

Having spent nearly Rs 13.7 billion on 136,985 railway bio-toilets—criticised for being “no better than septic tanks”—and after earmarking Rs 2.5 billion to install [bio-toilets](#) on remaining trains by March 2019, the railway ministry is now considering “upgraded” vacuum [bio-toilets](#) at a cost of Rs 62.5 billion.

“We have started experimenting with vacuum [bio-toilets](#) like those in an aeroplane,” Railway Minister Piyush Goyal [told PTI](#). “Some 500 vacuum bio-toilets have been ordered and once the experiment is successful, I am willing to spend money to replace all the 250,000 toilets in the trains with vacuum bio-toilets.”

Vacuum toilets, which cost around Rs 250,000 per unit, will be odour-free, will cut down water use by 1/20th and have fewer chances of getting blocked, he added.

This takes the cost to Rs 62.5 billion.

In addition, vacuum toilets will need to be emptied and cleaned in rail yards.

As of May 31, 136,965 bio-toilets have been fitted in 37,411 coaches, at a cost of around Rs 100,000 per toilet, according to railway ministry officials quoted by the *PTI*. This brings the expenditure to about Rs 13.7 billion.

There is a plan to install bio-toilets in around 18,750 more coaches by March 2019, when all the coaches of the [Indian Railways](#) will be fitted with such toilets, costing the national transporter around Rs 2.50 billion, the *PTI* release added.

The technology—and the criticism

[Indian Railways](#) are often described as the world’s biggest toilet: They eject around 3,980 tonnes of faecal matter—the equivalent of 497 truck-loads (at 8 tonnes per truck)—onto rail tracks every day, according to a [report](#) released by the Comptroller and Auditor General (CAG) in 2013.

Bio-toilets are small-scale sewage-treatment systems beneath the toilet seat: Bacteria in a compost chamber digest human excreta, leaving behind water and methane. Only the water, disinfected later, is let out on the tracks. That’s how they were supposed to work.

But, signs of failure came early.

In 2007, an experts committee headed by Vinod Tare, a professor at Indian Institute of Technology, Kanpur, had concluded that bio-toilets developed by the Defence Research and Development Organisation (DRDO) were not workable. “Yet, the [Indian Railways](#) went ahead with the decision to proliferate this model,” Tare told **IndiaSpend** in this January 7, 2018, [interview](#).

Sanitation experts and various studies—including commissioned by the railways—have pointed out that most of the new “bio-toilets” on Indian trains are ineffective or ill-maintained and the water discharged no better than raw sewage, as **IndiaSpend** [reported](#) on November 23, 2017.

Lokendra Singh, former director of the Defence Research and Development Establishment (DRDE), had, after an expedition to Antarctica, brought home psychrophilic bacteria that can survive in extremely low temperatures. The bacteria were mixed with cow dung and normal soil, which have methogens (microorganisms that produce methane) capable of breaking down human excreta. This was then supplied to the manufacturers of rail bio-digesters.

Singh's claims of a scientific breakthrough were questioned: The bacterium did not have independent third-party certification, the Defence Research and Development Organisation (DRDO) did not have a patent for the design and manufacture of bio-toilets, and once the tank is filled, human excreta is allowed to drop down onto the tracks.

A December 2017 [report](#) of the Comptroller and Auditor General on these bio-toilets echoed the findings of our November 2017 [investigation](#) into their widespread malfunctioning: The CAG found 199,689 defects in 25,000 toilets. Some major issues were:

- Highest number of problems/ defects (41,111) found at the Bengaluru coaching depot, followed by Gorakhpur (24,495) and Wadi Bunder (22,521);
- Complaints per bio-toilet were highest at the Bengaluru coaching depot (98), followed by Wadi Bunder (32), Rameshwaram (28) and Gwalior (17);
- Of the 102,792 instances of choking, 10,098 (10%) cases reported in March 2017;
- Of the 102,792 cases of choking in 25,080 bio-toilets, the highest (34%) were reported from Bengaluru. This implied that one bio-toilet got choked 83 times a year;
- Choking incidents have risen from 2015-16: One bio-toilet got choked four times a year during 2016-17.

Responding to the CAG findings, the railway ministry said its criticism was “not correct” and that “some problems of choking were occurring on account of misuse of toilets by passengers”.

An official note from December 20, 2017, said: “These issues are being dealt with promptly.”

The denial

The railways ministry responded to our November 2017 investigation, pointing out what it calls “factual inaccuracies” and a lack of “technological understanding”. We had published the rejoinder verbatim, with our response:

- The ministry said the IIT Madras study was conducted “on stationary toilets on selected 15 field installed units and 6 units installed at IIT Madras Campus with bio-digesters based on [DRDO](#) technology”, and not on railway coaches. “There is absolutely no difference,” professor Ligy Philip of IIT Madras had told us. “The same technology and the same bacteria is being used for both the land-based and the train bio-digesters.”

- “It is not correct to say that bio-toilets in coaches are ineffective or ill-maintained,” the ministry said, adding that periodic tests are conducted to ensure that the discharged water meets specific norms. However, agenda papers of a Railway Board meeting in October 2017 showed that bio-toilets have not passed the performance tests.
- “DRDE has more than a dozen national and foreign patents not only on the basic technology but also on the bio-digester fitted in railway coaches,” the ministry said. However, the patent is for engineering and septic tank design. There is no mention on the use of the Antarctica bacteria to aid the bio-digestion process.
- The ministry said that a memorandum of understanding (MoU) was signed with the [DRDO](#) in March 2010. However, the patent for engineering and septic tank design was awarded in 2015—five years after the MoU for supply of bio-toilets was signed.

The policy U-turn

As a possible solution, **IndiaSpend** had offered the ‘zero-discharge toilets’ developed by IIT Kanpur.

“IIT Kanpur developed ‘zero-discharge toilets’ which have a separator to segregate the solid matter of human excreta from the liquid portion,” Tare, the professor, told us. “The liquid portion, after treatment, can be used for flushing, while the solid waste can be evacuated at junctions with the aid of assembly suction pumps. Human excreta—mixed with cow dung—could subsequently be used for vermi-composting.”

The railway ministry rejected this solution saying the system “involves installation of ground handling facility to evacuate retention tanks at the terminals”.

“This involves huge infrastructure cost, man-power, terminals are landlocked, inter-track distance is not uniform everywhere,” the ministry said. “Whereas, in IR-[DRDO](#) system, waste is treated on-board itself and thus no ground infrastructure is required. Thus, IR-DRDO bio-toilets being proliferated over IR, is a better solution.”

Vacuum toilets, such as those used in aeroplanes, as we said, will need evacuation facilities and treatment plants—which will come at an additional cost to the Rs 62.5 billion likely to be spent on replacing the bio-toilets.

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