Tank 610 of the pesticide plant run by Union Carbide India Limited in Bhopal released nearly 40 tons of methyl isocyanate, a chemical used there to make the insecticide carbaryl, sold as Sevin, over a densely populated city. The Indian Council of Medical Research calls it the worst chemical disaster in the world (Indian Council of Medical Research 2010).

What people breathed that night has never been fully known. The Council's own toxicology report records that the tissues of the dead held, besides the products of methyl isocyanate, 'numerous unidentified organic chemicals', and, citing a 1987 editorial, that the composition of 'the poisonous cloud actually inhaled by the people of Bhopal' was not known. Some of its results were never published, the report adds, because of legal embargoes (Indian Council of Medical Research 2010).

Nor was the number of the dead ever settled. The Supreme Court's own record carries three figures side by side: 2,660 deaths, as the Union of India stated them to the High Court in 1988; about 3,000 fatal cases, on which the Court based the 1989 settlement of US$470 million; and 5,295 deaths, in the Union's 2010 petition to reopen that settlement, which also counted 527,894 cases of minor injury where the Court had assumed 50,000. The Court dismissed the petition on 14 March 2023 (Supreme Court of India 2023). A harm that is counted only after it happens is compensated by estimate.

India's law also came after the harm. The Bhopal Gas Leak Disaster (Processing of Claims) Act was enacted on 20 February 1985 (Supreme Court of India 2023), and the Environment (Protection) Act received assent on 23 May 1986, less than eighteen months after the leak. The second Act empowers the central government to lay down 'standards for the quality of environment in its various aspects' and standards for the emission or discharge of pollutants (Government of India 1986, section 3(2)(iii) and (iv)). That power has existed for forty years; in 2024 the Central Pollution Control Board told the National Green Tribunal that no standard is prescribed for PFAS in drinking water (section 5). The Act's preamble cites the 1972 United Nations conference at Stockholm. It is a later Stockholm agreement, the 2001 Convention on persistent pollutants, whose PFAS listings India has not accepted (section 6).

Bhopal did not end with the night. An earlier judgment of the Court, quoted in 2023, already contemplated claimants 'yet unborn' whose congenital defects might be traced to methyl isocyanate (Supreme Court of India 2023). The 337 tonnes of waste left at the factory were burned only in 2025, at Pithampur, and in December 2025 the disposal of the ash was still before the High Court (Press Trust of India 2025, reported).

PFAS are not a Bhopal. They come as no cloud and kill no one overnight; they cannot be seen in a glass of water, and finding them takes a laboratory that measures parts per trillion. The governance follows the same pattern, though: a chemical whose effects were not known in advance, a count made after the fact, a law written after the harm, and a burden that outlasts the event. Bhopal was a pesticide plant, and PFAS are now among the pesticides found on Indian food (section 3). The rest of this paper asks whether India needs to wait for a count before it writes a limit.

2

What PFAS are, in everyday terms

PFAS are a large family of synthetic chemicals. The United States Environmental Protection Agency lists where people meet them: non-stick cookware; stain- and water-repellent treatments on carpets, upholstery, clothing and other fabrics; grease-resistant paper, fast-food containers and wrappers, microwave popcorn bags, pizza boxes and candy wrappers; certain shampoos, dental floss and cosmetics; and the aqueous film-forming foams used to put out fuel fires. Many 'break down very slowly and can build up in people, animals, and the environment over time' (US EPA 2026c). In an Indian kitchen, that means the non-stick tawa and kadai; in an Indian street, the raincoat, the takeaway wrapper and the pizza box.

Some pesticides are PFAS too. A 2026 review counted 55 PFAS-based pesticides in residue monitoring of Indian grapes from 2014 to 2025, including fipronil and lambda-cyhalothrin, and found that a few exceeded safety thresholds in less than 0.1 percent of samples (Gunjal et al. 2026). The line between a pesticide paper and a PFAS paper is thinner than the regulations assume.

3

What has been found in India

The record is short, recent and nearly all academic. Across seven major rivers of southern India, the mean sum of 16 PFAS was 96.9 ng/L along urban stretches, about seven times the 13.5 ng/L along suburban and rural stretches, and PFOS exceeded the European environmental quality standard for surface water (Pavithra et al. 2026). In groundwater, a vital source of drinking water in the Kamrup region of Assam, 12 PFAS were detected (Sharma et al. 2024). In sediments of the upper Ganges and the Ganges Canal, 16 PFAS were detected, and the extractable organic fluorine rose fivefold along the stretch studied, with the PFAS that laboratories target accounting for at most 1.3 percent of it (Müller et al. 2026). In Chennai, sediment cores from the Cooum River showed PFAS rising after the 2015 flood, which the authors read as evidence of 'ongoing production and use of PFAS in India' (Yamazaki et al. 2025).

The state's own submission to the National Green Tribunal cites drinking-water figures from South India: PFOA rising from below 0.005 ng/L in 2008 to 2 ng/L in 2015, and PFOS from below 0.033 to 1 ng/L, which it relates to a shift of industrial production toward countries such as China and India (Central Pollution Control Board 2024). Two nanograms per litre of PFOA is half the United States limit. The same submission reports a 2022 finding, prepared for the environment ministry, that PFAS concentrations in India are 'relatively lower than those in other countries'. Lower than elsewhere, measured where and how often, is the question this paper's companion on India's waters asks of pesticides (Ramprasad 2026).

4

What others have set

The United States regulates PFOA and PFOS in drinking water at 4.0 ng/L each, three further PFAS at 10 ng/L, and a mixture of four through a hazard index; systems must test quarterly wherever a regulated PFAS exceeds a trigger level, and compliance with the limits is due by April 2029 (US EPA 2026a). In May 2026 the EPA proposed to keep the limits for PFOA and PFOS while letting systems apply for two more years, to 2031, and separately proposed to rescind the limits for PFHxS, PFNA, HFPO-DA and the mixture (US EPA 2026b). The European Union limits the sum of 20 PFAS to 0.10 µg/L, and all PFAS together to 0.50 µg/L once methods are agreed, from 12 January 2026 (European Union 2020). The World Health Organization's 2022 guidelines contain no PFAS guideline value (WHO 2022).

Four nanograms per litre is four parts per trillion, about four seconds in 7,900 years; one gram of PFOA would bring 250 million litres, about 100 Olympic swimming pools, to the United States limit.

5

What India has set

We read each Indian instrument for a PFAS parameter. India's drinking-water standard, IS 10500:2012, has none (Bureau of Indian Standards 2012). The packaged-water regulation, which holds bottled water to 0.1 µg/L for each pesticide, has none; neither does the full regulation on contaminants, toxins and residues in food, in the compendium of 3 February 2026 (Food Safety and Standards Authority of India 2011; 2026). The Jal Jeevan Mission's testing framework, which lists every parameter its laboratories test, has none (Ministry of Jal Shakti n.d.).

The state has said so itself. Asked by the National Green Tribunal about PFAS in Chennai's lakes, the Central Pollution Control Board replied on 27 August 2024 that 'there is no standard prescribed for PFAS in drinking water by Bureau of Indian Standard in Indian standard (IS 10500:2012)'. It described a 'first step': the adoption of three ISO methods, a specification for laboratory water, guidance on designing sampling programmes and a statistical method for calibration, none of them specific to PFAS. A dedicated Indian method for PFOS and PFOA, IS 3025 Part 72, has been listed as a draft under development since 2020. The Board added that a national inventory of manufacturing and use, including PFAS, was under way (Central Pollution Control Board 2024).

INSTRUMENT	PFAS PARAMETER?	HOW WE CHECKED
IS 10500:2012, drinking water	None	Full text searched; confirmed by the Central Pollution Control Board, 27 August 2024
Packaged drinking water, regulation 2.10.8	None	Compendium chapter 2.10 read; pesticides capped at 0.1 µg/L each, no PFAS
Food contaminants, toxins and residues regulation	None	Compendium of 3 February 2026 searched for PFAS, PFOS, PFOA, perfluoro
Jal Jeevan Mission testing framework	None	Parameter tables, pp. 91–92, read
Test method for PFOS and PFOA	Draft only	IS 3025 Part 72, listed as under development since 2020
Stockholm Convention listings of PFOS, PFOA, PFHxS	Not accepted by India	Convention secretariat's ratification records for India

6

Governance by list

Why does India have no limit? Part of the answer is a mechanism few people outside chemical diplomacy have heard of. The Stockholm Convention eliminates or restricts persistent organic pollutants by listing them in its annexes, and most parties are bound by new listings automatically unless they object. India is an opt-in party: a new listing binds it only once it accepts that listing. India became a party in 2006. Of the chemicals added since, it has accepted seven, all in force for India from 17 March 2021. It has not accepted PFOS (listed in 2009 and again in 2019), PFOA (2019) or PFHxS (2022), nor lindane, alpha- and beta-HCH, endosulfan or dicofol (Stockholm Convention Secretariat 2026).

Lists govern in strange ways. Kinniburgh and colleagues show that private agricultural standards copy the Rotterdam Convention's list into their own lists of banned substances, so that adding a chemical to the treaty triggers private bans as well; the effect is to make states more reluctant to list, a 'confounding interaction' in which stricter private rules impede the treaty (Kinniburgh et al. 2023). Donley shows how far national lists diverge: 72 pesticides approved for outdoor farm use in the United States are banned or being phased out in the European Union, and pesticides banned in the Union account for more than a quarter of American agricultural use (Donley 2019). Shattuck traces the industry behind the lists, now a generic trade largely produced in China and India, with commodity chains and environmental impacts that are 'less legible' (Shattuck 2021; Berndt et al. 2025). India's own lists show the same split: within a month of proposing to ban 27 insecticides in 2020, the government amended the draft to let firms keep making them for export (Ministry of Agriculture and Farmers Welfare 2020).

A list is a decision about whose water counts. A chemical off the list is a chemical no one is required to test, and a chemical no one tests produces no evidence that it should be listed.

Who carries it

The burden is unlikely to be even. The southern rivers study found PFAS about seven times higher along urban stretches than rural ones (Pavithra et al. 2026). Children carried the highest estimated hazard in Assam's groundwater (Sharma et al. 2024). The people likely to be most exposed are those who work with PFAS and live beside the places they are made, used or burned; India's national inventory of those places has been under way since at least 2024 and is not public (Central Pollution Control Board 2024). The households that cannot buy filtered or bottled water have no limit to appeal to, and the bottled water they cannot buy has none either.

What would settle it

The recommendation has five parts.

1. **Set an interim limit now.** Write a PFAS value into IS 10500 and the packaged-water regulation, using the European sum of 20 PFAS at 0.10 µg/L as a floor until India sets its own.
2. **Finish the method.** Complete IS 3025 Part 72, a draft since 2020, and equip state laboratories with the instruments to run it.
3. **Test the tail first.** Add PFAS to the Jal Jeevan Mission's state-laboratory panel, beginning with drinking-water sources near manufacturing, use and disposal sites, urban river stretches and groundwater-dependent households.
4. **Accept the listings.** Accept the Stockholm Convention's listings of PFOS, PFOA and PFHxS, so that India's obligations match the chemicals it already carries.
5. **Publish the inventory.** Release the national inventory of PFAS manufacture and use and the 2022 report prepared for the environment ministry, so that monitoring can follow the sources.

What would overturn this argument is stated in advance: an Indian standard or regulation, in force, that sets a PFAS limit for drinking water or food, or a systematic national survey, with published detection limits, that finds PFAS consistently below the United States limit.

How we verified it

Every claim of absence in this paper was checked in the primary document, and every number in the source that first reported it. Table 2 lists each check, the document read, and the result. A claim we could not read in the original is marked as such.

CLAIM	SOURCE READ	RESULT
Bhopal: nearly 40 tons of MIC from Tank 610 of a pesticide plant, 2 to 3 December 1984	ICMR 2010, technical report on pathology and toxicology, introduction and summary	Verified
Composition of the cloud never known; unidentified chemicals in tissues; results under legal embargo	ICMR 2010, introduction	Verified
Deaths recorded as 2,660 (1988), about 3,000 (1989 settlement) and 5,295 (2010 petition)	Supreme Court of India, Curative Petition (C) 345-347 of 2010, order of 14 March 2023	Verified
Environment (Protection) Act: assent 23 May 1986; power to set quality and discharge standards	Act No. 29 of 1986, Gazette text, section 3(2)(iii) and (iv)	Verified
337 tonnes of factory waste incinerated at Pithampur in 2025; ash disposal pending	Press Trust of India, 2 December 2025, and other press	Reported; court orders not read
India has no PFAS limit in drinking water	IS 10500:2012; CPCB reply to NGT, O.A. 548/2024, 27 Aug 2024	Verified
No PFAS limit in bottled water or food	FSSAI compendium ch. 2.10; contaminants regulation compendium, 3 Feb 2026	Verified
Not in the Jal Jeevan Mission panel	Framework, pp. 91–92	Verified
The 'first step' was three general ISO methods	CPCB reply, para 6	Verified
India accepted 7 Stockholm listings, not PFOS, PFOA, PFHxS	Stockholm Convention secretariat records, accessed 17 Oct 2026	Verified
US limits 4.0 ng/L for PFOA and PFOS; compliance April 2029	40 CFR Part 141, Subpart Z, in force 1 Sep 2026	Verified
EPA proposal to extend to 2031	EPA page on the proposed rule, May 2026	Verified
EU limit 0.10 µg/L for 20 PFAS from 12 Jan 2026	Directive (EU) 2020/2184	Verified

CLAIM	SOURCE READ	RESULT
WHO 2022 guidelines have no PFAS value	WHO 2022, full text searched	Verified
Everyday products containing PFAS	US EPA, human health and environmental risks of PFAS	Verified
Southern rivers: urban mean 96.9 ng/L, about seven times rural	Pavithra et al. 2026, abstract	Verified (abstract)
Assam groundwater: 12 PFAS detected	Sharma et al. 2024, abstract	Verified (abstract)
Upper Ganges sediments: targeted PFAS at most 1.3% of organic fluorine	Müller et al. 2026, abstract	Verified (abstract)
South Indian drinking water PFOA 2 ng/L in 2015	As cited by CPCB from Selvaraj et al. 2021	Reported; original not read
55 PFAS-based pesticides on Indian grapes	Gunjal et al. 2026, abstract	Verified (abstract)
Private standards impede treaty listing	Kinniburgh et al. 2023, abstract	Verified (abstract)
72 US-approved pesticides banned or being phased out in the EU	Donley 2019, abstract	Verified (abstract)
Low-income pesticide use substantially underestimated	Shattuck et al. 2023, title only	Not read in full

Privacy and use

This paper uses published standards, regulations, treaty records and peer-reviewed studies. It names no household, worker or site.

11

Limits of this paper

We read the instruments in force on 17 October 2026 and may have missed a state-level rule, a sectoral effluent standard or an amendment not yet published online. The Indian measurements are few and use different compounds, matrices and methods, so they cannot be added together or compared directly with drinking-water limits. Several studies were read at the level of their abstracts. The Global Pesticide Use and Trade database (Shattuck et al. 2023), which reports that pesticide use trends in low-income countries are substantially underestimated, was available to us by title only.

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