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Advancing and Integrating Waste Management and Health

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1. Introduction

The laws of thermodynamics indicate that energy and materials experience losses during transfers or transformations from their original state. Thus, a thriving civilization produces waste as a byproduct of its activities. If this waste is not adequately managed, it can lead to accumulation problems. History has shown that this accumulation of waste can devastate human lives, often resulting in health crises.

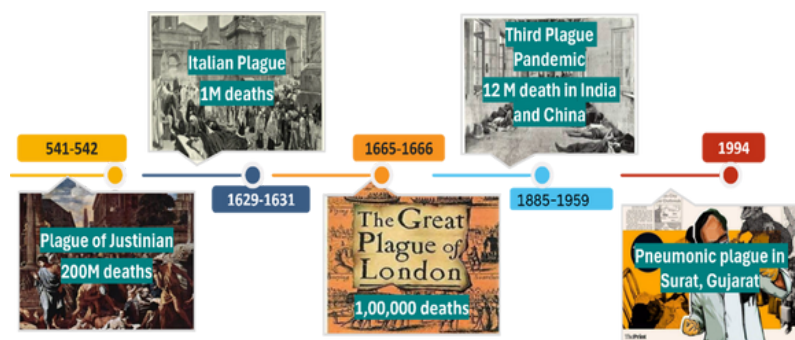


Image 1. Major disease outbreaks due to improper waste management

The Industrial Revolution in the mid-nineteenth century led to increased urbanization and denser settlements. Despite this, health issues related to waste were fewer and less severe than in earlier periods. Waste problems were mainly addressed for economic and political reasons. In 1860, the British Royal Commission appointed sanitary commissioners in Bengal, Madras, and Bombay to improve health conditions, particularly for their troops. The first Chair of Hygiene was established

at Calcutta Medical College in 1865. By 1896, the Indian Plague Commission highlighted the importance of health and sanitation, requiring Medical Officers of Health to hold a diploma in public health. The School of Tropical Medicine was founded in 1920, followed by the All-India Institute of Hygiene and Public Health in 1932.

Rapid urbanization increased the roles of engineers and architects in managing housing, infrastructure, and urban planning. Government funding largely emphasized on infrastructure, resulting in more engineers in municipalities and a reduced role for public health officers. Engineering departments oversaw water supply, sanitation, and drainage, while medical officers managed solid waste. In the 1950s, Roorkee College of Engineering (now IIT Roorkee) launched its first Master's program in Public Health Engineering.

Environmental concerns emerged during the 1970s and 1980s, primarily focusing on pollution. Key events like the Bhopal gas tragedy in 1984 highlighted the importance of hazard management, and the 1987 Brundtland Commission introduced the concept of sustainable development. Experts from various fields joined this movement, driven by the need to protect public health through pollution reduction. In response, India enacted the Water (Prevention and Control of Pollution) Act in 1974 and the Air (Prevention and Control of Pollution) Act in 1981, followed by the Environmental Protection Act of 1986, emphasizing the management of water and air pollution and material handling in industries.

"Health adds a crucial human element and purpose to waste management initiatives."

-Dr Arun Kansal
Professor & Director
ICWMR, TERI SAS, New Delhi

The 1990s marked a significant shift in the focus on climate change and the need to balance economic growth with environmental protection. Experts from various fields—including economics, public policy, law, and social sciences—began contributing to this discussion. Resource economics, circular economy, and fiscal and market-based instruments gained prominence during this time. However, attention to the scientific management of solid waste was largely lacking until the bubonic plague outbreak in Surat in 1994. Even though, solid waste management (SWM) in India is governed by guidelines and rules; the country still lacks established standards for performance measurement, unlike the long-standing standards for water and air quality over the past fifty years.

The disparity in waste management regulations can be attributed to several factors. Firstly, there is often no direct correlation between health outcomes and sound solid waste management, unlike the more evident relationships observed with water and air quality. Additionally, municipalities may experience a delayed response to the accumulation of waste following significant health episodes. Financial constraints also play a major role, as local governments are primarily responsible for waste management but

may lack the necessary funding. Consequently, all these factors have contributed to a slower regulatory response regarding municipal waste management. The approach to addressing this issue has typically leaned towards neo-environmentalism, where economic considerations, resource efficiency, and private sector involvement are prioritized, emphasizing creating “**wealth from waste**”.

There is a lack of studies in literature that establish the correlation between health outcomes of effective solid waste management, unlike the more evident relationships observed with water and air quality.

The private sector participation has significantly improved waste management in India. Many municipal corporations have formed Memorandums of Understanding (MoUs) utilizing a public-private partnership model. The focus of these efforts tends to revolve around financial considerations, payback periods, and long-term contracts. Non-governmental organizations (NGOs) and civil society groups have also contributed by promoting decentralized waste management solutions, sometimes as part of trendy initiatives. However, discussions on health implications, which were the primary policy guidelines until the late 1970s, have diminished in favour of engineering and economics approaches.

The current approach to waste management has overlooked critical

issues, necessitating a health-focused strategy to address new challenges. While high-tech solutions and informal recycling efforts have progressed, they often prioritize financial gains over comprehensive solutions, leaving behind unique problems to tackle. Large garbage piles on the outskirts of urban areas generate harmful vectors and produce methane gas. Furthermore, the relationship between waste management and caste dynamics has exacerbated class distinctions, placing the burden of waste management on the poor. This situation has slowly brought new diseases affecting humans, plants, animals, and ecosystems. Health concerns related to waste have evolved from isolated outbreaks and epidemics to a broader range of health issues, which often remain understated and underestimated.

“Health sector alone cannot address the issues faced by communities associated with waste management sector, inter and intra-sectoral collaborations is the key, and the involvement of people and communities stands important.”

-Ms. Payden
Deputy WHO Representative to India

To date, the health benefits associated with waste management have not justified the investments made (and there are not enough studies in the literature to support or refute the claim). SWM programs often lack key indicators like cost-benefit ratios or financial evaluations of benefits. However, the effectiveness of these investments can be measured in terms

of savings related to human health and productivity. Focusing **on health in waste management** clarifies objectives for engineers and policymakers. Health considerations are as crucial as equipment and infrastructure, leading to a people-centered approach in designing and operating waste systems. Engaging stakeholders such as medical professionals, health workers, researchers, educators, women, social scientists and environmental advocacy group is essential for realizing this vision.

2.The problem of waste generation, collection and treatment

Waste production is projected to triple in the world's emerging economies and double in large and medium-sized cities by 2050 (Global Waste Management Outlook, 2024). Currently, 38 per cent of the globally generated waste is disposed of in an uncontrolled manner, potentially causing significant health hazards.

India ranks among the top 10 municipal solid waste generation countries, with 40-45 per cent organic waste and 20-30 per cent inert (International Trade Administration, 2023; National Action Plan for Municipal Solid Waste Management, 2019). However, only 69 per cent of waste is collected, and just 28 per cent is treated before disposal (Agnihotri, 2022). The lack of waste segregation exacerbates the strain on public health systems. Unsegregated waste is difficult to recover, and often goes untreated ending up in landfills. 60 per cent of the waste in landfills is organic, contributing to methane emissions (Gupta and Sachdeva, 2021). Poisonous leachates from the landfills contaminate ground water and contribute to serious diseases. The lack of adequate collection, storage, treatment and disposal of the waste has profound implications on both people and planet, impacting not only the health and sanitation but also environmental, economic and social systems.

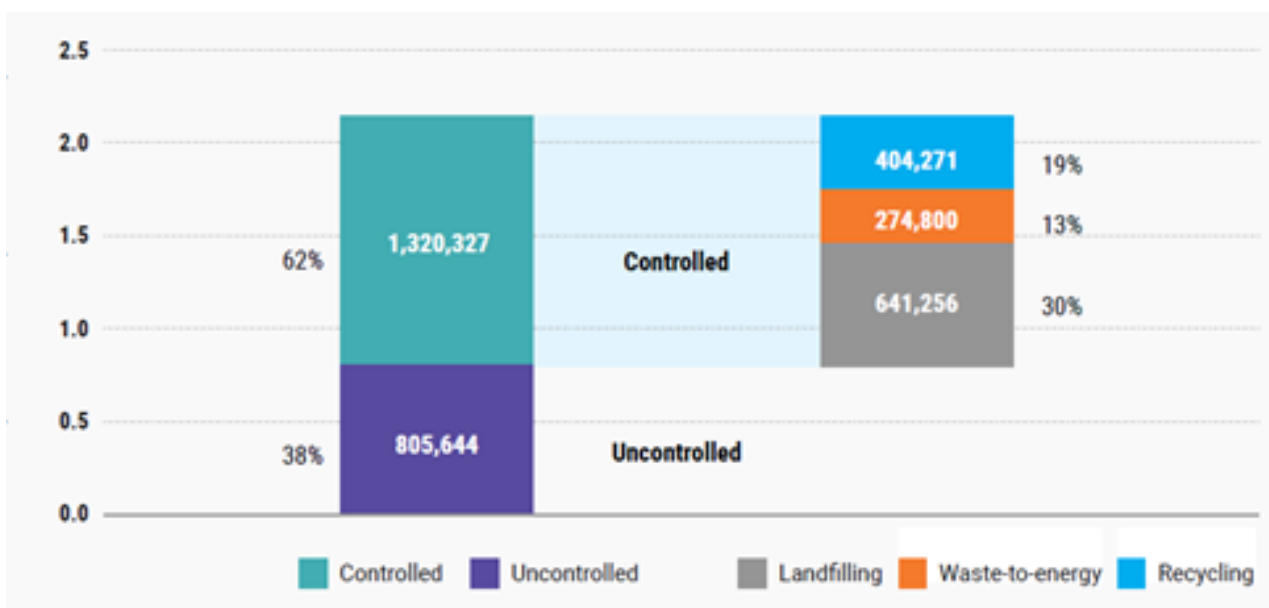


Image 2. Global municipal waste destinations in 2020: Controlled (landfilling, waste-to-energy and recycling) and uncontrolled (Source: Global waste management outlook, 2024)

3. Circular economy and wealth from waste

The circular economy is a system of economic activity that is regenerative by design, aiming to eliminate waste and the continual use of resources. In solid waste management, the concept of 'wealth from waste' is promoted in the rules and policies related to waste management. 'Waste to wealth' is also a National Mission of the Government of India (GoI). The most effective approach is integrated SWM which emphasizes reducing waste generation at source, improving source segregation, managing organic waste closer to the source and channelizing dry waste to respective processing / recycling industry for further use.

“Developing Integrated solid waste management systems is the key to solving India’s complex waste management challenges. It will help in resource recovery, generating economy and promoting health.”

-Mr Ashish Jain
Founder Director
IPCA

Several categories of waste that generates monetary value have been mainstreamed in the circular economy. For instance, one does not see PET bottle waste littered on the streets and on landfill since recycling infrastructure for PET is available and its supply chain has been established. However, waste material that does not fetch higher economic value is often overlooked. Organic waste is one such waste. It is easy to manage at the source but since

the economy around it is not well established, it generally ends up in landfills posing significant health implications. This calls for an urgent need to re-evaluate the health aspects in waste management, in addition to its economic sustainability.

4. Need to examine waste management for public health

The health impact of solid waste lacks sufficient evidence and research to establish a direct link to disease outbreaks, largely due to the time lag between waste origin and health issues. This makes it difficult for healthcare experts to precisely identify or attribute causes of diseases or deaths to irresponsible waste disposal. Health impacts vary by gender and age, but more reliable data is needed for effective risk analysis (UNEP-IETC and GRID-Arendal 2019). Additionally, the absence of data on informally dumped and burned waste leads to underestimating its environmental and public health effects (Ramadan et al. 2023).

Solid waste can harm human health through indirect routes too. For example, air pollution due to waste burning and soil and water contamination from landfill leachate can lead to respiratory, cardio-vascular and gastric effects (Alam , 2021; Mazhar et al., 2021; Pervez et al., 2022; Khan et al., 2022). Prolonged exposure to hazardous waste leads to multigenerational risks and long-term health issues, such as cancer and reproductive disorders like birth defects, commonly referred to as non-communicable diseases (Faiza et al., 2019).

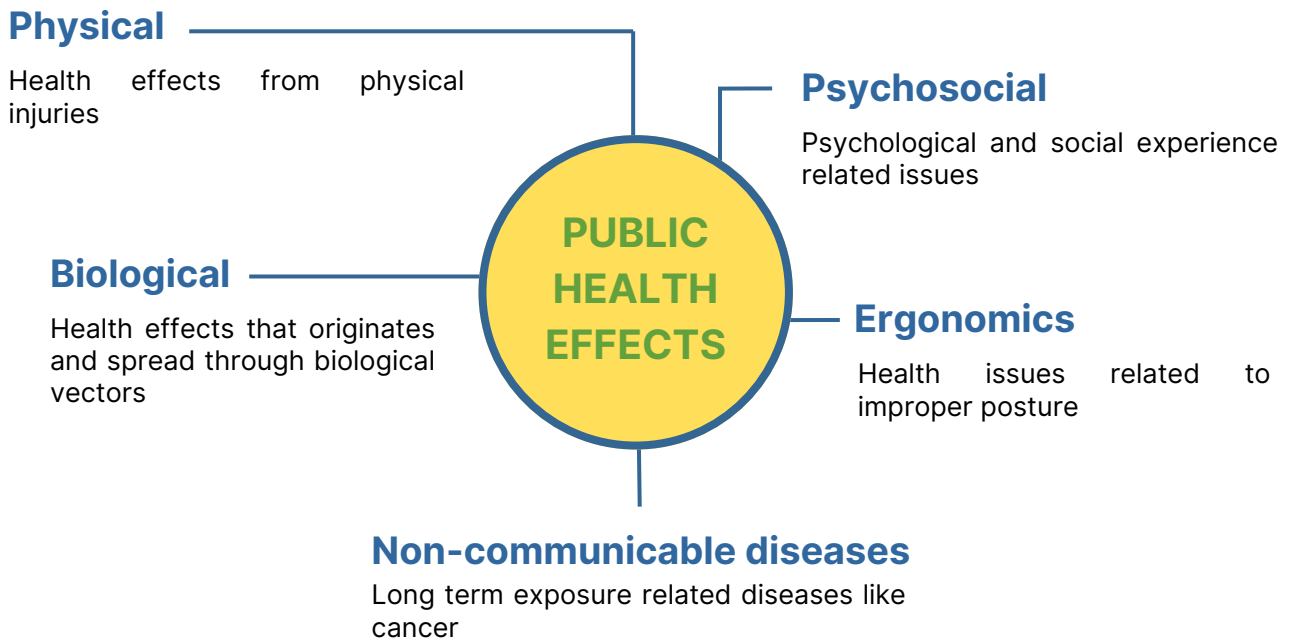


Image 3. Health effects of the waste

Malaria and dengue are feebly linked to waste disposal in drains. Waste workers face physical injuries from cuts and burns at landfill sites, along with psychological issues such as depression and anxiety (Chokhandre and Kashyap, 2017; Mishra et al., 2023). The heavy loads carried by waste pickers also result in musculoskeletal disorders. Annually, 400,000 to 1 million people die from diseases linked to mismanaged waste, including diarrhea and heart disease (Williams et al. 2019). Alarmingly, the lifespan of waste pickers is just 45 to 65 years (Danielson et al. 2020).

Issues like persistent pollutants in the food chain are highlighted globally. Microplastics has emerged as a significant concern, with studies estimating that people ingest between 78,000 and 211,000 microplastic particles annually (Cox et al., 2019). These particles are found everywhere—from land and water to the air and even the human placenta—and are linked to serious health issues, inc-

luding heart attacks, strokes, inflammatory bowel syndrome, reduced sperm count, and colon cancer (Ragusa et al., 2021; UNM Department of Pharmaceutical Sciences, 2024). Additionally, plastic pollution contributes to biodiversity loss, ecosystem degradation, and climate change (IUCN, 2024), with effects ranging from physical harm to wildlife to contamination of the food chain, risking population declines and species extinction.

5.Plight of rag pickers

The informal sector in waste collection, particularly ragpickers, lacks adequate support from the government, perpetuating a cycle of marginalization (India Exclusion Report, 2016). This group plays a crucial yet unrecognized role at the base of the waste disposal hierarchy (Uplap and Bhate, 2014). Even in nations that acknowledge their contributions, a structured approach to integrate the informal sector into formal waste management is absent (Kapur

and Agarwal, 2024). Men primarily handle the transactional aspects of waste, while women and children focus on retrieval and sorting, exposing themselves to hazardous materials and health risks (Shankar and Sahni, 2018; Kumari and Kiran, 2022).

“Waste sector is a black box where the urban miners, green brigade and wastepreneurs, the actors in the waste handling are often marginalized.”

-Dr Venkatesh
Associate Professor
Karlstad University, Sweden

Clause 15 of the Solid Waste Management (SWM) Rules, 2016 mandates local authorities to establish a system recognizing waste picker organizations. It promotes the integration of authorized waste pickers into formal solid waste management systems. Authorities must also facilitate the formation of Self-Help Groups and provide identity cards to waste workers. Currently, 27.22 crore informal workers from rural areas are registered on the eShram Portal, improving their access to social security and welfare schemes (Ministry of Labour and Environment, 2024).

The economic inclusion of waste pickers faces challenges due to political factors and their inability to meet formal schedules and performance indicators. However, with support from NGOs and private sector, developing business models that promote entrepreneurial opportunities for waste pickers can enhance their situation. NGOs bridge the gap

between waste workers and the government, helping them gain recognition and form cooperatives, ensuring working rights and social security, including health care benefits. They can additionally aid in advocating for the legal rights of the waste workers.

The private sector can play a vital role in enhancing occupational safety and improving the health of waste workers through Corporate Social Responsibility (CSR) initiatives. Gladly, there are good examples to cite. Eco Recycling Ltd in India launched the 'Ecoreco Enviro Education' program, training 300,000 informal waste workers (Kabadies) over ten years to manage e-waste safely. Similarly, Nestle India's Project Hilldaari has professionalized 546 waste workers in six tourist cities, providing them with occupational IDs and enrolling them in the e-Shram portal to access government welfare schemes (Kapur and Agarwal, 2024). The Indian Pollution Control Association (IPCA) has carried out several programmes for the upliftment and the formalization of the informal workers in the waste management sector. Additional efforts in the form of regular health checkups are offered to the waste workers and their children.

“For better health outcomes for today and the future generations, it is imperative to maintain the quality of waste by processing it at source and managing the networks in the waste management supply chain more efficiently.”

-Dr Sameer Prasad
Associate Professor, University of
Colorado Colorado Springs, USA

6. Financing of waste management sector

In India, municipal corporations are primarily responsible for waste management. A significant portion of their budget goes to salaries, leaving limited funds for operation and maintenance (O&M) and development projects (CPHEEO, 2013). Collection and transportation account for 80–95 per cent of the municipal solid waste management (MSWM) budget, while disposal and treatment often lack investment, leading to poorly managed landfills in many cities. Most municipalities face financial instability due to inadequate accounting and budgeting systems and a lack of multi-year financial planning (Hanrahan et al., 2006).

After the bubonic plague in 1994, India sought to improve its SWM by involving the private sector, as public funding was insufficient (Dey, 2018). This collaboration aimed to enhance waste collection, treatment, and disposal of waste, thereby improving the public health and sanitation by reducing the disease spread. Success stories, like Indore's biogas plant at landfill site, demonstrate how private involvement can minimize environmental and health impacts while generating carbon credits.

The Providing Urban Amenities to Rural Areas (PURA) program was launched in 2003 to tackle challenges faced by rural populations in India regarding access to goods, healthcare, and education. Supported by the Asian Development Bank, its pilot implementation ran from 2004 to 2007, aiming to reduce the urban-

rural gap by bringing urban amenities to rural areas. In 2010, it was restructured as PURA 2.0, a collaboration between panchayats and private sector partners. However, the initiative is often deemed a failure due to a lack of a solid business plan, an overemphasis on infrastructure, and insufficient integration with other rural strategies. This indicates that a top-down approach may not suffice; instead, a bottom-up approach, informed by local needs, could lead to better outcomes. Integrating health outcomes into the PPP model can help government bodies align with evolving public aspirations.

Bottom-up approach driven by the local population sensitive to the specific needs can create a better impact.

The MoHUA launched Swachh Bharat Mission (SBM) as a five year flagship programme in 2014, aiming for all urban local bodies to achieve 100 per cent Open Defecation Free (ODF) status along with scientific SWM, by promoting behavioural change through *jan andolan* (*people's movement*). The second phase of SBM launched in 2021, retained the ODF status and broadened its focus to biodegradable and plastic waste management. The Namami Gange programme, yet another programme of Gol has received significant investment since 2015 to clean the Ganga River through various interventions. Even when the government spending on sanitation and waste management surpasses that of the Namami Gange Programme, the issues related to waste management remain unresolved, compromising public health.

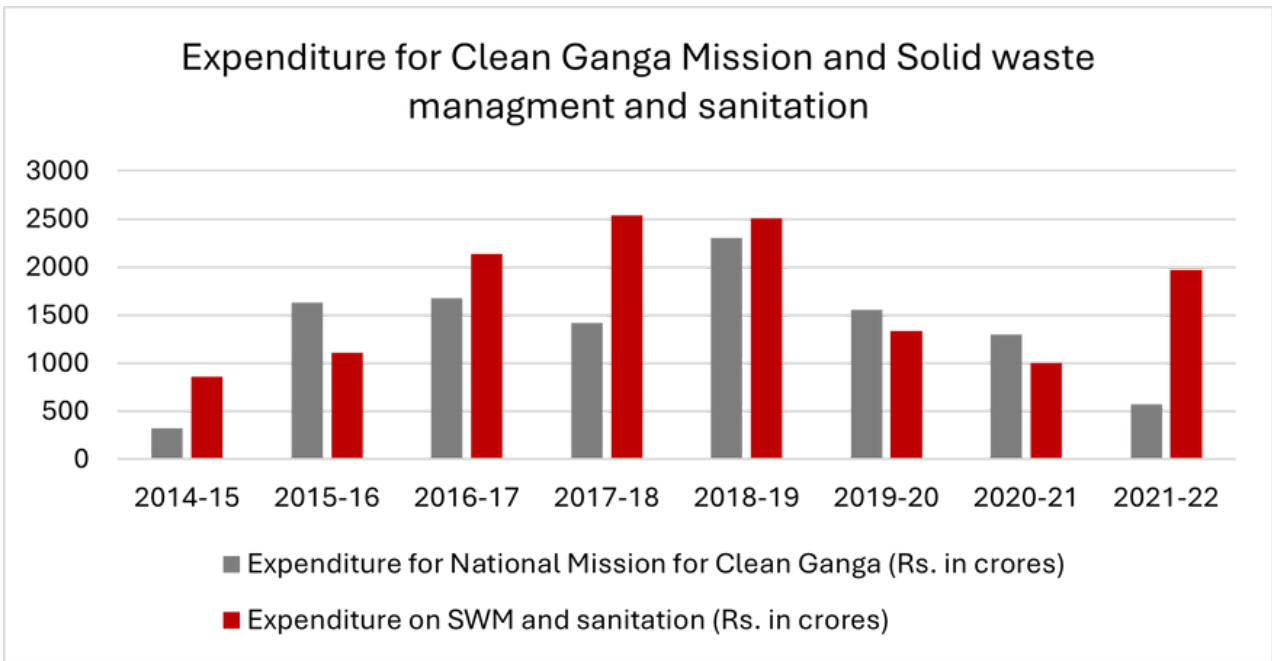


Image 4. Expenditure for clean Ganga mission and SWM and sanitation (Source: Ministry of Jal Shakti, 2021)

It is to be noted that the GDP's Government Health Expenditure (GHE) has marginally increased from 1.13% in 2014-15 to 1.84% in 2021 with the focus remaining on healthcare infrastructure rather than preventive health initiatives like waste management. Out-of-pocket health expenditure (OOPE) is pushing 3-7% of Indian households below the poverty line annually.

7. Waste management for public health

Re-evaluating health aspects in waste management is the need of the hour. To understand the impact of waste on human health and to bring out a policy intervention, a systematic long-term assessment and monetary

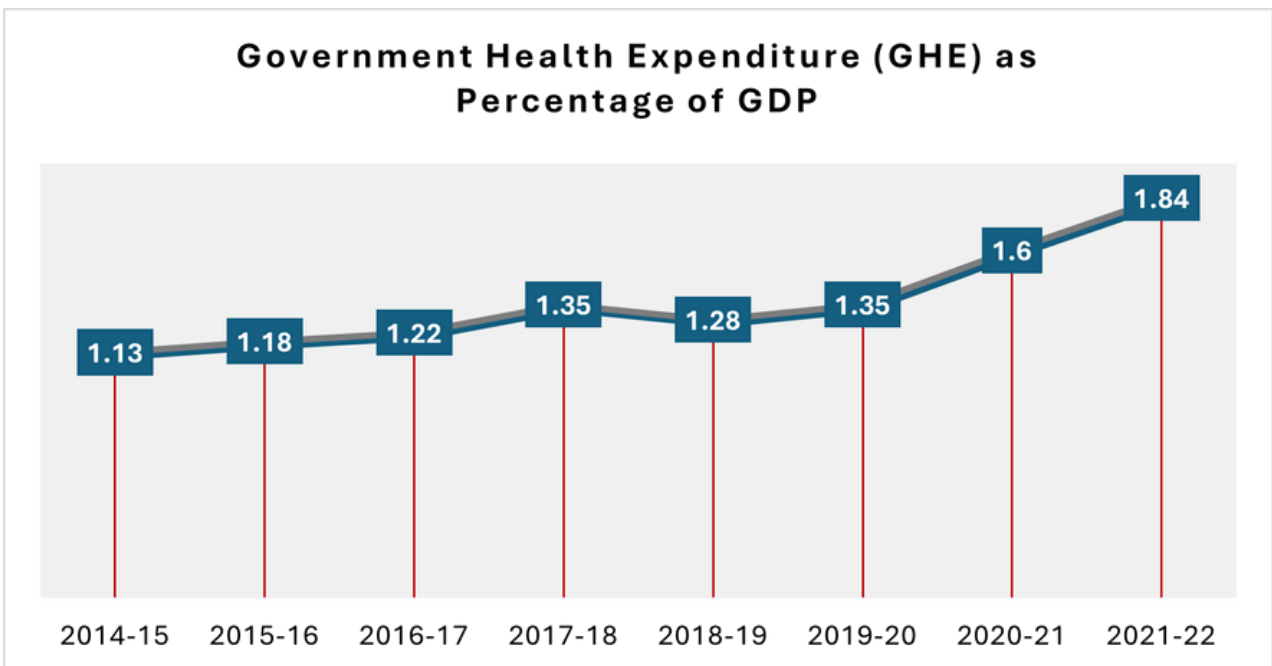


Image 5. Government health expenditure as percentage of the GDP in India (Source: NHA, October 2024)

quantification are essential. Economic quantification helps allocate resources efficiently to protect public health, yet investment in “Health through waste management” is limited due to unclear financial returns.

Uncontrolled municipal waste creates externalities that are often overlooked. For instance, in the case of ragpickers/ waste collectors who are exposed to occupational health hazards, an hour spent in the hospital means an hour of loss of wages. Income being the priority, they often neglect health issues. Reducing these externalities requires decreasing waste generation and reintegrating it into production. Economic valuation focusing on circular economy principles can be compelling.

Economic quantification of health impacts provides the base for efficient resource allocation to safeguard and advance the health and well-being of individuals and society.

a. Economic valuation of health impact of waste

Direct healthcare costs and indirect costs related to illness and mortality must be considered for this valuation. Common metrics like quality-adjusted life years (QALY) and disability-adjusted life years (DALY) represent social well-being and are analyzed through market or non-market valuation methods. These values guide decisions in cost-benefit and cost-effectiveness analyses. Input-output analysis for economic evaluation quantifies the costs and benefits associated with a disease, aiding decisions on budget allocations for health policies.

Cost-effectiveness analysis helps identify the most valuable actions within budget constraints by assessing the ratio of health outcomes to costs, which is crucial for countries like India with significant organic waste.

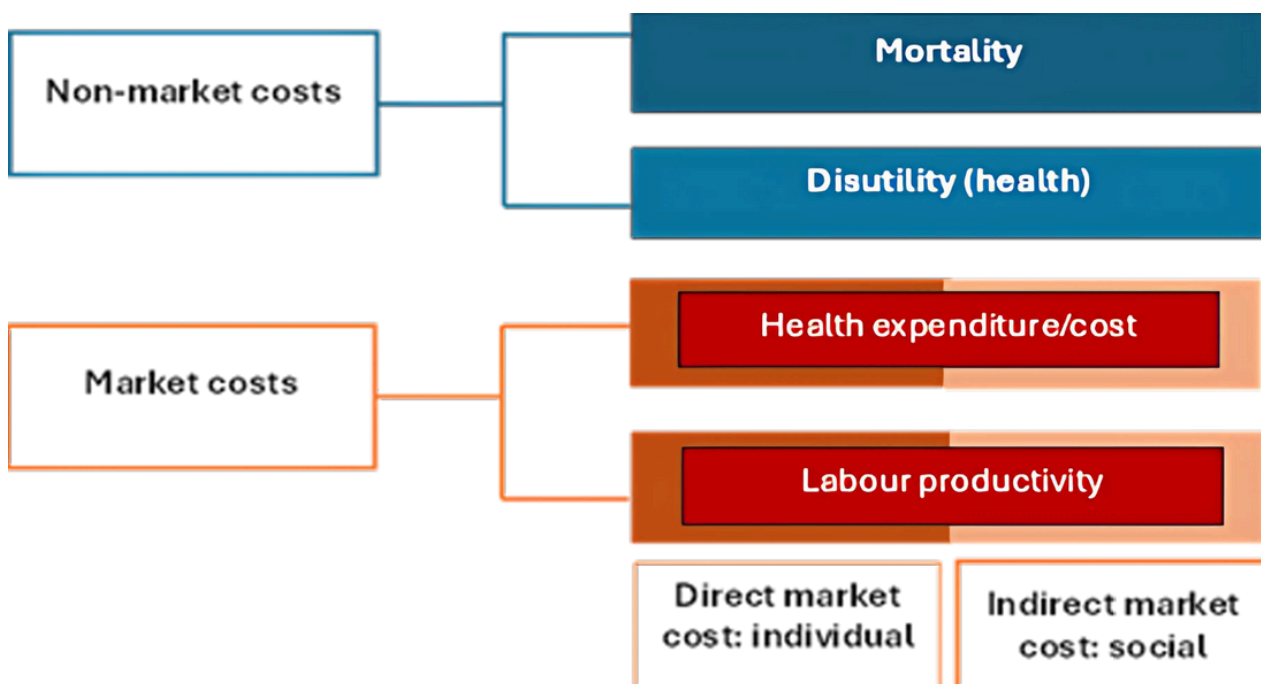


Image 6. Types of cost associated with the health (Source: WHO, 2023)

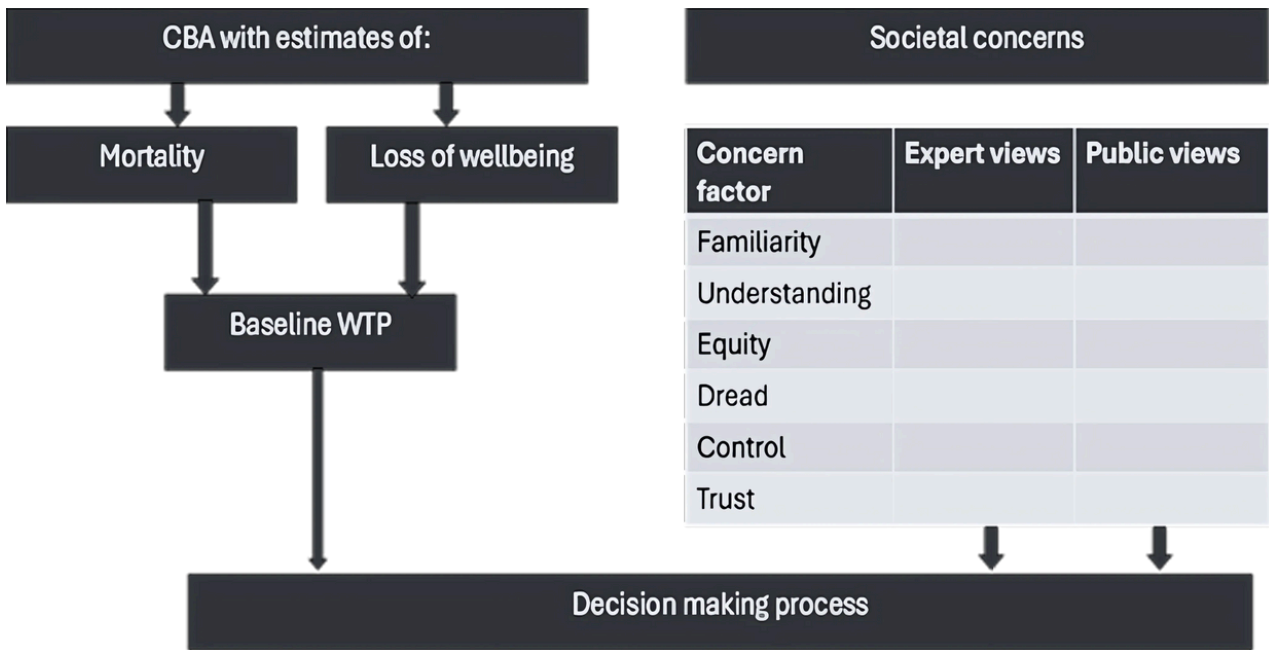


Image 7. Concern Assessment Framework (Source: WHO, 2023)

The Concern Assessment Framework can address societal issues related to waste management facilities, like landfills or WtE plants, guiding effective decision-making. Discrepancies between expert and public opinions on health risks highlight the need for communication strategies involving local authorities to benefit the community and governing bodies.

Evident economic returns from the waste to wealth initiatives and the financial assistance and subsidies for setting up the facilities promotes the initiative.

b. Waste Management Provisions

The policy frameworks related to waste management in India focus significantly on promoting the concept of wealth from waste. For example, according to the framework of Extended Producer Responsibility (EPR) under the Plastic waste management rules, mandatory use of a percentage of recycled

plastics in the new product packaging, encourage investment in plastic waste management and helps in developing the framework for circular economy. However, till date, the investment in ‘waste management for public health’ is not part of any policy framework.

It is true that India's waste management policies include health provisions, as detailed in Biomedical Waste Management Rules, addressing the management of potentially toxic healthcare waste. While E-waste and battery waste policies give reference to the health of waste worker and the Construction and Demolition waste management rules talks about the health inspection of the workers in the landfill site, the Solid Waste Management Rules focus on environmentally sound solid waste disposal through proper segregation, collection, and treatment.

The 2016 Solid Waste Management manual by the Ministry of Urban Development emphasizes worker

safety at the landfills and integrating the informal sector into formal waste management. It highlights the need for social security and health benefits for informal workers, promoting the

transformation of rag pickers into formal waste collectors with the support from NGOs and self-help groups. Table 1 summarizes health provisions in these policies.

Table 1. Provisions for health in the waste management policies

S. No.	Waste Management Rule	Provision for health mentioned
1.	National Urban Sanitation Policy (NUSP), 2008	<ul style="list-style-type: none"> • Broadly covers aspects of urban sanitation, with a specific focus to eliminate open defecation in cities • Focus on re-orienting institutions for developing city-wide approach to sanitation, covering all its aspects including SWM
2.	Solid Waste Management Rule, 2016	Lays emphasis on waste reduction, reuse, recycling, recovery and optimum utilization of various components of solid waste to ensure minimization of waste going to the landfill and minimize impact of solid waste on human health and environment while preparing State policy and strategy on solid waste management
3.	E-Waste (Management) Amendment Rules, 2024	The Department of Labour undertakes annual monitoring to ensure safety and health of workers involved in dismantling and recycling.
4.	Hazardous And Other Wastes (Management and Transboundary Movement) Second Amendment Rules, 2021	The Department of Labour undertakes annual monitoring to ensure the safety and health of workers involved in recycling, preprocessing and other utilization of hazardous wastes.

Table 1. Provisions for health in the waste management policies

S. No.	Waste Management Rule	Provision for health mentioned
5.	Biomedical waste management, Second Amendment Rules, 2019	<ul style="list-style-type: none"> • Ensuring occupational safety of all health care workers and others involved in handling of biomedical waste by providing appropriate and adequate personal protective equipment. • Conducting health check-ups at the time of induction and at least once a year for all its health care workers and others involved in handling of bio- medical waste. • Take all necessary steps to ensure that the bio-medical waste collected from the occupier is transported, handled, stored, treated and disposed of, without any adverse effect to the human health and the environment, in accordance with these rules and guidelines issued by the Central Government or the central pollution control board from time to time • Bio-medical waste will be treated and disposed of in accordance with Schedule I, and in compliance with the standards provided by the health care facilities and common bio-medical waste treatment facility • Coordinate with State Pollution Control Boards for organizing training programmes for staff of health care facilities and municipal workers on bio-medical waste.
6.	Plastic waste management (Amendment) Rules, 2024	Mandates the units engaged in the processing or recycling of the plastic waste to specify the occupational safety and health aspects of the

Table 1. Provisions for health in the waste management policies

S. No.	Waste Management Rule	Provision for health mentioned
		workers in the waste processing/recycling facilities.
7.	Construction & Demolition Waste Management Rules, 2016	Mandates the health inspections of workers at landfill sites and regular monthly health checkup of workers at processing / recycling site.
8.	Battery waste management Rules, 2022	Mentions that it is the responsibility of the producers to ensure safe handling of Battery or Waste Battery such that no damage to human health and environment occurs.

Despite the above provisions, a concrete waste management plan or policy emphasizing the integration of wealth with waste is absent. It is also found that insufficient monitoring and enforcement of these provisions results in poor compliance, thereby negatively affecting community health.

The waste management sector is dynamic with the presence of continuously evolving actors.

c. Stakeholders in Waste Management

The multifaceted waste management landscape involves stakeholders from diverse fields including the ministries, private enterprise and the community-based organizations. With the dynamic nature of the sector, these stakeholders have a key role to play. Under this scenario, shifting the role of the existing stakeholders giving adequate power on the government

departments that focus on the health aspects can positively impact the economy, ecology and the health of the citizens and the environment. For instance, increasing the capacity of health actors (Ministry of Health and Family welfare) to address environmental health determinants through concrete actions which can substantially link the waste with health.

There is a need for a participatory, action oriented and community-based research for co-creation of knowledge that can help overcome the knowledge gaps and empower and make the informal sector visible as agents for social change. Additionally, the involvement of private sector for infrastructural development that focuses on the ‘Health through Waste Management’ is also needed. Emphasizing on the provision of government fund or incentive for the investment in the health through waste management aspect can improve the health of the people.

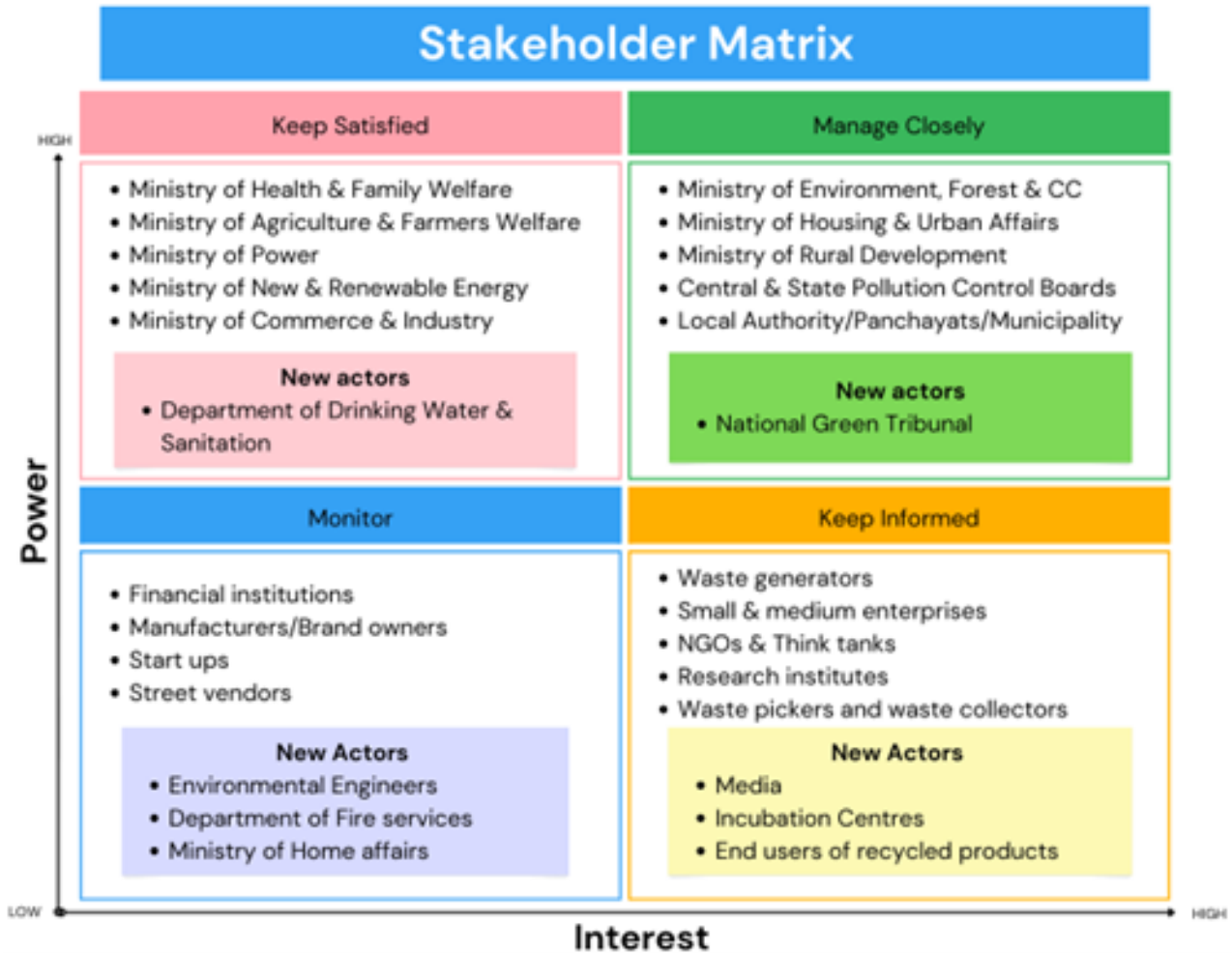


Image 8. Stakeholders and new actors in waste management

With the dynamic nature of the sector, new actors who contribute directly or indirectly to waste management continuously evolve. There is a need to constantly identify these actors, analyse their roles and include them as part of the policy frameworks.

8.SDGs advocate the integration of sectoral policies

International agreements like the Paris Climate Accord and commitments to

the Sustainable Development Goals (SDGs) stress the importance of sustainable waste management, considering health, environmental, and economic factors. Protecting citizens' health requires government support for effective waste management. This aligns with India's efforts to achieve multiple SDGs, including those focused on poverty reduction, health, clean water, decent work, reduced inequalities, and environmentally sound waste management.

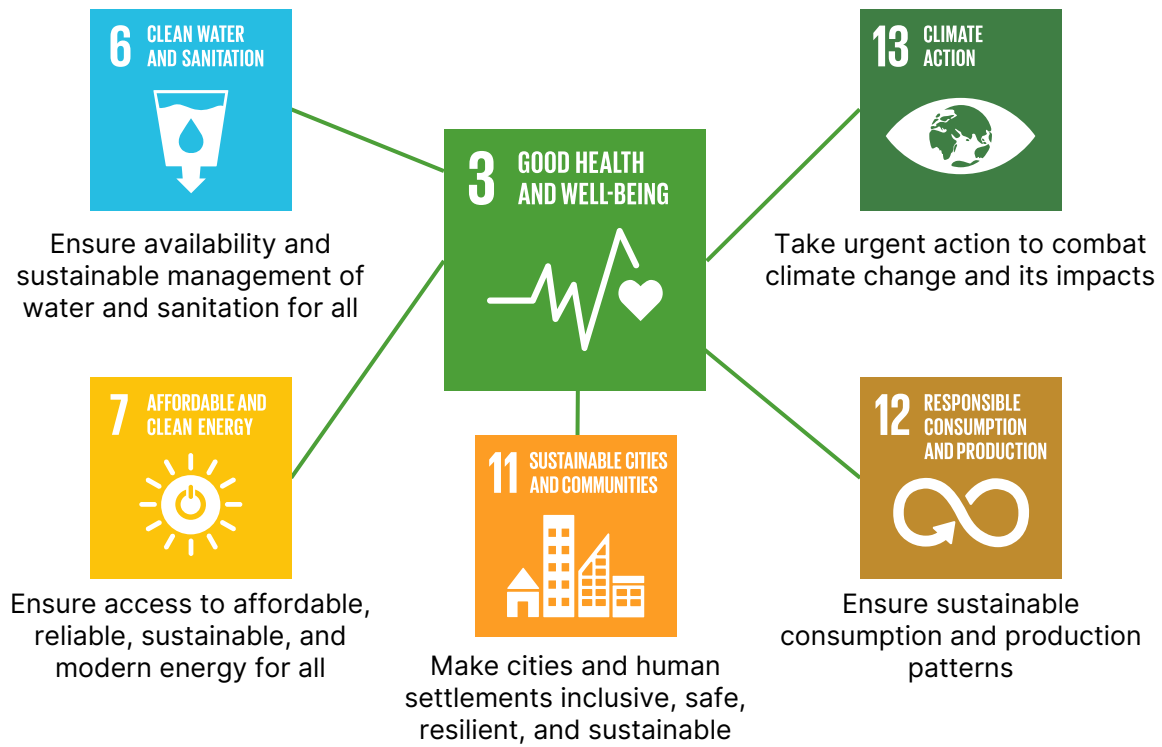


Image 9. Linking waste management and health with SDGs

9. Conclusion

Intersection of health and waste management is a critical and underexplored area that demands urgent attention. There is a need to undertake research in the area to highlight the direct linkages between waste and health. Policy frameworks should promote research in this aspect, so that evidence-based studies can be brought out to strengthen the notion of health impact of improper waste management. At the same time, policies should encourage education and awareness generation amongst various stakeholders. There should be careful consideration of the economic burden of mismanaged waste while drafting the provisions and policies related to waste management.

Solid waste management is overseen by several ministries, including the Ministry of Housing and Urban Affairs (MoHUA), the Ministry of Rural Develop-

ment (MoRD), and the Ministry of New and Renewable Energy (MNRE), as well as the Ministry of Environment, Forest and Climate Change (MoEFCC) and the Ministry of Jal Shakti (MoJS), through their river cleaning programs). However, there is a lack of unified action to tackle the challenges in this area. As a result, there is no dedicated budget for waste management, and the notion remains that the private sector can financially sustain itself in this sector through the value extracted from waste recycling/processing. Consequently, several critical aspects of waste management, which are not easily profitable for businesses and entrepreneurs, have been neglected.

Assigning the management of waste to the Ministry of Health can address critical aspects of waste management that significantly impact public health. To enhance waste management systems, it is essential to strengthen policies, raise public awareness, and

promote collaboration among the health, environmental, and municipal sectors. New actors contributing directly or indirectly in the waste management sector should be identified and their roles and responsibilities should be clearly defined in the rules.

Additionally, integrating public-private partnerships (PPPs) can improve mech-

anization and financial stability, while regulatory frameworks should encourage responsible practices. Involving the private sector in infrastructural development focused on health through waste management can yield significant public health benefits. The goal is to create a system that balances economic benefits with public health, livelihoods, and environmental sustainability.



Image 10. Group Photo from International Conference on Solid Waste Management for Good Health and Wellbeing organized on 1st March 2024 at TERI School of Advanced Studies (TERI SAS), New Delhi

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