Preface

It would not be wrong to say that the technology of toilets — an equipment to handle human excreta in a safe and hygienic manner — has been the least researched in the world. It is clear we need technologies for diverse ecosystems which can meet the twin objectives of equity and sustainability. This would require toilets to be engineered or re-engineered so that they can be made affordable, as well as capable of reusing and recycling the excreta that is generated.

The current technology of sewage management uses water to flush and dilute. It is centralised, capital-intensive and mostly unaffordable for the vast newly growing areas of the world. This, when human excreta is nutrients, which can be returned to the land but is dumped instead into our water bodies. Human kidneys are nitrogen factories: urine is a cheap and rich source of nitrogen, which does not contain the pathogens found in faecal waste. This resource, desperately needed to fertilise land, is wasted. Similarly, phosphorous is a scarce resource, and the focus of today's intense geopolitical conflict. In the current sewage management system, nature's nutrient cycle — in which nutrients collected from the land are returned back to the land — is broken. Instead of going back to the land, these nutrients are dumped in water, leading in turn to pollution and eutrophication. The loop of nutrients — from land to land — needs to be closed once again.

The problem with human excreta is the pathogens it contains: enterovirus, salmonella, shigella, faecal coliform and others. This cocktail of germs is what makes human excreta so deadly. The advantage is that this bacteria — unlike its chemical counterpart — is biodegradable. It needs the sun to burn it and the soil to degrade it. The question is, how quickly and effectively can the pathogens be destroyed?

Why we need to reinvent?

The truth about 'where there are humans there will be excreta' needs to be enjoined with some hard facts. One, investment in sewage must match the investment in water supply. Two, pollution control is not possible without investment in sewage systems — to convey waste and then to treat it before disposal and reuse. Three, if the waste of all is not treated, then pollution control will not work. In other words, sewage facilities must be extensive; they must reach all people and intercept the waste of all for treatment. Otherwise, treated sewage — and it is expensive to build sewage treatment plants and it costs to run them — will be mixed with untreated sewage. The end result will be (and is) pollution.

India has a huge backlog of sewage facilities to build. In most cities, settlements have grown without underground drainage infrastructure. 'Fitting' in the sewage lines into already built, crowded, congested and haphazard construction is a difficult task. This challenge is compounded by the fact that even where sewage lines exist, they are already buried, broken or choked. Worse, nobody really knows the state of disrepair. But even as the old needs repair, there is much more that needs to be newly built as cities sprawl out of control.

Bengaluru, a city with a well-managed water and sewage utility, metered water supply and high order of investment speaks of the crisis of not being able to keep pace with excreta's growth costs. The city has 3,610 km of sewage lines and has built 14 sewage treatment plants; all variations of treatment technologies have been installed here. The rough estimation is that the city generates some 800-1,000 million litre a day (MLD) of sewage, while the installed capacity to treat is roughly equivalent — some 721 MLD. In other words, on paper, it would be an ideal city. It has high tariffs, 100 per cent metered supply, high recovery of its dues, 100 per cent water supply and substantial investment in sewage infrastructure.

But there is a fatal missing link. Bengalaru's sewage treatment plants only receive some 300 MLD of sewage! In other words, less than half the sewage is trapped and less than half is treated. The city now estimates that it will have to double its current network — build over 4,000 km of underground sewerage lines to join the missing links. This is when the city is also expanding: more investment is needed to supply water and to take back sewage. It is no wonder then that its rivers and lakes remain polluted. Worse, nitrate levels in groundwater are increasing, which is dangerous for health.

What is worrying is that Bengaluru is the country's best practical example. Other cities do not even have the beginnings of a sewage network, let alone systems of taking back the waste.

In this situation, pollution control is a near impossible task. It can only work when the method of controlling pollution is changed — it does not wait for sewage to be first intercepted through underground drainage and it does not treat pollution as waste, but as a resource.

The fact is that Indian cities have the opportunity to reinvent sewage paradigms, simply because they have not yet built the infrastructure. They can leapfrog into new ways of dealing with excreta, which are affordable and sustainable.

How? This reworked excreta journey is the real water-waste agenda for the future. It will involve doing much that is innovative and much that has never been tried before. But the principle has to be to cut the cost of building the sewage system, cut the length of the sewage network and then to treat the waste as a resource — turn sewage into water for drinking or irrigation or use in industry.

But the alternative technology for toilets and sewage must not be relegated to small systems for the poor. If alternative toilets are designed for the poor and unreached only, then the trajectory of sanitation will continue — the flush being at the pinnacle of this ladder. We have to remember that it is the rich person's flush that is the biggest environmental culprit today. This is what needs to be reinvented.

What do we need to do?

There are many variations of this bioremediation system and many are being tried out with success. There is no doubt that this technology will work. The question is how these systems built on the principle of closing the nutrient loop will be scaled up to treat the waste of aan entire city. This is the challenge that could well make or break country's future quest on health and water.

Our toolkit is an attempt to put together the new knowledge so that we can build a new generation of innovators and providers. It is clear that this new generation sewage technology will not work unless it gets validated in terms of effectiveness and cost. This requires technology providers and practitioners of the idea of decentralised sewage treatment systems to be open to scrutiny; to do research on the inlet and outlet parameters; and most importantly, to look critically at how such technologies, used and operated in stand-alone institutions, can be up-scaled and disseminated.

It is here that we must also begin to understand the concept of up-scaling differently. These technologies are based on two important principles — devolving levels of application so that sewage can be treated at affordable costs, without costs of pumping large distances and the treated sewage can be reused and recycled locally.

These principles must guide application. The aim is not to be dogmatic about a particular technology. The aim is to be dogmatic about the objectives of the technology. Only then will we see a million flowers of innovation bloom.

This is the key aim of this toolkit. We must begin to practise this change on the ground. Only then will the future change.

Sunita Narain