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Hygiene for Humanity: The Sanitation Framework of Prayagraj's Maha Kumbh

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ABSTRACT: In 2025, the Maha Kumbh Mela will be considered one of the most significant and largest religious gatherings in the world. There are expected to be around 660 million pilgrims during the entire festival. This huge number of pilgrims presents unique challenges in terms of infrastructure, particularly in terms of sanitation. Sanitation is essential not only for public health and hygiene but also for maintaining the spiritual and cultural sanctity of the event. This report focuses on sanitation management strategies adopted during Maha Kumbh Mela. It includes construction of an extensive infrastructure comprising more than 150,000 toilets including a competent infrastructure crew of around 15,000 trained sanitation workers. Incidentally, the undertaking has also been declared a Guinness World Record (the largest public sanitation drive ever undertaken).

This study is concerned not only with operational effectiveness, efficiency and sustainability but also about the planning, coordination and real time management systems required for carrying out such a large-scale public health operation in a time-limited and high pressure situation. Besides logistics considerations, this study also addresses the cultural and spiritual aspects of cleanliness in context of the Kumbh Mela, with particular emphasis on how cleanliness and sanitation have deep religious roots in the religion of the devotees participating in the Kumbh Mela.

However, by looking at integrating sanitation infrastructure in the context of cultural awareness and priority public health issues, this research seeks to provide valuable insights and best practices for managing future mass events, as well as to underline the important interplay between religion, health, urban planning and event management with the Indian context, which could serve as a reference for mega-events globally.

KEYWORDS: Maha Kumbh Mela, sanitation, public health, Guinness World Record, cultural significance, event management, mass gatherings, hygiene infrastructure.

I. INTRODUCTION

It literally feels like you're floating on a river of humanity that could sustain entire nations—this is the Maha Kumbh Mela 2025 at Prayagraj (Allahabad) with an impressive 660 million pilgrims expected to gather across the 48-day long festival. It is hardly just a religious festival—in fact, it is a living symbol of faith—a time for generations to spend soaking in the holy Sangam, where the Ganga, Yamuna and the legendary Saraswati rivers meet. But behind all the spirituality there is another huge challenge in sight – how to organise such an event as clean, safe and sustainable?

From Ancient Rituals to a Global Pilgrimage – The story of the Kumbh Mela goes back to at least ancient times. It was written about in the ancient texts as the Magh Mela, a time to renew one's spirit. By 1870 it had evolved into the Kumbh we all know today—a festival bound by celestial rhythms: it happens every 12 years. For many years it was a quiet retreat of ascetic and devotees, but now one of the most powerful phenomena on Earth. The 2013 Kumbh—involving 120 million pilgrims—was so extraordinary that UNESCO declared it as an Intangible Cultural Heritage of Humanity.

Cleanliness as an Act of Devotion – In Hinduism, purity isn't just about rituals—it's woven into daily life. The principle of Shaucha (cleanliness) teaches that outer cleanliness reflects inner spirituality. This belief has driven India's Swachh Bharat Mission (Clean India Campaign) to make the 2025 Kumbh a model of public health. Picture this: 150,000 toilets, 10,000 sanitation workers, and cutting-edge waste systems working around the clock—a feat so massive it earned a Guinness World Record. Yet, even with these staggering numbers, the real challenge isn't just

building infrastructure—it's ensuring millions of people use it responsibly, preventing waste from polluting the sacred rivers, and stopping disease before it spreads.

This isn't just about logistics; it's about honouring faith with action. How do you balance ancient traditions with modern sanitation? Can a temporary city of millions leave no trace behind? These are the questions at the heart of the Maha Kumbh's greatest test—one that could redefine how the world approaches mass gatherings in the future.

Infrastructure of the Kumbh Mela

Considering the grandeur and significance of the upcoming Maha Kumbh 2025, which is being celebrated as an auspicious event that occurs once every 144 years, the Government of Uttar Pradesh has made extensive preparations. It is estimated that over 60 crore pilgrims will visit Prayagraj to take a holy dip at the sacred confluence (Sangam) of the Ganga, Yamuna, and the mythical Saraswati rivers. Given that the city of Prayagraj does not have the capacity to accommodate such an enormous influx of pilgrims, the state government has established a temporary city known as Maha Kumbh Nagar. This vast, purpose-built city spans over 4,000 hectares, which is three times larger than the area developed during the Ardh Kumbh in 2019.

To ensure seamless management and infrastructure, the government has deployed state-of-the-art technologies and modern urban planning techniques. Maha Kumbh Nagar is divided into 25 well-organized sectors, and the total length of the constructed bathing ghats extends to approximately 12 kilometers, allowing for smoother access to the holy waters.

Pilgrims visiting the Kumbh Mela are provided with a wide range of facilities, from basic necessities to luxurious amenities, to suit all socio-economic classes. The temporary city includes around 1,50,000 tents, offering deluxe and super deluxe accommodations for the elite class, while common shelters, general tents, and traditional Akhadas cater to the needs of the general pilgrims. Furthermore, the infrastructure includes the renovation of 92 roads and the construction of 30 pontoon bridges to facilitate efficient transportation and crowd movement. The entire city is equipped with modern facilities, including multilingual signage, a robust public transportation system, efficient health and sanitation services, and comprehensive safety and security arrangements.

The Maha Kumbh 2025 is not just a religious gathering, but a massive demonstration of cultural heritage, administrative efficiency, and technological advancement, setting a new benchmark for organizing mega events in India.

Hygiene & Sanitation Challenges

The Maha Kumbh Mela faces several significant challenges due to the enormous number of pilgrims and the temporary nature of the event infrastructure. Over 66 crore people are expected to take a holy dip during the 45-day-long Kumbh Mela. This massive influx of pilgrims gives rise to multiple issues, including waste management, open defecation, inadequate sanitation infrastructure, water pollution, hygiene concerns, health risks, and broader environmental impacts. One of the major challenges for the organizing authorities is the creation and maintenance of temporary infrastructure, which becomes unusable after the event concludes, resulting in substantial financial investment with limited long-term utility.

II. THE KEY CHALLENGES RELATED TO HYGIENE AND SANITATION ARE OUTLINED BELOW

- **Waste Management:** The enormous number of pilgrims at the Maha Kumbh Mela generates a vast quantity of waste, including approximately 16 million litres of faecal sludge and 240 million litres of greywater daily, in addition to solid waste produced by over 15 million devotees each day. This solid waste includes leftover food, plastic materials, flowers, and other biodegradable and non-biodegradable substances. Given the scale and diversity of the waste generated, there is an urgent need for an efficient and high-capacity waste management system that ensures the proper collection, treatment, and disposal of waste on a daily basis. Additionally, the infrastructure must be restored and prepared overnight to accommodate the next day's influx of pilgrims.

Failure to manage waste effectively can lead to the contamination of water bodies, the spread of communicable diseases, foul odours, and an overall decline in environmental and public health standards. Therefore, a robust system for waste segregation, recycling, safe sludge disposal, and water treatment must be implemented alongside public awareness campaigns promoting hygiene and eco-friendly practices among visitors.

- **Sanitation Facilities:** Now that the Kumbh Mela has concluded, an important question arises – Was Prayagraj truly prepared to tackle the massive sanitation challenges caused by the enormous gathering during the Kumbh Mela? Unfortunately, the answer is no. Why? Because the Kumbh Mela is a short-term, periodic event, and cities are generally not designed to maintain large-scale, permanent sanitation infrastructure for such temporary occasions. The real challenge for the mela authorities was to develop a temporary yet highly efficient sanitation system that could meet the needs of millions of pilgrims while keeping the entire mela area clean and hygienic.

This temporary infrastructure included lakhs of toilets—both Indian and Western styles—along with dedicated facilities for women, senior citizens, and Divyang (persons with disabilities). It also included numerous urinals, mobile sewage treatment plants, vehicles for transporting human waste and greywater, water purification units, solid waste collection mechanisms, and cleanup operations along the riverbanks and even within the river itself. Establishing and operating this infrastructure required advanced technology and a large, dedicated human workforce, working round the clock to ensure daily sanitation needs were met. Continuous power and water supply, along with proper support systems for the workers, were essential to avoid any disruptions.

One of the most critical challenges was maintaining the cleanliness and purity of the river water to prevent any contamination. Clean water was vital not only for religious rituals but also for preventing the outbreak of waterborne diseases among pilgrims. Failure to provide adequate sanitation infrastructure could lead to severe health consequences, including the rapid spread of illnesses among both local residents and visitors, all stemming from contaminated water and unmanaged waste.

- **Environment Impact:** Apart from waste management and water pollution, one of the most pressing environmental challenges during the Kumbh Mela is keeping the atmosphere of Prayagraj and the Kumbh Nagar free from air and noise pollution.

Air pollution becomes a significant concern due to the large influx of diesel and petrol vehicles, including both public and private transport. In addition, diesel generators, widely used to provide an uninterrupted power supply for the functioning of the mela infrastructure, contribute substantially to air pollution. Furthermore, religious activities such as the burning of holy havans, diyas, and incense also add to the degradation of air quality. Another contributing factor is deforestation, carried out to clear land for setting up the temporary Kumbh Nagar. Although considered necessary for logistical purposes, it negatively impacts the local environment and ecological balance.

In addition to air pollution, noise pollution is another critical issue. The constant use of loudspeakers—for making announcements related to facilities and safety, as well as for religious chanting in akharas, temples, and other locations—creates a high-decibel environment. This persistent noise affects not only the health and well-being of humans, especially the elderly and children, but also disturbs local wildlife and the natural soundscape of the region.

Sanitation Strategy in Action

The Government of Uttar Pradesh and the Mela authorities set up a temporary yet efficient mechanism to address the challenges of sanitation, waste management, and environmental protection, including the restoration of forestry. The authorities utilized advanced technologies developed by two of India's premier scientific institutions—BARC and ISRO. An adequate number of toilets, urinals, and pits were installed; workforce was deployed, machinery was arranged for waste segregation, and transportation systems were put in place to ensure the safe movement of waste. The detailed approach to waste management, the sanitation drive, and the green initiatives is described below:

The authorities set up a large-scale yet efficient sanitation infrastructure, including 1,50,000 toilets, which comprised Fiber Reinforced Plastic (FRP) toilets with septic tanks and prefabricated steel toilets with soak pits. Additionally, community urinals were strategically placed across the fairgrounds. To maintain a clean and safe environment in Maha

Kumbh Nagar, over 15,000 sanitation workers were deployed. These workers were provided with Personal Protective Equipment (PPE), special perks, and were supported through various welfare measures. The toilets were color-coded for easy identification based on their specific use or user needs. Each unit was equipped with jet cleaning technology, ensuring quick and efficient cleaning for the next user. Apart from toilets and urinals, 25,000 litter bins were installed at short intervals to keep the area clean. Additionally, over 2,00,000 trash bins were used to ensure waste segregation at the source, and around 38 lakh liner bags were utilized for collection and disposal of waste.

The sanitation framework also employed approximately 120 GPS-equipped tipper trucks, 40 compactors, and over 300 advanced suction machines, all operating round the clock for the collection and disposal of liquid waste. To manage the massive quantity of waste—around 650 metric tonnes (MT) per day—a precision mechanism was implemented at the Baswar waste processing plant, with the primary goal of ensuring zero discharge into the holy Sangam. Additionally, two skimmer machines were used to collect plants, plastic/paper bags, flowers, and all types of religious offerings from the bathing ghats and riverbanks.

The authorities also took proactive environmental steps, including a complete ban on plastic. Shopkeepers and pilgrims were encouraged to use biodegradable alternatives to support sustainability efforts during the event. The administration reinforced these efforts through extensive public awareness campaigns, educating both devotees and local residents about the importance of sanitation-conscious behavior, while also establishing a robust citizen feedback and grievance redressal system.

Restoration of Maha Kumbh Site

However, beyond ensuring sanitation, the greater challenge lay in dismantling the extensive infrastructure that had been erected to accommodate the record-breaking footfall during the Maha Kumbh. Officials from Mahakumbh Nagar, the temporary administrative district created for the event, worked around the clock to dismantle structures, clear waste, and restore the floodplains to their original state. The mammoth task of dismantling the infrastructure was meticulously coordinated and divided among various departments, each operating under strict deadlines. Thanks to their collective efforts, the area was successfully cleared and rehabilitated, marking the efficient conclusion of the event's logistical operations.

Greening the Kumbh

In preparation for the Maha Kumbh, the Uttar Pradesh government implemented the Miyawaki afforestation technique to boost green cover and improve air quality in Prayagraj. This method, known for creating dense forests in small spaces, was first introduced in the city in 2020–21 and significantly expanded in 2023–24. Over 1.19 lakh saplings of 63 species were planted across 34,200 sq. meters in Nevada Samogar, a previously polluted industrial area.

Similarly, the Buswar garbage dumping yard was transformed by planting 27,000 saplings over 9,000 sq. meters, turning the waste site into a green forest. In total, Miyawaki forests were created at 13 locations across the city. Key species included neem, mango, peepal, tamarind, and various medicinal and ornamental plants.

These green spaces have contributed to lowering temperatures by 4–7°C, improving air and water quality, preventing soil erosion, and enhancing biodiversity. Through the Miyawaki initiative, the city not only tackled environmental challenges but also reinforced its commitment to sustainable development during the Maha Kumbh.

III. CONCLUSION

Maha Kumbh 2025 serves as a powerful illustration of India's evolving commitment to sanitation, public health, and environmentally conscious event management. With a record-breaking sanitation infrastructure, deployment of thousands of trained workers, and integration of cutting-edge waste management systems, the event underscores how spiritual traditions and modern sanitation can coexist harmoniously. From safeguarding river purity to creating temporary eco-conscious urban spaces, every element of the sanitation strategy has been meticulously aligned with both cultural reverence and public welfare. As one of the world's largest gatherings, Maha Kumbh 2025 not only meets the logistical challenge of hygiene for millions but also sets a global benchmark for managing mass events through innovation, inclusivity, and sustainability.

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