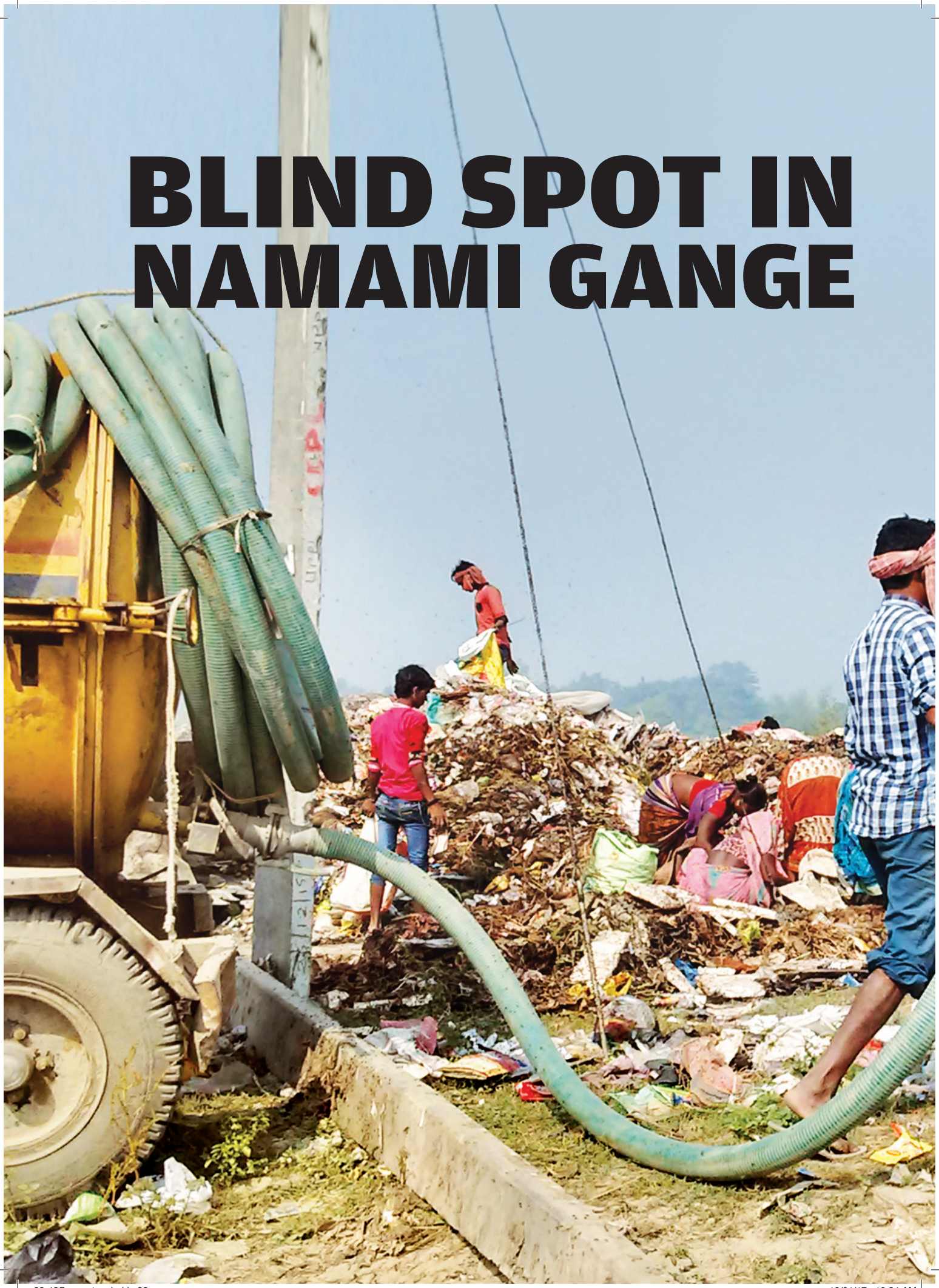
BLIND SPOT IN NAMAMI GANGE



ANIL YADAV / CSE

Two flagship programmes of Prime Minister Narendra Modi are working at cross-purposes. By 2019, when Swachh Bharat Mission comes to an end, some 30 million septic tanks and pits would have been dug along the Ganga. These tanks and pits would produce 180 million litres of faecal sludge every day, which will eventually find its way into the Ganga, defeating Namami Gange. It's time the Central, state and local sanitation programmes recognised faecal sludge management as a priority to ensure a clean Ganga

RESEARCH BHITUSH LUTHRA, SHANTANU KUMAR PADHI, ANIL YADAV, AMRITA BHATNAGAR, BHAVIK GUPTA AND AISHWARYA VARADHARAJAN

REPORTING ANUPAM CHAKRAVARTTY

In Bihar's Katihar town most people have toilets with septic tanks. The urban local body collects septage and simply dumps it in the landfill at Udma Rekha

WINTERS ARE extremely hectic for Sushma Patel, a vegetable grower in Uttar Pradesh's Chunar town. Her farm is in the fertile plains of Ganga where people grow three crops a year. But this is the only season when she can grow vegetables. And before that, she needs to manually dig out shreds of plastic and wrappers from her one-hectare (ha) farm. "This is all because of the nullah," she says, pointing at an open drain that runs through her field, carrying sewage from the neighbourhood to the Ganga. "Every monsoon, the drain overflows and inundates the field with a thick, black sludge and plastic debris. We cannot even go near the field as the stench of sewage fills the air," she says. But Patel has no one to complain to as this is the way of life for most people in this ancient town.

About 70 per cent of the people in Chunar depend on toilets that have on-site sanitation, such as septic tanks and pits. In the absence of a proper disposal or management system, people simply dump the faecal sludge and septage in storm water drains running across the town. These 27 drains eventually discharge the untreated sewage into the Ganga and its tributary, the Jargo. On the way, they contaminate the groundwater and farmlands.

Such rampant discharge of untreated sewage into the Ganga prompted the National Green Tribunal (NGT) to issue show cause notices on May 18, 2016, to Chunar and four other municipalities —Mirzapur, Bhadohi, Fatehpur and Hastinapur— in Uttar Pradesh. NGT had asked the municipalities to submit their plans to prevent untreated sewage flowing into the river.

Officials are since scrambling to abate the flow of sewage into the Ganga. "We have identified 10 ha along the Ganga to set up a sewage treatment plant (STP) with a capacity of treating 8 million litres of sewage a day (MLD). At present, Chunar generates 6 MLD of domestic sewage which goes directly into the river untreated," says Shamsher Singh, sanitation inspector of Chunar Municipal Corporation. "We also plan to set up pumping stations at four places. These will intercept the drains and send the sewage to the proposed STP," Singh says. But there is a problem. The town is surrounded by hills, which makes transportation of sewage to the proposed STP difficult. For instance, a huge drain passes through Aawas Colony, located at the foot of a hill. The municipal council plans to set up a pumping station along the drain. But it is not sure whether the station will be able to pump

VIKAS CHOUDHARY / CSE

the sewage across the hill to the proposed STP.

Chunar, Mirzapur, Bhadohi, Fatehpur and Hastinapur are not the only towns along the Ganga struggling to manage their faecal load. Researchers with Delhi-based non-profit Centre for Science and Environment (CSE) say a major portion of the sewage generated by all the settlements along the 2,500-km-long bank of the Ganga ends up in the river—without any treatment.

The sheer volume of the untreated sewage flowing into the Ganga can be gauged from the fact that 25 per cent of the 400 million people living along it depend on on-site sanitation; there are at least 18 million septic tanks and 10 million pit latrines around the main stream of the Ganga, according to the Census 2011. More often than not people dispose of faecal sludge from these tanks and pits without any treatment.

A report on the pollution load in the Ganga, prepared by the Central Pollution Control Board (CPCB) in 2013, states that more than 6,087 MLD of wastewater flows into the Ganga from 138 drains. Experts say domestic sewage is a major constituent of this wastewater. The five states through which the main stream of the Ganga flows—Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal—have the capacity to treat only 1,208 MLD of sewage. Not to mention the

Every day, more than 6,000 million litres of wastewater flows into the Ganga from 138 drains. Faecal sludge, with an equal pollution load, will flow into the river after settlements on its banks achieve open defecation-free status

Ganga is also a receptacle of 501 MLD of industrial wastewater.

The situation is only going to get worse with the implementation of Swachh Bharat Mission, the flagship programme of the Union government that aims to achieve an open defecation-free India by October 2, 2019. Under the mission, the government plans to construct 1.52 million toilets in rural areas along the Ganga and 1.45 million toilets (this includes private and public toilets) in cities that dot the river banks. These toilets will be built with four on-site sanitation technologies—septic tank, twin pits, biotoilet or biodigester. This means by 2019, over 30 million tanks or pits would have been dug along the Ganga.

A back-of-the-envelope calculation by CSE shows these tanks and pits will produce 180 MLD of faecal sludge and septage. In the absence of a proper management system, this waste will eventually find its way into the Ganga (see 'Ganga in peril', *p36*). Pollution concentration in 180 MLD of septage is equivalent to that of 6,000 MLD of sewage.

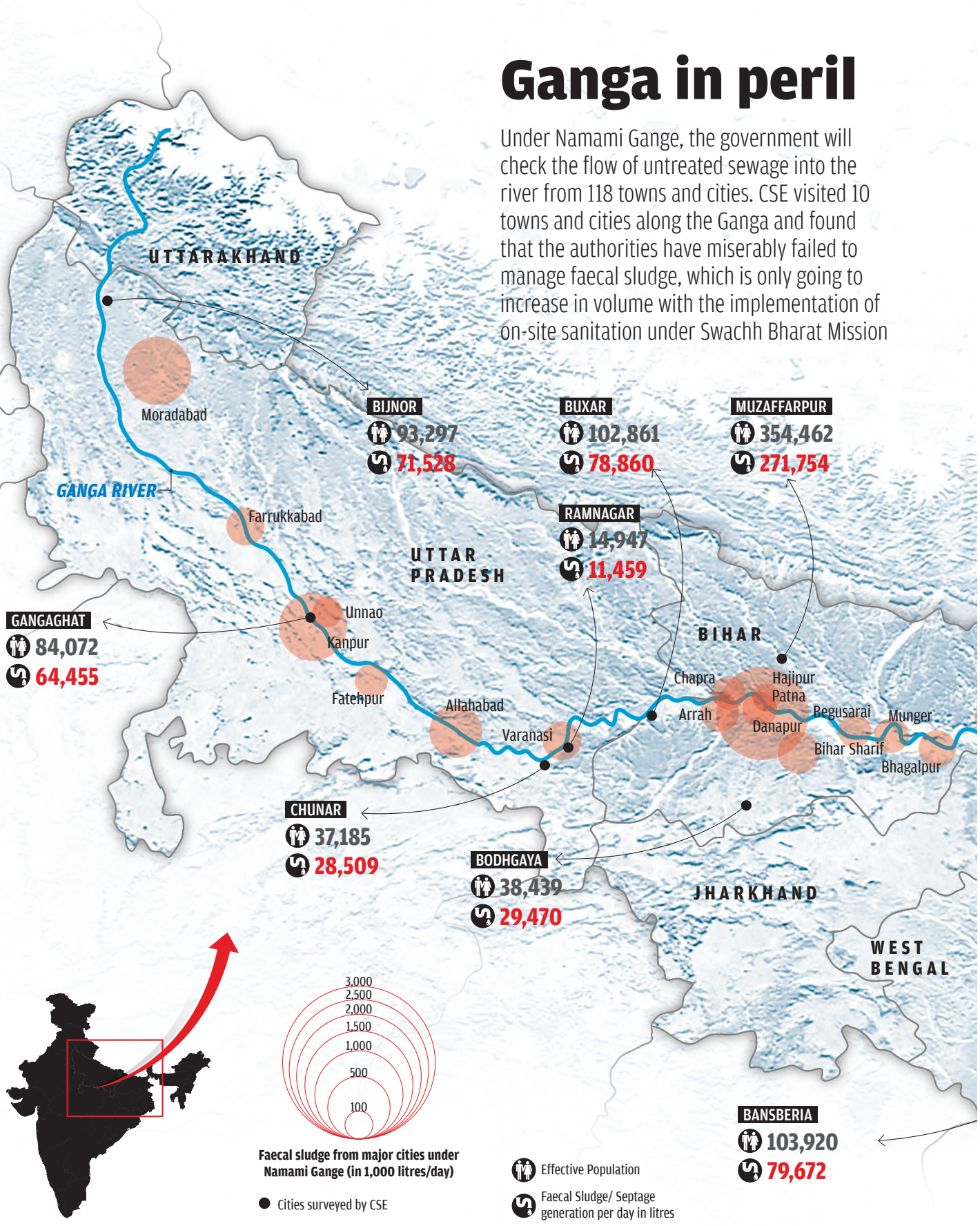
The finding of CSE is alarming because the impact of the increasing number of toilets without any provision to treat the sludge is palpable across the Ganga. The level of faecal coliform, which indicates the extent of excreta in water, is increasing in the Ganga, and goes beyond the acceptable limit as the river crosses Kanpur in Uttar Pradesh, states the CPCB report. "High coliform levels make the water unsuitable for bathing and drinking," says Javier Mateo Sagasta, senior researcher with the International Water Management Institute (IWMI), India.

"Unfortunately, faecal sludge and septage management do not find a mention in sanitation programmes like Swachh Bharat Mission," says Suresh Kumar Rohilla, programme director of urban water management unit at CSE.

The load of faecal sludge and septage from millions of toilets, which are being installed along the Ganga under Swachh Bharat Mission, may defeat the government's ambitious Namami Gange (National Mission for Clean Ganga). Though the mission has identified varied projects, right from modernisation of *ghat*s to construction of toilets and STPs in 118 target towns and cities, to arrest pollution in the river, it too gives faecal sludge and septage management a miss. "We plan to set up STPs to take care of sewage as well as faecal sludge," says Shashi Shekhar, secretary with the Union Ministry of Water Resources, River Development and Ganga Rejuvenation. As of now, Namami Gange focuses on treatment of sewage, that too only from class-1 cities (that have over 100,000 population).

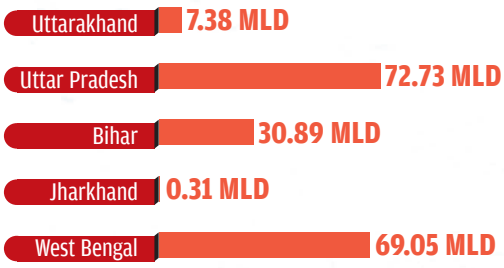
Ganga in peril

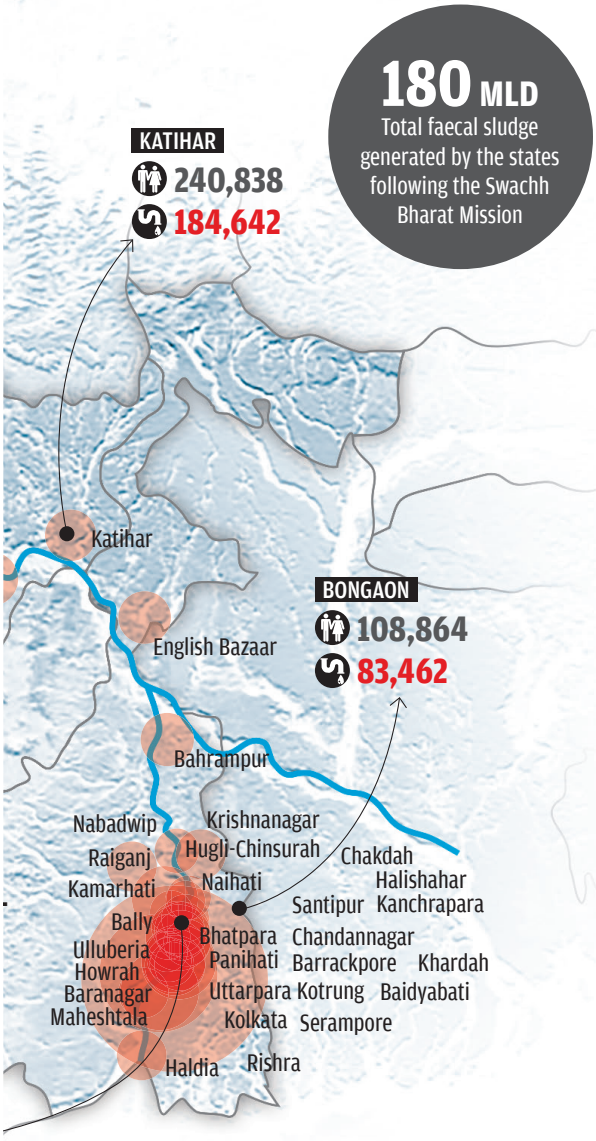
Under Namami Gange, the government will check the flow of untreated sewage into the river from 118 towns and cities. CSE visited 10 towns and cities along the Ganga and found that the authorities have miserably failed to manage faecal sludge, which is only going to increase in volume with the implementation of on-site sanitation under Swachh Bharat Mission



Load of Swachh Bharat Mission

Faecal sludge to be produced by states along the Ganga on going open defecation-free





Prepared by DTE/CSE Data Centre
Infographics: Raj Kumar Singh; Analysis: CSE Water Team
Data source: Various sources
For more such infographics visit: *www.downtoearth.org.in/infographics*

So far, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is the only programme that requires cities to submit sewage and septage management plan. But it fails on two counts. First, AMRUT is restricted to class-1 cities. Second, it monitors urban local bodies' performance based on their sewerage coverage. This discourages the authorities to prepare septage management plan.

"All Central, state and local programmes should recognise faecal waste management as a priority action area along the ongoing efforts to achieve healthy and clean cities in the Ganga basin," says Rohilla. This is particularly important because a survey of cities along the Ganga shows that the authorities have miserably failed to manage their faecal waste.

Between October and November, CSE researchers visited 10 small- and medium-sized cities in Uttar Pradesh, Bihar and West Bengal that provide a snapshot of settlements across the Ganga basin. And the findings are startling. Of the 10 town and cities surveyed, only two (Ramnagar and Bijnor) have sewer lines. But they defeat the purpose as the authorities are yet to set up STPs. At least 60 per cent households in all the 10 towns and cities have toilets with on-site sanitation. But faecal sludge from these facilities are randomly dumped in vacant land, open drains, landfills and near water bodies. In West Bengal's Bansberia and Bongaon cities, the authorities are in a fix. Almost all households in these cities have built toilets under Swachh Bharat Mission. "We have no idea how to dispose of the enormous volume of sludge these tanks and pits will produce in the coming years," says Jagabandhu Saha, an official with Bongaon municipality.

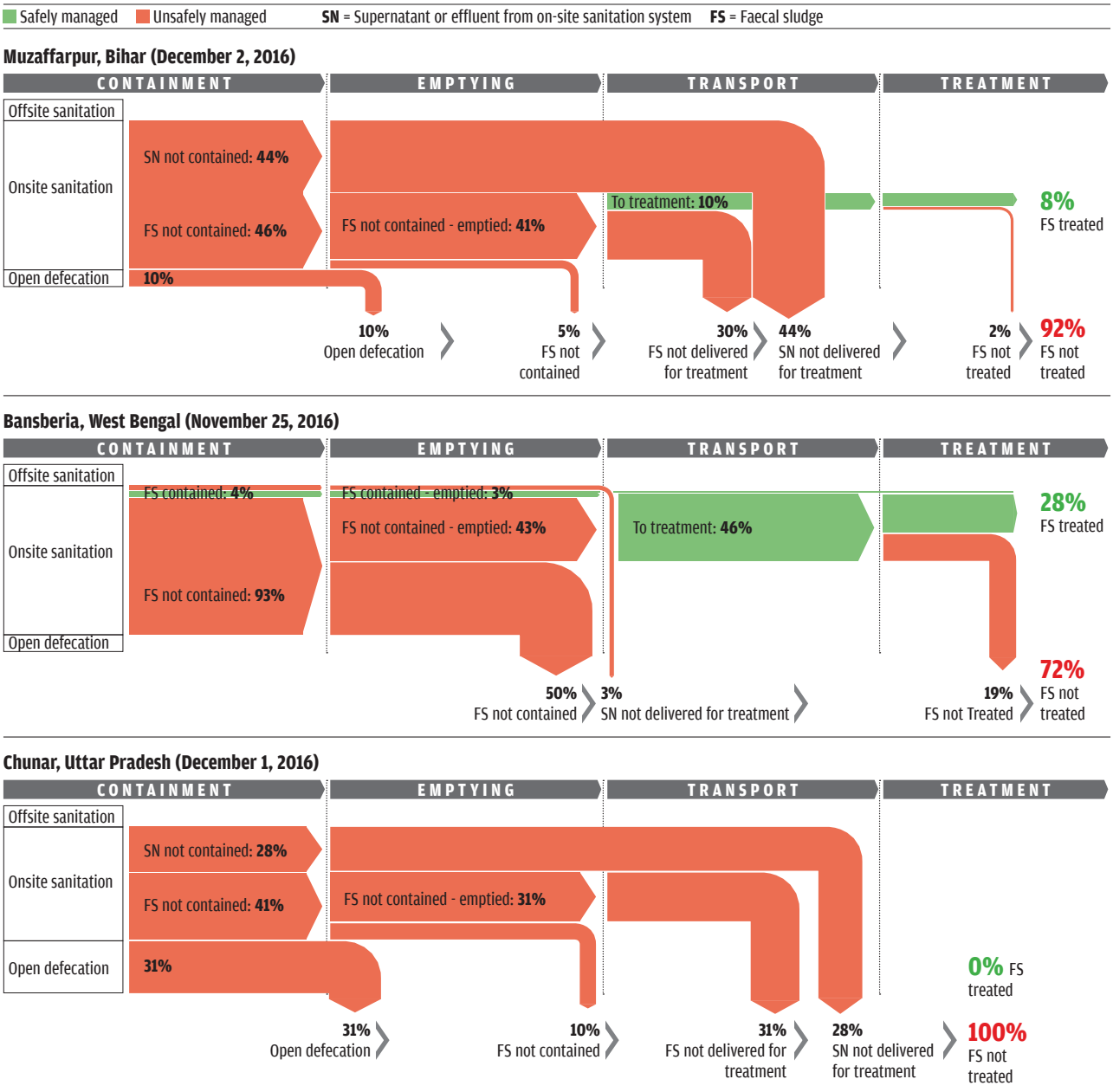
LOSE-LOSE SITUATION

In Uttar Pradesh's Ramnagar town, 60-70 per cent households are connected to the sewer lines. Between November and June, when people in the region grow wheat, the irrigation department diverts the untreated sewage to farmers after diluting it. In fact, the irrigation department has set up a sewage pumping station and laid pipelines for this purpose. The urban local body has a vacuum tanker for cleaning out the septic tanks and pits. But it has been used only five to six times in two years as most septic tanks are inaccessible and emptied manually. More often than not, the faecal sludge is dumped in nearby fields and low-lying areas, from where it finds its way into the Ganga.

The situation is similar in the state's Gangaghat

Reality check

Very few cities along the Ganga treat the faecal sludge, that too in a minuscule amount



town. Since the only vacuum tanker owned by the urban local body is too big to enter the narrow lanes, people contact private septage haulers from Kanpur. Residents say the tankers on their way back dump the untreated sewage at Railway Khanti, a low-lying area, or in the Chamak Ganga, a tributary of the Ganga whose flow has now been blocked due to construction activities. Years of dumping of faecal sludge has turned Railway Khanti and the Chamak Ganga into sewage pools.

Census 2011 states that some parts of Chunar are connected to sewer lines, but CSE researchers could not find any.

In Bijnor, people depend on five private septage haulers for emptying the tanks. Farmers have tied up with these tankers to provide them sludge, which they use as manure. The town is now shifting towards managing faecal waste in a centralised

AD

manner. The authorities have laid sewer lines and are setting up an STP. "Pollution in the Ganga can be fixed only through effective management of STPs," says I P Singh, executive officer of Bijnor urban local body, adding that small STPs are cost-effective and efficient.

In Bihar's Katihar and Buxar cities, municipal corporations provide vacuum tankers to clean out the septic tanks, but their responsibility ends there. The vacuum tanker of Katihar dumps the faecal sludge in a landfill at Udama Rakha. Since the landfill does not have a protective lining to check percolation of leachate, septage increases the risk of groundwater contamination. In Buxar, the vacuum tanker dumps the faecal sludge in open drains or on vacant land in nearby Darapur and Ahrauli villages.

When CSE researchers visited Bodhgaya, sewer lines were being laid in the town. But since households are yet to be connected to the network, its urban local body continues to clean the septic tanks and dump the septage on agricultural fields, often without the consent of the farmer.

Though Bongaon is likely to achieve open defecation-free status by the end of December 2016, people here have constructed large pits instead of septic tanks. This increases the risk of groundwater contamination with faecal matter. The municipality dumps septage in landfills, located next to a pond. This heightens the contamination risk of both groundwater and surface water.

CASHING IN ON SHIT

In two of the cities surveyed, efforts are under way to manage the faecal sludge. Consider Bihar's Muzaffarpur city. Most households here have toilets with on-site sanitation, and a fertiliser company is cashing in on it. Sona Ganga Fertilizers procures about 8 per cent of the septage from Muzaffarpur. It then dries and composts the waste and sells the biocompost to farmers.

A similar initiative is under way in Bansberia in partnership with the municipality. The municipality collects septage from 47 per cent of its households and transports it to the faecal sludge treatment plant (FSTP), set up under public-private partnership in 2006. A private company,

In Bihar's Muzaffarpur city most households have toilets with septic tanks. The municipal corporation collects faecal sludge and releases it in open drains

BHITUSH LUTHRA / CSE

Greenery Biocompost and Animal Farming, which runs the FSTP, recycles the sludge and converts it into biocompost. The company sells 50 kg of the biocompost for ₹850.

These initiatives show the economic value of faecal sludge and septage, which can be converted into soil conditioners, unlike sewage. In the process, they create employment and encourage resource recovery and recycle. But in the absence of funding, guidelines and expertise, most urban local bodies turn a blind eye to the potential of faecal sludge and septage.

FUTURE LIES IN SEPTAGE

There is enough evidence to show that faecal sludge and septage management (FSSM) is not only economical as compared to centralised sewerage system but can also be implemented quickly to make cities clean and healthy.

IWMI's recent study analyses the cost of faecal waste management in all 2,367 cities in the five states along the Ganga. It says effective management of faecal sludge and septage generated in these cities will cost US $2.8 billion (about ₹18,900 crore), whereas laying sewerage networks and STPs will cost six times more—a whopping $17.4 billion (about ₹117,400 crore). Besides, installing the sewerage system takes seven to eight years, whereas setting up an FSTP takes one to two years.

Sewerage system is also resource intensive. Unlike septic tanks, sewer networks involve large amounts of water. It can be laid by only those cities that supply 135 litres per capita a day—a dream for even most class-1 cities. "Using water to flush faecal matter is just a waste of precious resource," says Rohilla. Since sewerage systems require electricity for pumping sewage to running STPs, they are not reliable in small towns and cities that face frequent power outages. On the contrary, FSTPs require little electricity as most are based on natural systems (see 'Triple bonanza').

Small wonder, several developing countries in Asia are taking steps to strengthen septage management. Consider the Philippines. About 40 per cent of the country's population (including 85 per cent of the people in capital city Manila) use toilets that have septic tanks. Septage management is a main component in its Clean Water Act of 2004. The health department has also issued a manual guiding implementation of septage management programmes. Cities, such as Marikina and Dumaguete, have issued ordinances requiring regular desludging of septic tanks and have set up new FSTPs. In Malaysia, desludging at regular intervals is a must under federal law.

While India can follow in on the footsteps of these countries, it must ensure that people install on-site sanitation technologies suitable to the region's geology. For example, people in Goa say none of the four sanitation technologies promoted under Swachh Bharat Mission is suitable for the region. The state receives heavy rainfall, has riverine areas, a high water table and a long sandy coastline. This makes it easy for faecal matter to seep through these twin pits and contaminate the groundwater. Septic tanks with soak pits also do not work as the partially treated effluent leaches through the soak pits. Biodigesters and biotoilets maybe suitable for the region, but they are expensive and people lack skills to construct, operate and maintain these toilets.

"We have received reports from Agra, West Bengal and various other places that biotoilets fail

Triple bonanza

Faecal sludge management is not only cost-effective but also generates livelihood opportunities. Some technologies do not even require electricity

BLACK SOLDIER FLY LARVAE: The technology uses larvae of a benign fly species, *Hermetia illucens*, to feed on the faecal matter. As the larvae grow and proliferate, they drastically reduce the volume of the waste within a couple of days and convert the dangerous pit material into a potentially useful soil conditioner or fertiliser. Once the larvae attain the prepupae stage, they can be harvested, processed to remove any possible pathogens and sold as animal feed. Because of high fat and protein content, there is an increasing demand for these animal feed.

The technology is gaining ground in South Africa's Ethekwini municipality. The country, which launched a sanitation programme similar to Swachh Bharat Mission in the 1990s, is innovating ways to dispose of the huge loads of faecal sludge and septage.

PLANTED AND UNPLANTED DRYING BED: At a faecal sludge treatment plant, sludge is dried naturally in a sealed shallow pond with several layers of fliters and with evaporation facility. While this simple method can produce soil conditioners, one can plant wetland plants on the bed for efficient drying-up. It has an added advantage: the filters do not need to be desludged after each drying cycle. Fresh sludge can be directly applied onto the previous layer as the plants and their root systems maintain the porosity of the filter. Compared to unplanted drying beds, planted drying beds (also called humification beds), require desludging only once every five to 10 years and the removed sludge is a nutrient-rich soil conditioner.

While Ghana has experimented with unplanted drying bed, planted drying bed is popular in Bangkok.

ANIL YADAV / CSE

Faecal sludge treatment plant at Bansberia in West Bengal. The company operating the plant recycles faecal sludge and sells the biocompost at ₹750/50 kg

to perform. People who had built toilets based on the technology are now abandoning them. The technology is now under scanner," says Rohilla. He says a septic tank designed as per standards in itself provides primary treatment to sewage. Care needs to be taken to ensure that manual scavenging is not promoted, he adds.

FSSM has its advantages. It is effective in unplanned areas—a common phenomenon in all towns in the Ganga basin. It can work seamlessly with sewers. For example, local urban bodies can include faecal sludge management alongside sewerage plan in Master Plans, City Development Plans and Swachh City or City Sanitation Plans.

All they need is guidance to upgrade on-site sanitation systems as per prescribed standards and bye-laws, to regularise private vacuum tankers and to operate and maintain FSTP. They should also be encouraged to tie up with private companies in managing faecal sludge. In Bangladesh, non-profit WaterAid Bangladesh and its partners the Bangladesh Association for Social Advancement are working with the Shakipur municipality to run a co-compost plant that uses both faecal sludge and organic waste to make compost.

Researchers with IWMI say cities that have sewerage systems in place should set up a plant that can treat both sewage and faecal sludge. Cities that do not have a sewerage system and have a water supply level above 80 litres per capita a day (lpcd) should have a simplified sewer system to convey effluents from septic tanks, which can then be treated in a decentralised manner. The faecal sludge can be treated at FSTP. Co-composting can also be considered. Cities that have less than 80 lpcd water supply can treat faecal sludge by using microphytes in wetlands. They can also consider co-composting if the municipality collects solid waste.

"More than anything else, public awareness should be created," says Nagendra Kumar, an official with Gangaghat Nagar Palika Parishad. "We cannot achieve anything without the cooperation of people," he says.

Agrees Rohilla. Ganga can be cleaned and city-wide sanitation can be achieved only if the government, civil society and people recognise faecal sludge management as a complementary solution along with the sewerage system. The need of the day is to connect water, sanitation and public health issues with abatement of pollution in river. ■

With inputs from Nikita Lamba and Vaishnavi Rathore

@down2earthindia