POLICY BRIEF

RESEARCH PROGRAM ON Water, Land and Ecosystems

LED BY: IWMI International Water Management Institute

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Reducing fecal pollution in small and medium-size cities along the Ganga River

Results from the Healthy Ganga project highlight the potential for alternative solutions and recommendations to better manage pollution from untreated domestic wastewater and septage, discharged along the Ganga and its tributaries.

OVERVIEW

The Ganga River, which is sacred to Hindus, also serves as a lifeline for hundreds of millions of people and as an engine of economic growth for the whole river basin. Yet, its waters remain heavily polluted, with dramatic impacts on human health, livelihoods and ecosystems. Because of continuous discharge of untreated sewage and septage, fecal pathogens proliferate, worsening pollution to the point that the water is no longer suitable for bathing or drinking, except in a few upstream locations.

The many small and medium-sized cities along the Ganga and its tributaries contribute heavily to water pollution because of poor sanitation and waste treatment. This project carried out a study in three representative cities along the most polluted section of the Ganga: Mughalsarai, Unnao and Gangaghat in the State of Uttar Pradesh (UP). The aim was to consider how medium-size cities (with a population of 50,000 to 200,000) in the Ganga Basin manage fecal pollution and what might be the most appropriate and cost-effective solutions for better pollution control.

RESEARCH FINDINGS

Reducing urban fecal pollution remains a key priority for improved Ganga water quality

Baseline assessments show that sanitation conditions in the selected cities are very poor. There are almost no functional sewers and no waste and wastewater treatment capacity. While most households rely on septic tanks, there is no facility for safe septage removal and treatment. Fecal pollution in the Ganges becomes worse during the monsoon, with average concentration of fecal coliforms significantly higher than

Figure1: Project cities in the state of Uttar Pradesh, India

KEY POLICY RECOMMENDATIONS

1. Small and medium-size cities should give high priority to better controlling fecal pollution through better toilets for all, unclogging and covering urban drains, and investing in innovative septage management solutions like co-composting and reuse.
2. The first septage management project in the Ganges basin should be implemented at scale (e.g. in Mughlasarai and/or Gangaghat) for demonstration and training.
3. Technical guidelines for septage management need updating to incorporate business models and cost-recovery mechanisms. The guidelines should show how to make septage collection, treatment and reuse safe and feasible

Fig 2.1. Fecal pollution management in Unnao

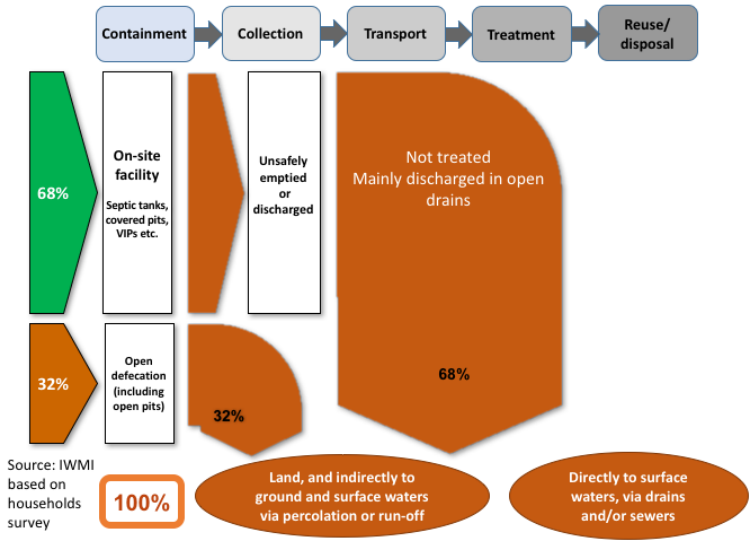


Fig 2.2. Fecal pollution management in Gangaghat

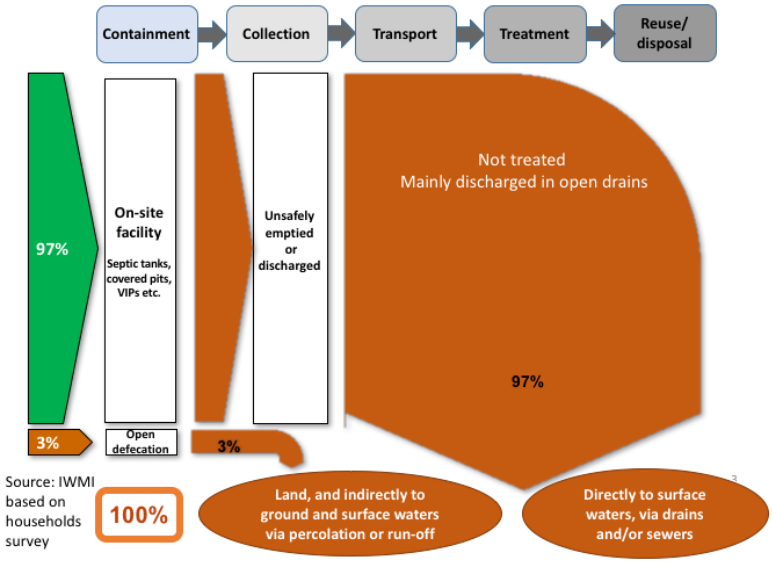
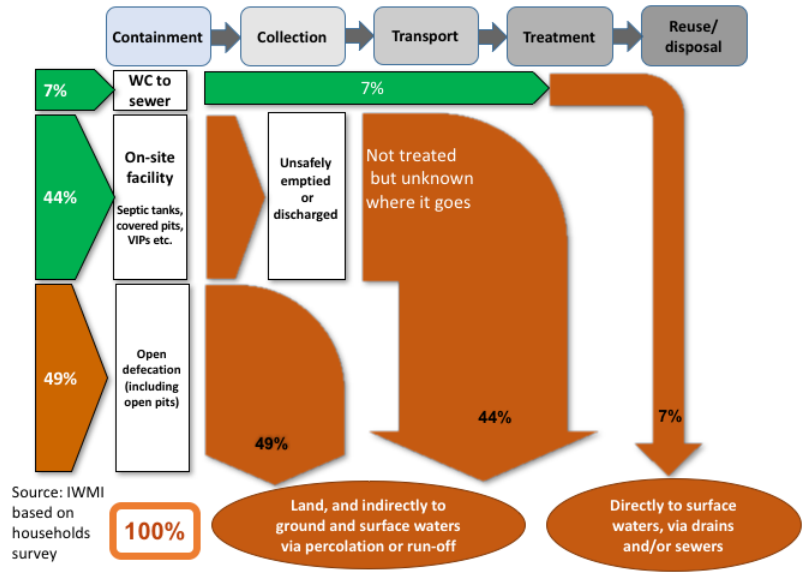


Fig 2.3. Fecal pollution management in Mughalsarai



in the dry period. This reflects large-scale uncontrolled pollution resulting from practices like sludge dumping and open defecation.

Local capacities for sanitation and wastewater treatment are weak, and local urban entities rely on technical support from UP State authorities for future plans and projects.

How domestic wastewater and septage find their way to the Ganga

Many households (up to 48% in Mughalsarai) still practice open defecation and contribute to widespread pollution through open drains on rainy days.

Most households (up to 97% in Gangaghat) rely on septic tanks, but these are not properly maintained. Septage is collected every 10-15 years, even though collection every 3 years is the recommended practice for optimal septic tank performance. Consequently, septic tanks that could potentially remove 60% of suspended solids and 40% of the organic matter from domestic wastewater have almost no treatment capacity.

Septage, once collected, is unsafely disposed of in open drains or in peri-urban farms or landfills, with no treatment.

Open drains collect most of the fecal pollution, resulting from open defecation and unsafe septage disposal and also from septic tank outlets, many of which do not have soak pits and discharge directly into open drains.

Pollution from the study cities flows through a network of small and progressively larger open drains, which eventually flow into the Ganga. None of the three cities has a scheme for management of solid waste, most of which is dumped in the streets, clogging open drains and adding to the pollution load. Only a fraction of this waste is collected by the Nagar Palika Parishads (NPP) and dumped at the city limits without treatment or recycling.

Septage management is a no-regrets solution

This research shows that septage management is more cost-effective than conventional sewers and sewage treatment plants for small and medium-size cities in

the Ganga region. This means that, for a given budget, more pollution can be abated. Indeed, given the tremendous sanitation and treatment gap in the Ganga Basin and limited government budgets, priority should go to the most cost-effective solutions rather than to potentially effective but unaffordable pollution reduction systems. The costs of building sewers and treatment plants in all urban areas in states along the Ganga could exceed 17 billion USD plus hundreds of millions in operation and maintenance every year. Access to land for such projects is also an issue.

Septage collection, treatment and re-use is the preferred first intervention for these small and medium-size cities. Mechanical septage collection is 10-20 times cheaper than setting up a sewerage network, according to the study's calculations. The cost of septage treatment (250 to 2,000 Rs/person) is much lower than conventional sewage treatment plants (up to 5,000 Rs/person) as well as cheaper to maintain and operate. Moreover, mechanical collection and transport of septage prevents this valuable resource from being diluted with storm water or mixed with industrial effluents that could lower its potential for re-use in agriculture, for example.

As more funding becomes available, septate management can be complemented with centralized or decentralized wastewater treatment (or onsite treatment in open drains in peri-urban areas, if land is not available for treatment plants) to further treat remaining pollution in urban drains.

RECOMMENDATIONS

Fig. 3. Discharge of untreated septage

Give priority to septage collection, treatment and re-use

Small and medium-sized cities along the Ganga River need more and better toilets for all to prevent widespread pollution from open defecation. These cities also need to unclog and cover urban drains to improve their hydraulic capacity and prevent human exposure to wastewater.

Solutions need to focus on cost-effective sanitation systems that not only collect and treat waste but also re-use it, with the possibility of partial cost recovery.

Attractive decentralized models include sludge co-composting with food waste or straw (Fig 4) and constructed wetlands for sludge leachate. The latter reduces wastewater pollution load, and treated water can be re-used in irrigation, for example. The nutrient-rich and pathogen-free compost can be used as an organic amendment and fertilizer for agriculture.

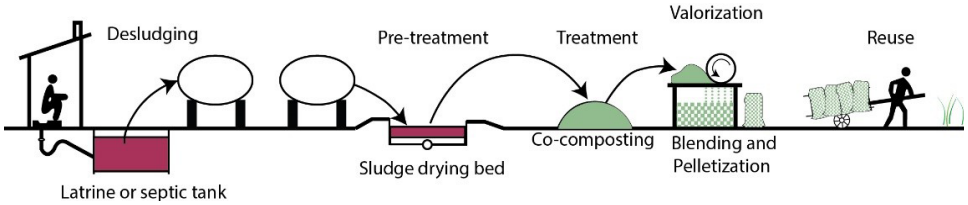
Instead of waiting for large-scale and expensive "ideal solutions," such as sewers and conventional sewage treatment plants, these cities should act now, using feasible options that can be implemented more quickly and permit partial cost recovery with the right incentives.

Support a pilot septage management project

Septage management has a lot of potential for cost-effective abatement of pollution in small and medium-size cities of the Ganga Basin, leading to improved human and environmental health. There are cases of successful septage management across the developing world but not a single example in the Ganga Basin. A large-scale pilot initiative in one of the three project cities would contribute to capacity building and demonstrate the benefits of septage management in the region.

This project has designed co-composting treatment plants of adequate dimensions to treat all septage from the septic tanks and municipal solid waste generated in Mughalsarai and Gangaghat. The plants would produce 9.2 and 7.5 tons of compost per day, respectively, in the two cities. This would require investments of around 57.5 million Rs for Gangaghat and 65.5 million Rs for Mughalsarai (around

Figure 4: Example of safe and productive septate management



1 million US$), and the operation and maintenance costs would be around Rs 12.3 and 12.8 lakhs/month, respectively. This is just a fraction of the costs of the equivalent sewers and conventional treatment plants. Most costs could be recovered through affordable user charges to households and from the sale of compost, for which most farmers are willing to pay.

Develop revenue models for septage and wastewater management

Tackilng the issue of cost recovery in sanitation requires suitable financial mechanisms, which include charges for sanitation services and the sale of resources recovered from waste, such as compost or recycled water produced from wastewater and sludge treatment. Complementary public subsidies might also be justified, if there are broad benefits for society and the environment, beyond those going to the population served by sanitation services.

There is a need to improve state policies for fecal sludge management guidelines (which at present are mainly technical) by incorporating guidance on business models for fecal sludge management and on cost-recovery mechanisms. These guidelines should explain not only how to build and operate septic tanks but also how to safely collect, treat and dispose of, or reuse, this resource.

Recommended Reading

Clean Ganga Project Page: https://wle.cgiar.org/healthyganga

Report on Business models for fecal sludge management Resource Recovery and Reuse Series 06: https://wle.cgiar.org/business-models-fecal-sludge-management

Report on Testing the implementation potential of resource recovery and reuse business models: from baseline surveys to feasibility studies and business plans. RRR report Series 10: https://wle.cgiar.org/testing-implementation-potential-resource-recovery-and-reuse-business-models-baseline-surveys

Report on Technological options for safe resource recovery from fecal sludge. RRR Report Series 02: https://wle.cgiar.org/technological-options-safe-resource-recovery-fecal-sludge

About this brief

This brief presents the findings of the pollution control component of the Healthy Ganga project carried out by the IWMI, in collaboration with the following organizations: World Wildlife Fund (WWF), the Indian Institute of Technology-Kanpur (IIT-K), the Institute of Rural Management (IRMA), the World Bank Water and Sanitation Program (WSP) and the National Mission for Clean Ganga (NMCG). This project aims to identify the most promising technical and institutional solutions to better manage pollution from untreated domestic wastewater and septage, discharged along the Ganga and its tributaries.

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ABOUT WLE

The CGIAR Research Program on Water, Land and Ecosystems (WLE) combines the resources of 11 CGIAR centers, the Food and Agriculture Organization of the United Nations (FAO) and numerous national, regional and international partners to provide an integrated approach to natural resource management research. WLE promotes a new approach to sustainable intensi cation in which a healthy functioning ecosystem is seen as a prerequisite to agricultural development, resilience of food systems and human well-being. This program is led by the International Water Management Institute (IWMI) and is supported by the CGIAR System Organization, a global research partnership for a food-secure future.

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