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Sanitation Woes in India: Problems, Consequences and Remedies

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Abstract

Sanitation, clean water, and hygiene are fundamental to public health, environmental sustainability, and socio-economic progress. Poor sanitation contributes to disease outbreaks, environmental contamination, and social disparities, particularly impacting vulnerable communities. India continues to struggle with challenges such as inadequate sanitation infrastructure, open defecation, inefficient wastewater treatment, and deep-rooted social inequalities. While initiatives like the Swachh Bharat Mission have made substantial progress, gaps persist in ensuring comprehensive sanitation coverage. Addressing these challenges requires long-term investment, policy enhancements, and widespread behavioural change. To improve sanitation, India has implemented key programs like the Jal Shakti Abhiyan and wastewater treatment initiatives, alongside innovative solutions such as bio-digesters, e-toilets, and rainwater harvesting. Public-private collaborations and community-led interventions play a vital role in promoting sustainable sanitation and enhancing public health outcomes. Efficient sanitation infrastructure not only mitigates disease risks but also drives economic development and elevates living standards. Achieving universal sanitation by 2030 demands continuous investment, technological innovations, and integrated policies addressing both urban and rural sanitation needs. A concerted effort from the government, private sector, and communities is essential to ensure equitable sanitation access, foster sustainable urbanization, and build a healthier future for all.

Keywords: Sanitation, Hygiene, Waste Management, Open Defecation, Policy Reforms.

I. Introduction

Mahatma Gandhi, revered as the Father of the Nation, strongly emphasized the importance of cleanliness and sanitation. He believed that "cleanliness is next to godliness" and that one cannot seek divine blessings while maintaining an unclean body or mind. A clean body, he argued, should not exist in an unclean environment. Gandhi acknowledged the advancements made by Western nations in municipal sanitation and hygiene, stressing that India must learn from their methods while adapting them to its own needs. The principles of public cleanliness and hygiene, developed through scientific progress in the West, should serve as a guide for India's sanitation reforms. He firmly opposed unhygienic practices such as spitting and indiscriminate disposal of waste. He condemned the habit of spitting on streets, especially after chewing betel leaves and tobacco, as it not only polluted public spaces but also showed disregard for others' well-being. Furthermore, Gandhi emphasized that sanitation cannot be improved solely through taxation or government services. Instead, true reform is only possible through the collective and voluntary participation of all citizens, both rich and poor. He warned that if people failed to keep their surroundings clean, the dream of Swaraj (self-rule) would be tarnished by filth and decay **(Gandhi, 1925).** Access to basic sanitation, clean drinking water, and proper hygiene practices is essential for human development, health, and overall well-being. These interconnected factors are crucial in safeguarding public health, minimizing the spread of infectious diseases, and enhancing the quality of life (**Prüss-Üstün et al. 2019).** The safety of drinking water is particularly vulnerable to contamination from human waste, which harbours harmful bacteria, viruses, and nutrients. If not managed properly, these can seep into water sources and lead to significant contamination **(Bartram and Cairncross, 2010).** Inadequate sanitation infrastructure, especially in rural and marginalized communities, further heightens the risk of waterborne diseases, thereby threatening both the environment and public health **(Juran, 2017).** The adverse impact of poor sanitation on health is widespread. Substandard sanitation and hygiene practices are strongly associated with the transmission of diseases like diarrhoea, cholera, and dysentery, with children under five years old being particularly vulnerable **(Gartner et al. 2015).** According to the World Health Organization **(WHO, 2017),** approximately 1.6 million deaths annually result from unsafe water, inadequate sanitation, and poor hygiene, most of which occur in low- and middle-income countries. Beyond the health toll, these diseases also have a significant socioeconomic impact by

reducing productivity, driving up healthcare costs, and limiting educational opportunities **(Prüss-Üstün et al. 2019).** The promotion of sanitation and hygiene practices, such as regular handwashing with soap, maintaining personal cleanliness, and ensuring safe waste disposal, is vital in reducing the transmission of diseases **(Curtis and Cairncross, 2003).** For instance, studies have shown that handwashing can reduce the incidence of diarrhoeal diseases by up to 47% **(Luby et al. 2005).** Additionally, the proper disposal of human waste and the establishment of efficient sanitation systems help mitigate environmental damage while improving both individual and community health outcomes **(Ahern et al. 2017).** Governments and international organizations play a pivotal role in ensuring access to safe water and sanitation. The United Nations Sustainable Development Goal (SDG) 6 emphasizes the importance of ensuring universal access to clean water, sanitation, and hygiene and promoting sustainable management **(United Nations, 2015).** Through initiatives like Water, Sanitation, and Hygiene (WASH) programs, governments and international bodies have made significant strides in providing sustainable solutions in regions with the greatest need, contributing to improved public health and socio-economic development **(Waddington et al. 2009).** The WASH approach has been proven to be an effective strategy for improving health outcomes by addressing the interrelated challenges of water, sanitation, and hygiene **(WHO, 2019).** Research indicates that integrating WASH interventions can improve health, reduce healthcare costs, and enhance community well-being, especially in rural and underserved areas **(Clasen et al. 2014).** Furthermore, these programs contribute to long-term development by providing infrastructure that is sustainable and manageable by local communities, thereby increasing resilience to future challenges **(UNICEF, 2016).** In conclusion, tackling issues related to sanitation and hygiene, along with ensuring access to clean drinking water, is crucial for improving public health, supporting economic development, and achieving the Sustainable Development Goals. Cooperation among governments, international organizations, and local communities is essential to ensuring the sustainability of water and sanitation systems, reducing disease burdens, and ultimately improving the quality of life **(Saghir and Santoro, 2018).**

II. Sanitation: A Basic Need

The United Nations General Assembly, during its Sixty-Fourth Session on July 28, 2010, passed a resolution affirming that access to safe and clean drinking water and sanitation is a fundamental human right. This right is considered essential for the full enjoyment of life and all other human rights. The resolution urges governments and international organizations to take necessary actions, including financial support, capacity-building, and technology transfer, to enhance water and sanitation services. It particularly emphasizes the need for international assistance and cooperation to help developing countries expand access to safe, clean, affordable, and accessible drinking water and sanitation for all **(United Nations General Assembly, 2010).**

Sanitation is one of the most fundamental needs of humanity, alongside food, shelter, and clothing. It is crucial for maintaining public health, environmental sustainability, and social dignity. Access to clean water and sanitation is indispensable in preventing disease outbreaks and improving the overall well-being of individuals and communities. While often taken for granted in many parts of the world, inadequate sanitation remains a pressing issue for billions of people globally, contributing to widespread poverty and preventable health problems.

Sanitation and public health are inextricably linked. The WHO defines sanitation as the safe management of human excreta and wastewater, along with the disposal of solid waste. Poor sanitation is a major cause of waterborne diseases such as cholera, typhoid, and dysentery, which are responsible for millions of deaths each year. According to **UNICEF (2017),** about 2.3 billion people globally lack access to safely managed sanitation services, putting them at risk for these diseases. Contaminated water sources and improper waste management are primary routes for the transmission of infectious diseases, particularly in areas where sanitation infrastructure is lacking or underdeveloped **(UNICEF, 2019).**

The absence of proper sanitation systems leads to significant health consequences, especially in developing regions. Inadequate sanitation is responsible for 432,000 deaths annually from diarrhea alone **(WHO, 2020).** Children under the age of five are particularly vulnerable, and they account for a disproportionate number of deaths caused by poor sanitation. The **WHO (2017)** stresses that improving sanitation systems can reduce the burden of waterborne diseases and prevent millions of deaths each year. Access to sanitation is thus a life-saving necessity.

Investing in sanitation has far-reaching socio-economic benefits. According to a report by the **World Bank (2020),** the global economic cost of inadequate sanitation is estimated to be $260 billion annually, with the bulk of these costs stemming from poor health outcomes, lost productivity, and environmental degradation. When people suffer from preventable diseases due to poor sanitation, they are unable to work, attend school, or fully participate in society. For women and children, who are often responsible for water collection and maintaining household hygiene, inadequate sanitation can impose significant time burdens, reducing their opportunities for education and employment **(UNICEF, 2019).**

Improved sanitation systems directly contribute to economic productivity. The **World Bank (2020)** estimates that for every dollar invested in sanitation, there is a return of $5.50 in benefits, primarily due to reduced healthcare costs and improved worker productivity. These financial savings are particularly critical in low-income countries, where the burden of disease

is higher, and public health infrastructure is often insufficient. Furthermore, sanitation can reduce the economic impacts of environmental pollution, improving the long-term sustainability of water resources and ecosystems.

Sanitation has profound social and gender implications. In many regions, the lack of adequate sanitation facilities disproportionately affects women and girls. For example, in areas without proper sanitation, women and girls are often forced to defecate in open fields, which exposes them to physical risks and makes them vulnerable to violence and harassment. Furthermore, a lack of privacy and safety in sanitation facilities can affect girls' education. Studies show that the absence of gender-sensitive sanitation facilities in schools leads to higher dropout rates among girls, especially during menstruation.

Access to improved sanitation is essential for safeguarding the dignity and security of individuals, especially women and children. It allows them to maintain privacy and hygiene and reduces the risk of social stigma. The UN's Sustainable Development Goal (SDG) 6 emphasizes the importance of providing equal access to sanitation services for all, regardless of gender, age, or social status **(UN, 2015).**

Despite the acknowledged importance of sanitation, a significant portion of the global population still lacks access to basic sanitation services. According to the United Nations, over 4.2 billion people do not have access to safely managed sanitation, with 1.7 billion of them relying on shared sanitation facilities **(UN, 2017).** The lack of adequate sanitation services in rural areas, informal urban settlements, and slums is particularly concerning. In many developing countries, the rapid pace of urbanization and population growth has outpaced the development of sanitation infrastructure, leading to a growing sanitation crisis **(UN-Habitat, 2020).**

Addressing these challenges requires comprehensive strategies that involve investments in infrastructure, education, and policy reform. Governments, international organizations, and local communities must collaborate to build sustainable and equitable sanitation systems. Innovations in low-cost technologies, decentralized sanitation solutions, and community-based sanitation programs are some of the ways to overcome these challenges **(WHO, 2017).** Additionally, the inclusion of sanitation in national development agendas and international agreements like the SDGs is essential for ensuring universal access to sanitation by 2030. Sanitation is not merely a convenience; it is a basic human right and a critical element of public health, economic development, and social equality. Ensuring universal access to clean water and sanitation services is essential for preventing disease, promoting social dignity, and enhancing the quality of life for all. However, despite progress, substantial gaps remain, particularly in low-income countries and underserved urban areas. As the global community works toward achieving SDG 6, continued investment and innovative solutions are necessary to make sanitation accessible, affordable, and sustainable for everyone.

III. Definitions of Sanitation

Sanitation **(Box-1)** refers to the provision of safe, hygienic, and accessible services and facilities for the disposal of human excreta and sullage, ensuring privacy, dignity, and a clean, healthful environment both within households and the broader community **(WHO and UNICEF, 2006).** It specifically involves systems for the safe management of human waste, including urine and faeces, alongside public health initiatives designed to maintain hygienic conditions **(WHO, 2009).** According to the **Oxford Dictionary (2017),** sanitation is also concerned with public health conditions related to the treatment and disposal of human waste and sewage, as well as ensuring access to clean drinking water. Beyond waste disposal and sewage treatment, sanitation encompasses services such as garbage collection and wastewater management to maintain hygienic conditions **(WHO, 2020).** This broad definition includes not only infrastructure like latrines and sewers but also the regulatory frameworks, hygiene promotion, and management practices that help prevent diseases caused by faecal-oral transmission **(WELL, 1998).** In many developing countries, sanitation further extends to encompass drainage, solid waste management, and vector control, thus contributing to broader environmental hygiene **(WELL, 1998).** Sanitation involves both personal hygiene and public sanitation efforts. Personal sanitation includes activities like managing menstrual waste, cleaning household toilets, and handling household garbage. Public sanitation, on the other hand, covers municipal responsibilities such as garbage collection, wastewater treatment, cleaning public spaces (e.g., streets, schools, public toilets), and operating sewage treatment facilities **(Priya, 2019).**

Box-1 Shift in thinking about sanitation

Old Way of Thinking	New Way of Thinking
Sanitation is high cost and unaffordable.	Sanitation is affordable when the right technology is installed, reasonable financing is offered, and a creative mix of providers shares the cost.
The poor have more important needs than sanitation, and they cannot afford it.	Households—even poor ones—are willing to pay for sanitation.
Sanitation is not a high priority for governments.	Making sanitation a priority delivers big economic, health, and environmental benefits.
High-cost technology is needed to make sanitation work.	There are already innovative and low-cost—even waterless—technologies that can be used for wastewater management.
Governments and utilities do not have access to finance.	Financial viability can go with public affordability, and full cost recovery is feasible, provided the sanitation services are customer-oriented and worth paying for.

Source: Dignity, Disease, and Dollars: Asia's Urgent Sanitation Challenge. Why Invest in Sanitation. ADB.

Sanitation workers, who provide these essential services, play a pivotal role in maintaining public health. Environmental sanitation goes beyond waste management to address broader physical environmental factors that impact human health, such as effective drainage systems and control of disease-carrying vectors **(UNICEF, 1997).** By preventing the spread of diseases, sanitation plays a critical role in public health and sustainable development **(UNICEF Water, Environment and Sanitation, 1997).** Sanitation is also described as a set of practices focused on managing human excrement and wastewater hygienically to prevent disease transmission. These practices ensure the proper treatment and handling of water, food, and waste, protecting both individual and community health by preventing the spread of pathogens through correct excreta management **(WHO, 1987; Injury and Illness Prevention Program, 2005).** Furthermore, sanitation systems help maintain a healthy environment by providing clean water for drinking and hygiene purposes. Health and hygiene education programs are often integrated with sanitation initiatives to educate communities about health risks and improve sanitation practices. Key components of sanitation include the construction of infrastructure, sewage systems, and educational programs to ensure the proper use and maintenance of these facilities **(WHO, 2002).** In conclusion, sanitation is a multifaceted concept encompassing infrastructure, systems, and educational efforts necessary to sustain a clean and healthy environment. It plays an essential role in preventing disease spread and supporting sustainable development. Sanitation is not just about technical waste management but also about fostering social and behavioural practices that promote long-term public health and well-being **(UNICEF, 2019).**

IV. Objectives of Sanitation

Sanitation involves the provision of essential facilities and services for the safe disposal of human waste, access to clean water, and the maintenance of hygiene to prevent disease transmission and promote public health. The primary objectives of sanitation are critical in improving public health, protecting the environment, and enhancing overall quality of life. Below are the key objectives of sanitation in India, supported by relevant references:

Protect Public Health: One of the central goals of sanitation is to reduce the transmission of diseases through effective waste disposal, water treatment, and hygiene practices. Proper sanitation systems play a pivotal role in preventing waterborne diseases such as cholera, typhoid, and dysentery, which remain common in many parts of India **(Prüss-Üstün et al. 2019).** By minimizing disease transmission, sanitation supports healthier communities and reduces the burden on public health systems **(Gartner et al. 2015).**

Ensure Safe and Clean Water Supply: Sanitation is integral to ensuring the availability of clean and safe drinking water, which is essential for human health and survival. Proper management of wastewater and the safe disposal of human excreta help protect water sources from contamination **(Bartram and Cairncross, 2010).** In India, where water contamination poses significant challenges, sanitation systems are crucial in preventing the pollution of rivers, lakes, and groundwater resources **(Juran, 2017).**

Improve Environmental Quality: Effective sanitation systems contribute to a cleaner environment by managing waste in a way that reduces contamination of air, soil, and water. In India, where urbanization and population growth place immense pressure on existing sanitation infrastructure, it is critical to manage waste effectively to prevent environmental degradation **(Ahern et al. 2017).** Proper sanitation reduces the risk of pollution and promotes more sustainable environmental practices **(WHO, 2020).**

Promote Social and Economic Development: Sanitation plays a key role in fostering economic growth by reducing healthcare costs, boosting workforce productivity, and creating healthier societies. Improved sanitation decreases absenteeism due to illness, ensuring people can work and study in healthier environments **(Prüss-Üstün et al. 2019).**

Moreover, sanitation initiatives can improve living conditions and promote social equity by benefiting underserved communities **(Waddington et al. 2009).**

Support Sustainable Urbanization: As India's urban areas continue to expand, the need for effective sanitation systems becomes even more pressing. Sanitation ensures that infrastructure keeps pace with population growth, addressing challenges related to waste management and maintaining livable environments in both formal and informal settlements **(UNICEF, 2016).** Major cities such as Delhi and Mumbai face significant sanitation challenges, requiring innovative solutions to waste management and sewage treatment **(UNICEF, 2019).**

Enhance Hygiene Practices: Hygiene is an integral aspect of sanitation. Promoting good hygiene practices—such as handwashing with soap, safe food handling, and personal cleanliness—helps reduce the spread of infectious diseases. In India, where hygiene practices can vary significantly, public health campaigns that promote hygiene are essential to improving health outcomes **(Curtis and Cairncross, 2003).** These efforts align with the WHO's focus on hygiene as a key strategy for disease prevention **(WHO, 2009).**

Contribute to the Achievement of Sustainable Development Goals (SDGs): Sanitation directly contributes to achieving several SDGs, particularly SDG 6 (clean water and sanitation), SDG 3 (good health and well-being), and SDG 11 (sustainable cities and communities). In India, the Government's Swachh Bharat Mission has been a crucial step towards improving sanitation access in both rural and urban areas, aligning with the global goals for sustainable development **(UNICEF, 2016).**

Reduce Inequalities: Access to sanitation is often uneven, especially in rural areas and underserved urban settlements. Ensuring equitable access to sanitation helps reduce disparities by providing marginalized communities with the same basic health and hygiene services as more privileged groups **(Saghir and Santoro, 2018).** Addressing sanitation inequities is critical to improving public health and well-being for all **(Gartner et al. 2015).**

Promote Community-Led Sanitation Initiatives: Empowering local communities to take ownership of sanitation systems is key to ensuring their sustainability and resilience. Community-driven approaches have proven effective in rural India, where local involvement in sanitation practices enhances the maintenance of infrastructure and raises hygiene awareness **(Waddington et al. 2009).**

Enhance Disaster Resilience: Effective sanitation systems contribute to building resilience in communities, especially in the aftermath of natural disasters. In India, which frequently experiences floods and other natural disasters, re-establishing sanitation facilities promptly is vital to preventing disease outbreaks **(UNICEF, 2017).** Ensuring that sanitation systems are adaptable and resilient is essential for disaster preparedness and response. In conclusion, the objectives of sanitation in India encompass more than just infrastructure provision. They involve improving public health, safeguarding the environment, promoting economic development, and fostering social equity. Addressing sanitation challenges through both technical and community-based interventions is essential to achieving sustainable health outcomes and ensuring all communities have access to safe, hygienic, and dignified living conditions **(Saghir and Santoro, 2018).**

V. Major Components of Sanitation

Sanitation is a critical factor in promoting public health, driving economic development, and ensuring environmental sustainability worldwide. The components of sanitation span across essential areas such as infrastructure, hygiene practices, policies, and waste management, all of which are fundamental to the well-being of individuals and communities. In addition to these core components, other important aspects include the role of sanitation in disease prevention, its socio-economic impacts, and the challenges posed by urban sanitation. Addressing these elements is key to enhancing public health outcomes and improving quality of life on a global scale.

Access to Safe Water and Sanitation Services: Access to clean water and effective sanitation is the foundation of public health. Unfortunately, 2.3 billion people globally still lack access to safely managed sanitation services **(WHO, 2017).** Enhancing access to clean water and sanitation services helps to significantly reduce waterborne diseases, which remain a major public health challenge, especially in low-income countries. Furthermore, the provision of clean water and sanitation is central to achieving Sustainable Development Goal (SDG) 6, which seeks to ensure universal access to water and sanitation by 2030 **(UN, 2015).**

Sanitation Infrastructure and Wastewater Management: The proper infrastructure for sanitation includes sewer systems, septic tanks, and wastewater treatment facilities. Effective wastewater management ensures that used water is treated and safely returned to the environment, preventing contamination **(World Bank, 2020).** Insufficient infrastructure, however, leads to pollution and poses serious public health risks, particularly in urban slums or informal settlements.

Investment in sanitation infrastructure is therefore crucial for reducing environmental contamination and safeguarding public health **(UN-Habitat, 2020).**

Hygiene Education and Practices: Hygiene education is a vital aspect of sanitation, focusing on encouraging proper hygiene practices, such as handwashing with soap, safe food handling, and maintaining clean living environments. The **WHO (2018)** underscores that promoting hygiene in schools and communities can result in substantial reductions in diarrheal diseases, particularly among children. Hygiene education is essential for promoting healthful behaviours that help prevent the spread of infectious diseases, particularly in areas where sanitation infrastructure is limited or lacking.

Environmental Sanitation and Pollution Control: Environmental sanitation is aimed at managing factors such as solid waste, air pollution, and chemical exposure, which all have direct impacts on public health. Improper disposal of waste can lead to environmental contamination, contributing to health risks like the spread of vector-borne diseases **(WHO, 2016).** Solid waste management, which involves waste reduction, recycling, and composting, plays a critical role in minimizing pollution, improving cleanliness, and enhancing public health **(UN-Habitat, 2020).** Effective management of environmental sanitation contributes to cleaner, safer communities.

Policy and Regulation: Sanitation policies are crucial for ensuring the effective development of infrastructure, waste management systems, and hygiene promotion. Governments are tasked with establishing regulations that guarantee sanitation services are provided equitably and sustainably, while also ensuring compliance with environmental and public health standards **(World Bank, 2020).** Sound policies that integrate sanitation into broader health, water, and urban planning sectors help create sustainable and comprehensive solutions for sanitation **(WHO, 2017).**

Sanitation and Disease Prevention: Sanitation plays a key role in disease prevention. Poor sanitation conditions increase the risk of diseases like cholera, typhoid, and malaria, which can spread rapidly in areas lacking proper sanitation infrastructure **(UNICEF, 2017).** Adequate sanitation infrastructure, such as proper waste disposal and sewage treatment systems, helps reduce the transmission of these diseases. Moreover, sanitation is essential in preventing the spread of pandemics, as it reduces the likelihood of exposure to contaminated water and waste **(WHO, 2020).**

Socio-economic Impacts of Sanitation: The socio-economic benefits of improved sanitation are far-reaching. Access to sanitation boosts productivity, reduces healthcare costs, and improves educational outcomes, particularly for girls, by allowing them to attend school regularly and safely **(UNICEF, 2019).** Lack of sanitation is closely linked to poverty and inequality, particularly in rural or informal urban areas with limited access to services. Investing in sanitation not only improves public health but also promotes economic growth by reducing absenteeism due to illness, increasing work productivity, and lowering healthcare expenses **(World Bank, 2020).**

Urban Sanitation Challenges: Urbanization presents specific challenges for sanitation, especially in rapidly growing cities in low- and middle-income countries. Informal settlements, often lacking basic sanitation services, are particularly vulnerable to the harmful effects of inadequate sanitation. The expansion of slums and peri-urban areas, where infrastructure is insufficient, exacerbates health disparities and contributes to environmental pollution **(UN-Habitat, 2020).** Addressing these challenges requires innovative approaches, such as decentralized waste treatment systems and community-based sanitation programs, to ensure that urban populations benefit from improved sanitation services. Sanitation is an indispensable element of public health and its effective management requires a comprehensive approach that includes ensuring access to water, infrastructure development, hygiene education, disease prevention, and addressing socio-economic challenges. Alongside these factors, it is essential to improve policies and tackle the unique challenges of urban sanitation. Global efforts and sustained investment are needed to ensure sanitation is universally accessible, affordable, and sustainable, thereby promoting healthier, more resilient communities.

VI. Externalities of Sanitation

From the perspective of an environmental economist, **externality** refers to a side effect or consequence of an economic activity that impacts third parties, individuals who do not directly participate in the activity. These side effects can be either positive or negative when the full costs or benefits are not captured in the market price.

Positive Externalities of Sanitation

Sanitation is essential for public health, economic development, and environmental sustainability. Proper sanitation creates numerous positive externalities that extend beyond the individuals directly benefiting from it, contributing to broader societal improvements.

Public Health Improvements: One of the most significant benefits of sanitation is the reduction in the spread of waterborne diseases such as cholera and diarrhea. Improved sanitation and clean water access significantly reduce healthcare costs and enhance productivity, as fewer individuals suffer from preventable diseases **(Prüss-Ustün et al. 2019).**

Economic Growth and Productivity: Access to sanitation increases productivity by promoting better health. When people are healthier, they can work and attend school more regularly, which improves earnings and fosters economic stability. Businesses also benefit from reduced absenteeism and fewer workdays lost to illness **(Hutton and Chase, 2016).**

Environmental Benefits: Effective waste disposal and sanitation systems prevent water pollution, safeguarding ecosystems and agricultural productivity. Contaminated water can disrupt biodiversity, while proper sanitation helps maintain clean water supplies, benefiting both human populations and the environment **(WHO, 2022).**

Educational Gains: In low-income regions, sanitation improvements, such as clean school toilets and handwashing facilities, lead to fewer school absences. This is especially important for girls, who often miss school due to a lack of sanitation during menstruation **(Jasper et al. 2012).**

Social Equity and Human Dignity: Ensuring sanitation access for marginalized communities fosters inclusivity and reduces disparities. Investments in sanitation can promote social equity by addressing the needs of vulnerable populations, thus enhancing overall societal well-being **(United Nations, 2023).**

Investing in sanitation infrastructure delivers widespread benefits, improving public health, economic stability, environmental health, and social equity.

Negative Externalities of Sanitation

Inadequate sanitation can result in significant negative externalities, harming individuals, society, and the environment. Poor sanitation practices create side effects that disproportionately affect communities, public health, and the economy.

Health Impacts: One of the most severe negative externalities is the spread of diseases. Inadequate sanitation systems, such as improper waste disposal or open defecation, contribute to the transmission of infectious diseases like cholera, typhoid, and dysentery **(World Health Organization [WHO], 2020).** In areas with limited sanitation, environmental contamination from improperly disposed waste can lead to widespread health crises that burden public health systems **(UNICEF, 2019).** These diseases not only affect those directly involved but also place a financial strain on society through higher healthcare costs and lost productivity **(World Bank, 2020).**

Environmental Degradation: Poor sanitation results in environmental pollution when untreated sewage is released into rivers or lakes, polluting water sources and damaging ecosystems **(UN-Habitat, 2020).** In urban slums, where waste management is often inadequate, untreated waste is directly dumped into water bodies, exacerbating environmental harm. This not only harms aquatic biodiversity but also reduces agricultural productivity as contaminated water damages soil **(WHO, 2020).** These environmental damages affect entire ecosystems and hinder sustainable development.

Economic Burden: The economic cost of inadequate sanitation is immense. In developing countries, the economic burden of poor sanitation exceeds $260 billion annually, according to the **World Bank (2020).** These costs stem from increased healthcare spending, decreased workforce productivity, and environmental remediation efforts. The lack of sanitation services further limits economic growth, particularly in rural and informal urban areas **(UNICEF, 2020).** This financial burden disproportionately affects vulnerable communities, perpetuating poverty and inequality.

Social and Behavioral Externalities: Poor sanitation leads to social stigma and exclusion. Marginalized groups, such as women and children, often suffer the most from inadequate sanitation. Women and girls, in particular, face risks related to physical safety and dignity when sanitation facilities are unsafe or unavailable **(UNICEF, 2019).** Open defecation, common in regions with limited sanitation, leads to social stigma, resulting in discrimination against those practising it **(WHO, 2020).** These negative externalities contribute to inequality and hinder efforts to promote gender equality and inclusive development. The negative externalities of poor sanitation are pervasive, affecting public health, the environment, the economy, and social equity. The broader societal impacts of inadequate sanitation are profound, making it a critical issue to address through comprehensive policies and infrastructure investments. Improving sanitation not only protects public health but also contributes to environmental conservation and economic development, benefiting society as a whole. Therefore, addressing sanitation-related externalities is vital for sustainable development and the well-being of communities globally.

VII. Access to Sanitation in Developing Countries

Sanitation remains one of the most urgent global issues, particularly in developing countries. While access to sanitation is a fundamental human right, millions in low- and middle-income nations still lack proper sanitation facilities, resulting in widespread health, environmental, and socio-economic challenges. Despite some progress, the global scenario reflects significant disparities in access to basic sanitation services, highlighting the need for sustained efforts to achieve universal access by 2030, as outlined in the Sustainable Development Goals (SDGs). Access to improved sanitation in developing countries remains limited, with over 4.2 billion people globally lacking safely managed sanitation services **(UN, 2017).** A

large portion of this population resides in rural and informal urban areas, where sanitation infrastructure is either nonexistent or inadequate. The WHO estimates that approximately 2.3 billion people still lack safely managed sanitation services, relying on practices like open defecation or shared, unsanitary facilities **(WHO, 2017).** These poor sanitation practices contribute to the contamination of water sources, facilitating the spread of diseases such as cholera, typhoid, and dysentery, which are widespread in many developing nations. Regions such as rural India and sub-Saharan Africa face particularly severe sanitation challenges. For instance, around 600 million people in rural India lack access to sanitation services, and open defecation remains widespread despite government efforts to improve access **(UNICEF, 2019).** In sub-Saharan Africa, only 28% of the population has access to safely managed sanitation, with many relying on unimproved facilities like pit latrines (WHO, 2020). These poor sanitation conditions significantly contribute to high morbidity and mortality rates, with diarrhea alone causing over 500,000 child deaths annually **(UNICEF, 2017).**

Health Impacts of Poor Sanitation: The consequences of inadequate sanitation in developing countries are severe. **WHO (2020)** estimates that poor sanitation leads to over 800,000 deaths annually, primarily from preventable waterborne diseases. Diarrheal diseases, which are especially deadly for children under five, remain a leading cause of death. According to **UNICEF (2019),** waterborne diseases are responsible for approximately 70% of deaths in children under the age of five in developing countries. Inadequate sanitation also exacerbates malnutrition, as contaminated water and poor hygiene compromise the immune system, making individuals, especially children, more vulnerable to infections **(WHO, 2020).** Beyond health impacts, poor sanitation has broader socio-economic consequences. The **World Bank (2020)** estimates that inadequate sanitation costs developing countries over $200 billion annually, encompassing healthcare expenditures, lost productivity, and the strain on public health systems. These costs significantly hinder economic development, particularly in regions already struggling with limited resources.

Efforts and Challenges in Achieving Improved Sanitation: While significant strides have been made to improve sanitation in developing countries, numerous challenges persist. The United Nations' SDG 6 aims to ensure universal access to water and sanitation by 2030, but many countries remain off track in meeting this goal **(UN, 2015).** Factors such as inadequate infrastructure, poverty, rapid urbanization, and political instability contribute to these challenges. Countries like India and Kenya have made notable progress. The Indian government's Swachh Bharat Mission, launched in 2014, aims to eliminate open defecation and provide sanitation facilities for all citizens by 2024. By 2019, over 100 million toilets had been constructed under this initiative, significantly reducing open defecation **(UNICEF, 2019).** However, challenges remain, particularly in rural areas, where facility maintenance and behaviour change programs often fall short. Urban sanitation also poses significant challenges. In rapidly growing cities, especially informal settlements and slums, inadequate sanitation infrastructure exacerbates health and environmental problems. Cities like Nairobi, Kenya, and Dhaka, Bangladesh, face heightened risks of disease outbreaks due to poor waste management systems and overcrowded conditions. Scalable and adaptable urban sanitation solutions are crucial to addressing the needs of these growing populations **(UN-Habitat, 2020).**

Policy and International Support: International organizations, including WHO, UNICEF, and the World Bank, play a pivotal role in supporting sanitation efforts globally. These organizations provide financial support, technical expertise, and policy guidance to help countries improve sanitation. The **World Bank (2020),** for example, funds programs to improve water quality, expand sanitation infrastructure, and promote hygiene education in developing nations. Furthermore, it is increasingly recognized that sanitation must be integrated into broader initiatives addressing water quality, health systems, education, and social equity. National governments also bear responsibility for improving sanitation. However, political will and capacity vary greatly across countries. While some governments have prioritized sanitation in their national agendas, others face challenges in mobilizing sufficient resources or coordinating efforts across sectors. Effective sanitation policies must tackle the root causes of inadequate access, such as poverty, inequality, and poor governance, to provide long-term, sustainable solutions. The global sanitation scenario in developing countries highlights both significant progress and persistent challenges. Although many people have gained access to sanitation services in recent decades, billions still lack access to safe sanitation, with serious implications for public health, the economy, and the environment. Addressing these challenges requires continued global cooperation, innovative solutions, and substantial investments in infrastructure, education, and policy reforms. Achieving universal sanitation access by 2030 remains a critical priority for the global community.

VIII. MDG's and SDG's Approaches to Sanitation

The Millennium Development Goals (MDGs), established in 2000, aimed to tackle critical global issues such as poverty, education, and health. However, sanitation was initially excluded and was only incorporated in 2002 during the World Summit in Johannesburg. It was included under Goal 7, Target C, which sought to halve the proportion of individuals lacking access to basic sanitation between 1990 and 2015. Basic sanitation was defined as facilities that ensure the hygienic separation of human excreta from human contact. Despite global efforts, this target was not met. The percentage of individuals with access to basic sanitation rose from 54% in 1990 to 68% in 2015, falling short of the 77% goal. Consequently, over 700 million people remained without access to basic sanitation, while more than 2.4 billion lacked safe sanitation, and 946 million continued to practice open defecation **(Smiley, 2021; UNICEF, 2015).** The MDGs' approach

to monitoring sanitation progress faced criticism, particularly regarding the definition of "improved" sanitation. The Joint Monitoring Programme (JMP) categorized facilities such as simple pit latrines and ventilated improved pit latrines as "improved," regardless of their functionality and maintenance. This broad classification often led to an overestimation of access, as many facilities labelled "improved" were neither safe nor hygienic **(Satterthwaite, 2016).** Additionally, the emphasis on constructing sanitation facilities without ensuring proper waste management contributed to environmental pollution and health hazards, particularly in densely populated urban areas. Access to sanitation is deeply connected to human rights, encompassing dignity, health, and equality. The limited success of the MDGs in achieving sanitation targets highlights broader challenges in addressing inequalities and ensuring equitable access to essential services. Marginalized communities, especially in developing countries, continue to face systemic barriers that exacerbate health disparities and hinder socio-economic development **(Smiley, 2021).**

Several key lessons emerge from the MDGs' experience with sanitation. Firstly, comprehensive definitions and robust monitoring systems are essential to accurately assess progress and ensure sanitation facilities are functional, safe, and hygienic. Secondly, urban sanitation challenges require tailored solutions that consider rapid population growth, infrastructure limitations, and resource constraints. Thirdly, adopting a human rights-based approach ensures that sanitation initiatives prioritize equity, dignity, and the needs of marginalized communities, fostering inclusive development **(Bartram et al. 2018).** Moreover, infrastructure development must be complemented by behavioural change initiatives and community engagement to promote sustained usage and maintenance **(Mara et al. 2010).** Lastly, effective sanitation goes beyond toilet construction to include integrated waste management, ensuring safe disposal and treatment to prevent environmental contamination and health risks. In conclusion, while the MDGs successfully brought global attention to sanitation, the targets set were not fully met, and monitoring mechanisms had significant shortcomings **(United Nations, 2015; WHO and UNICEF, 2015).** The lessons learned from this experience underscore the need for more nuanced and comprehensive approaches under the Sustainable Development Goals (SDGs) to ensure not just access but also the safety and sustainability of sanitation services worldwide **(UN-Water, 2020)**

Sustainable Development Goal 6 (SDG 6) seeks to "ensure availability and sustainable management of water and sanitation for all" by 2030 (United Nations, 2015). This goal highlights the fundamental role of water and sanitation in driving broader development outcomes, including health, education, and economic progress **(UN-Water, 2020).** However, despite global initiatives, achieving universal access to safe and affordable sanitation services remains a challenge. According to the WHO and the UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation, as of 2020, 45% of the global population still lacked access to safely managed sanitation services, underscoring the extensive work needed to meet SDG 6 targets **(WHO and UNICEF, 2021).** The JMP, the official UN monitoring mechanism for SDG 6, publishes biennial reports assessing global water and sanitation progress**.** Several factors hinder the achievement of universal sanitation. Climate change, with its increasing frequency of extreme weather events such as droughts and floods, exacerbates water scarcity and damages sanitation infrastructure, making reliable water and sanitation services more difficult to sustain **(UNESCO, 2020).** Rapid urbanization, particularly in developing nations, has led to the expansion of informal settlements that often lack adequate sanitation facilities, straining existing infrastructure and contributing to environmental contamination and public health risks **(World Bank, 2019).** Additionally, insufficient funding remains a major obstacle, as many countries struggle to allocate adequate resources for building, operating, and maintaining sanitation systems, resulting in service gaps **(Hutton and Varughese, 2016).** The COVID-19 pandemic further intensified financial constraints, diverting resources away from water and sanitation projects while also highlighting the necessity of reliable hygiene practices **(WHO, 2021).** Addressing disparities in sanitation access is crucial to achieving SDG 6. Women and girls are disproportionately affected by inadequate sanitation, facing heightened health risks and safety concerns, making gender-sensitive facilities essential for promoting equality **(Sommer et al. 2015).** Rural areas often lag behind urban centres in sanitation coverage, requiring targeted interventions to bridge the gap **(UNICEF, 2019).** Similarly, marginalized communities, including indigenous populations, refugees, and people with disabilities, face significant barriers to accessing sanitation services **(UNESCO, 2020).** Inclusive policies are necessary to ensure equitable access for all.

Global partnerships play a vital role in advancing SDG 6. The Sustainable Sanitation Alliance (SuSanA) unites organizations and individuals committed to sustainable sanitation solutions, facilitating knowledge exchange and collaboration **(SuSanA, 2021).** Additionally, UN agencies such as UN-Water coordinate efforts to monitor and implement water and sanitation initiatives, providing technical support and advocacy **(UN-Water, 2020).** To accelerate progress, several innovative approaches have been adopted. Decentralized sanitation systems, such as septic tanks and composting toilets, provide viable alternatives in areas where centralized sewer networks are impractical **(Tilley et al. 2014).** Public-private partnerships leverage government and private sector collaboration to mobilize resources, enhance service delivery, and ensure long-term sustainability **(World Bank, 2017).** Community-Led Total Sanitation (CLTS) fosters local ownership and accountability by empowering communities to eliminate open defecation through collective behaviour change **(Kar and Chambers, 2008).** To overcome existing challenges and meet SDG 6 targets, several policy measures should be prioritized. Increased investment from governments and donors is essential for expanding sanitation infrastructure in both urban and rural areas **(Hutton and Varughese, 2016).** Strengthening governance through clear regulatory frameworks and accountability mechanisms can enhance service delivery and maintenance **(UNDP, 2019).** Capacity-building efforts should focus on training local stakeholders in sanitation planning, implementation, and management to ensure sustainability and

community engagement **(WHO, 2021).** Investing in research and innovation can drive the development of cost-effective and context-specific sanitation technologies **(JMP, 2021).** Furthermore, fostering multi-stakeholder collaboration by engaging civil society, the private sector, and international organizations promotes a comprehensive approach to sanitation challenges. While progress has been made in improving global sanitation, substantial efforts are still required to achieve SDG 6 by 2030. Tackling the complexities of sanitation access requires a concerted effort from governments, communities, and international partners **(United Nations, 2015).** By prioritizing equity, investing in infrastructure, and adopting innovative solutions, the global community can work towards making safe and sustainable sanitation a reality for all **(UNICEF, 2019).**

IX. Sanitation and Disease Burden

The **Global Disease Burden Report 2021** highlights the significant health challenges caused by inadequate sanitation worldwide, particularly in low- and middle-income countries. Sanitation-related diseases continue to account for a substantial portion of global morbidity and mortality. The report underscores the ongoing lack of access to clean water, sanitation services, and hygiene education in many regions, exacerbating the health burden. It calls for urgent action to address these issues, which remain leading drivers of preventable disease and death across the globe. The 2021 Global Disease Burden Report**,** produced by the WHO and the Institute for Health Metrics and Evaluation (IHME)**,** identifies sanitation-related diseases as key contributors to illness in many developing nations. Diarrheal diseases, primarily driven by poor sanitation and contaminated water, remain one of the leading causes of death, particularly among children under five years old. The **WHO (2021)** estimates that approximately 1.6 million deaths annually are linked to unsafe water, sanitation, and hygiene, with most of these fatalities occurring in sub-Saharan Africa and South Asia, where sanitation infrastructure is often underdeveloped or entirely lacking. The report highlights that diarrheal diseases—such as cholera**,** dysentery, and gastroenteritis comprise a significant portion of the global disease burden. Poor sanitation fosters the transmission of these diseases by contaminating drinking water, food supplies, and the environment. Furthermore, inadequate sanitation facilities create breeding grounds for disease vectors like flies and mosquitoes, further increasing the spread of infectious diseases **(UNICEF, 2020).** According to the **IHME (2021)**, nearly 10% of all global deaths can be attributed to diseases related to poor sanitation and unsafe water, with millions of people still lacking access to safely managed sanitation services.

Disproportionate Impact on Vulnerable Populations: The disease burden resulting from inadequate sanitation disproportionately affects vulnerable populations, including children**,** women**,** and marginalized communities**.** Children under five are particularly vulnerable to the detrimental effects of poor sanitation. As per **UNICEF (2021)**, children are more likely to experience malnutrition, dehydration, and stunted growth due to infections caused by unsafe sanitation practices. Additionally, inadequate sanitation can lead to long-term developmental delays and cognitive impairments in young children. Women and girls face additional challenges due to the lack of safe and private sanitation facilities. In many developing countries, the absence of sanitation infrastructure exposes women to physical risks, such as sexual harassment**.** In some cases, this lack of facilities leads to school absenteeism, especially during menstruation **(UNICEF, 2019).** The report calls for gender-sensitive sanitation policies that ensure the safety, dignity, and well-being of women and girls by providing them with accessible and private sanitation options.

Economic and Social Consequences: Beyond the direct health impacts, poor sanitation has significant economic consequences**.** The **WHO (2021)** reports that the economic costs of inadequate sanitation are immense, amounting to billions of dollars annually in healthcare costs**,** lost productivity**,** and environmental damage**.** A report by the **World Bank (2020)** estimates that poor sanitation costs countries approximately $260 billion each year. This economic burden is particularly challenging for low-income countries, where the resources required to invest in sanitation infrastructure and public health interventions are often limited. Inadequate sanitation also stifles economic growth**,** as individuals who fall ill due to sanitation-related diseases are less productive at work, resulting in lost wages and reduced economic output. The social consequences of poor sanitation are equally concerning. The lack of sanitation services deepens inequalities, particularly in urban slums and rural areas**,** where infrastructure is often underdeveloped or completely absent. In these regions, people are often forced to resort to unsafe practices such as open defecation**,** which further isolates them from public services and economic opportunities. This exclusion perpetuates the cycle of poverty and inequality, as individuals without access to proper sanitation are less likely to access essential services such as education, healthcare, and employment **(World Bank, 2020).**

The **Global Disease Burden Report 2021** emphasizes that addressing the global sanitation crisis requires comprehensive and integrated solutions. These solutions should focus on improving sanitation infrastructure**,** promoting hygiene education**,** and strengthening policy frameworks**.** According to **WHO (2021),** sanitation programs must prioritize the most vulnerable populations, including children, women, and marginalized communities, to reduce health disparities and improve social outcomes. National governments and international organizations must collaborate to provide sustainable sanitation solutions**,** such as the construction of proper sanitation facilities, waste treatment plants, and safe water systems. The report also advocates for increased investment in hygiene promotion and behaviour change campaigns. For example, handwashing with soap has been identified as one of the most cost-effective interventions to reduce the spread of infectious diseases.

Hygiene education campaigns can encourage communities to adopt healthier practices, thus reducing the transmission of diseases related to poor sanitation **(UNICEF, 2020).** Moreover, the report underscores the importance of data collection and monitoring in addressing sanitation-related diseases. Accurate data is critical for identifying areas with the greatest need and for tracking progress toward global sanitation goals, such as those outlined in the United Nations' Sustainable Development Goal 6 **(SDG 6) (UN, 2015).** The Global Disease Burden Report 2021 underscores the vital role that sanitation plays in improving public health, preventing disease, and reducing the economic burden of preventable illnesses. Despite global efforts to tackle the sanitation crisis, inadequate sanitation remains a major health and development challenge, particularly in developing countries. To address this challenge, increased investment in sanitation infrastructure, effective policy implementation, and international collaboration are urgently needed. The report calls for immediate action to ensure universal access to safe sanitation, especially for vulnerable populations, to reduce the global disease burden and improve quality of life.

X. Sanitation in the Indian Scenario

Sanitation, as defined by the National Urban Sanitation Policy (NUSP) (2008), involves the safe management of human excreta, along with hygiene practices and services like garbage collection and wastewater management **(Government of India, 2008).** The NUSP outlines specific objectives, including (a) promoting awareness and behavioural change, (b) achieving Open Defecation Free (ODF) cities, and (c) implementing integrated, city-wide sanitation initiatives. A key component of the NUSP is the City Sanitation Plan (CSP), a comprehensive framework that addresses the entire sanitation cycle, along with financing and institutional mechanisms to achieve urban sanitation goals. Additionally, the policy mandates that each state develop its own State Sanitation Strategy, tailored to its unique urban context and needs.

It is essential for human well-being, dignity, and public health, as poor sanitation contributes to disease, while improved sanitation enhances community health. A clean environment with proper sanitation supports urban stability, social balance, and economic growth. Additionally, sanitation is linked to broader development issues such as environmental sustainability, social inclusion, and poverty reduction. Recognizing its significance, the United Nations declared water and sanitation as fundamental human rights in 2010.

Sanitation is a fundamental aspect of public health and environmental sustainability. In India, sanitation continues to be a major concern despite significant progress in recent years. With over 1.3 billion people, the country faces immense challenges in providing universal access to sanitation. Sanitation issues in India are primarily due to a lack of infrastructure, poor management of waste, inadequate hygiene education, and social barriers. This article delves into the sanitation scenario in India, exploring the issues, impacts, and prospects, backed by data and reports from Indian and international organizations such as NITI Aayog, Ministry of Health and Family Welfare, Ministry of Jal Shakti, and others.

India has made significant strides in improving sanitation over the past few decades, but the country still faces challenges in ensuring universal access. According to the National Sample Survey Office (NSSO) data, as of 2018, only about 39% of Indian households had access to improved sanitation facilities **(NSSO, 2018).** The situation in rural areas is even more concerning, with millions of people still practising open defecation. Despite the implementation of the Swachh Bharat Mission (SBM) in 2014, a large section of the population still does not have access to toilets and sanitary facilities. The Swachh Bharat Mission, launched by the Government of India, aimed to eliminate open defecation by constructing over 100 million toilets in rural areas by 2019. While the mission has had a considerable impact, the success has been uneven, especially in rural India, where open defecation continues to be widespread. According to the Ministry of Jal Shakti, as of 2020, approximately 60 million people still practised open defecation in India, most of them in rural areas **(Ministry of Jal Shakti, 2020).**

XI. Issues and Challenges in Sanitation in India

Lack of Infrastructure: The most pressing issue in India's sanitation scenario is the lack of infrastructure, particularly in rural and underserved urban areas. The inadequate coverage of sewage treatment plants and the absence of solid waste management systems in many parts of the country exacerbate the problem. As of 2019, around 60% of India's urban population had access to piped water, but only 40% had access to sewerage systems **(NITI Aayog, 2020).** Many urban areas still rely on traditional methods such as septic tanks, and many rural areas lack basic sanitation infrastructure altogether.

Open Defecation: Open defecation remains one of the most critical challenges facing India. Despite progress made through SBM, the practice is still widespread in rural regions due to cultural and behavioural barriers, insufficient toilet facilities, and a lack of proper awareness regarding hygiene. The **World Bank (2019)** reported that approximately 550 million people in rural India still practised open defecation, which has far-reaching implications for public health and hygiene.

Wastewater Treatment and Recycling: India's sanitation infrastructure also faces challenges related to the treatment and recycling of wastewater. According to the Central Pollution Control Board (CPCB), only about 30% of the sewage generated in urban India is treated, leaving the rest to pollute water bodies **(CPCB, 2019).** This has significant environmental consequences, especially in water-scarce areas where wastewater often contaminates freshwater sources, leading to the spread of waterborne diseases.

Social Inequality and Stigma: Sanitation in India is deeply intertwined with issues of caste, gender, and social inequality. In many rural areas, access to sanitation facilities is restricted based on social stratification, particularly for Dalits and other marginalized communities. Women and girls often face additional challenges, such as a lack of access to safe and private sanitation facilities, leading to risks of sexual assault and harassment **(Ministry of Health and Family Welfare, 2020).**

Poor Hygiene Practices: Lack of hygiene education is another significant issue contributing to sanitation problems. Poor hygiene practices, including improper handwashing, inadequate disposal of waste, and the lack of menstrual hygiene management, contribute to the spread of diseases. The **Ministry of Health and Family Welfare (2020**) reports that diseases such as diarrhea and cholera continue to be prevalent in India, largely due to poor sanitation and hygiene.

Health Impacts: The health implications of inadequate sanitation are profound. According to the World Health Organization **(WHO, 2020),** over 150,000 children under the age of five die annually in India due to diarrhea, a preventable disease linked to poor sanitation. Additionally, waterborne diseases such as cholera, typhoid, and dysentery continue to affect millions of people. Poor sanitation leads to the contamination of drinking water, creating a cycle of disease and death, particularly among vulnerable populations such as children and the elderly.

Box-2 Challenges for Sanitation in India

Challenge	Description
Lack of Access to Clean Water	Over 163 million people in India lack access to clean water, and 21% of the country's communicable diseases are caused by unsafe water.
Inadequate Sanitation Facilities	India has the highest number of people practising open defecation globally. Nearly 50% of India's population defecates in the open, contributing to environmental pollution and the spread of diseases (UNICEF).
Poor Hygiene Practices	Lack of knowledge and awareness of basic hygiene practices like handwashing and personal hygiene leads to increased disease transmission.
Infrastructure Challenges	The lack of proper infrastructure to store and distribute clean water and dispose of waste creates additional challenges in ensuring safe sanitation and water.
Urbanization	Rapid urbanization has put pressure on existing water supply systems, leading to inadequate water supply and sanitation facilities.
Climate Change	Climate change is expected to increase water scarcity, exacerbating existing water, sanitation, and hygiene (WASH) challenges.
Funding	Insufficient funding for WASH programs and a lack of political will significantly hinder progress in improving water and sanitation services.
Poor Maintenance	Lack of proper maintenance of WASH facilities results in frequent breakdowns, reducing their lifespan and effectiveness.
Gender Inequality	Women and girls, particularly in rural areas, are disproportionately affected by the lack of access to safe water and sanitation facilities.
Cultural Practices	Certain cultural practices, such as caste-based discrimination, limit access to WASH facilities for specific communities, deepening social inequality.

Source: Compiled

A report by **UNICEF (2019)** revealed that India accounts for approximately 40% of the global burden of diarrhea-related deaths. The National Health Mission (NHM) also highlights that poor sanitation contributes to the spread of malnutrition, especially among children, as contaminated water and poor hygiene weaken the immune system **(Box-2)**.

Environmental Impacts: Inadequate sanitation contributes significantly to environmental degradation. Untreated sewage and waste often find their way into rivers, lakes, and groundwater, leading to pollution. The Ganga River, for example, continues to be one of the most polluted rivers in the world due to the dumping of untreated sewage, agricultural runoff, and industrial waste **(NITI Aayog, 2020).** The contamination of water bodies not only harms ecosystems but also affects agricultural productivity, as polluted water leads to soil degradation and loss of arable land.

XII. Prospects and Solutions

The evolution of rural sanitation policies in India reflects a systematic effort to improve sanitation coverage, hygiene awareness, and overall quality of life. The **Central Rural Sanitation Programme (1986–1999)** aimed to enhance the quality of life in rural areas, particularly focusing on providing privacy and dignity to women. The programme targeted a

25% increase in rural sanitation coverage, with financial support for below-poverty-line (BPL) households, leading to an increase in individual household latrine (IHHL) coverage from 3% in 1986 to 17% in 1999.

Building on this foundation, the **Total Sanitation Campaign (1999–2011)** expanded the focus to universal sanitation coverage by 2012. It emphasized Information, Education, and Communication (IEC) activities to promote hygiene awareness and behavioural change. The subsidy model for toilet construction was revised, offering increased financial assistance from the central and state governments. As a result, IHHL coverage grew from 22% in 2001 to 31% in 2011, reflecting gradual progress.

The **Nirmal Bharat Abhiyan (2012–2014)** further aimed to increase rural sanitation coverage while retaining IEC activities as a core strategy. A notable shift was the inclusion of certain above-poverty-line (APL) households in the subsidy scheme. However, due to the programme's short duration, no official government statistics are available to assess its impact.

Unnat Bharat Abhiyan (UBA), launched in 2014 by the Ministry of Education (MoE), Government of India, promotes rural development by engaging higher educational institutions (HEIs). It connects academia with villages, enabling students and faculty to address real-world challenges. Under UBA, colleges adopt five villages, conducting surveys and implementing sustainable solutions in **sanitation, waste management, clean energy, water conservation, and skill development**. The program enhances hygiene, renewable energy use, and rural entrepreneurship, fostering self-sufficiency and sustainability. By integrating modern knowledge with traditional wisdom, UBA strengthens higher education's role in nation-building.

A significant shift occurred with the launch of the **Swachh Bharat Mission-Grameen (2014–2019)**, which aimed to eliminate open defecation in India by 2 October 2019. This policy introduced greater flexibility for states, expanded its scope to urban areas, and continued supporting BPL and specific APL households. IEC activities remained central, and financial support for toilet construction increased significantly. According to government statistics, this initiative successfully achieved 100% sanitation coverage across rural and urban areas.

The **Rural Sanitation Strategy (2019–2029)** focuses on sustaining the progress made under the Swachh Bharat Mission-Grameen. It aims to ensure continued access to safely managed sanitation and promote solid and liquid waste management for a cleaner rural environment. As it is an ongoing initiative, the impact of this strategy is yet to be determined.

Swachh Bharat Abhiyan: Launched in 2014, Swachh Bharat Abhiyan (Clean India Mission) is a national campaign aimed at achieving universal sanitation coverage and ensuring clean and open defecation-free (ODF) India by 2nd October 2019. The program has constructed over 110 million toilets, which resulted in 22 states, and more than 700 districts and 600,000 villages declared open defecation free.

Jal Shakti Abhiyan: The Jal Shakti Abhiyan (Water Power Mission) was launched in 2019 to address water scarcity and ensure the conservation of water resources. The mission focuses on five key intervention areas: water conservation and rainwater harvesting, renovation of traditional water bodies, reuse of treated wastewater, interlinking of rivers, and implementation of groundwater recharge measures. Under this mission, more than 1.54 lakh water bodies have been renovated or constructed.

Community-Led Total Sanitation: Community-Led Total Sanitation (CLTS) is an innovative approach to promote the concept of open defecation-free communities. It involves community mobilization, triggering, and facilitating the process of behaviour change. In 2015, over 7.5 lakh villages in India were declared open-defecation-free, and CLTS played a significant role in this achievement.

E-toilets: India has installed e-toilets in several public places to provide clean and hygienic sanitation facilities. E-toilets are self-cleaning and eco-friendly. These toilets are equipped with sensors and devices that flush, clean, and disinfect the toilet seats automatically after use.

Bio-digesters: Bio-digester toilets have been installed in several rural areas of India. These toilets use bacterial decomposition to convert human waste into water and biogas. They are odourless, low maintenance, and do not require any connection to a sewage system. Bio-digesters have proven to be a cost-effective and sustainable solution for providing sanitation facilities in rural areas.

Rainwater Harvesting: India has made significant efforts towards rainwater harvesting to replenish groundwater reserves. Many states have mandated rainwater harvesting for all new constructions, including residential and commercial buildings. Rainwater harvesting has also been implemented in schools and public buildings.

Mobile Toilets: Mobile toilets have been installed in various public areas, including bus stands, railway stations, and crowded marketplaces. These toilets are easy to move and provide temporary sanitation facilities for large gatherings or events.

Public-Private Partnerships: The government has formed public-private partnerships to address the water, sanitation, and hygiene challenges in the country. These partnerships have been effective in implementing innovative solutions and achieving results quickly.

Sanitation Workers' Training: India has initiated programs to provide training to sanitation workers to ensure their safety and promote the use of modern and safe technologies for waste management.

Behaviour Change Communication: India has implemented a behaviour change communication approach to promote the adoption of safe sanitation practices. This approach involves community mobilization, education, and awareness campaigns to promote the importance of hygiene and sanitation.

The Role of Government Programs: The Government of India has committed to achieving universal access to sanitation through programs like the Swachh Bharat Mission (SBM). The SBM aims to eliminate open defecation, improve waste management systems, and ensure access to safe sanitation for all by 2024. As of 2020, over 100 million toilets were built, and the number of open defecation-free villages increased significantly **(Ministry of Jal Shakti, 2020).** However, for sustained progress, it is essential to focus on toilet maintenance, behavioural change, and hygiene education. The Pradhan Mantri Swachh Bharat Mission (Urban) and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) have been crucial in improving urban sanitation. These programs aim to create infrastructure for sewage treatment, waste recycling, and improving urban water management systems.

Focus on Wastewater Treatment and Recycling: A major area for improvement is wastewater treatment and recycling. The Government of India has initiated the National Mission for Clean Ganga (NMCG), which aims to reduce pollution in the Ganga River by treating wastewater and promoting waste-to-energy technologies. Expanding wastewater treatment capacity across cities and villages is essential to reducing pollution and promoting water reuse.

Policy Integration and Collaboration: Improving sanitation in India requires integrating sanitation policies with other sectors such as health, education, and water management. **NITI Aayog (2020)** has called for a collaborative approach to sanitation, emphasizing the need for coordination between various ministries, including the Ministry of Health and Family Welfare, the Ministry of Jal Shakti, and local government bodies. Public-private partnerships are also crucial in building and maintaining sanitation infrastructure.

Social Behavior Change: Sanitation remains a critical issue in India, with millions lacking basic facilities despite initiatives like the Swachh Bharat Mission. Challenges such as infrastructure gaps, open defecation, and poor hygiene persist, impacting health and the environment. Addressing social barriers through awareness campaigns, gender-sensitive sanitation, and menstrual hygiene management is essential. To achieve universal sanitation by 2030, India must improve infrastructure, wastewater treatment, and policy integration while ensuring continued investment and cross-sector collaboration.

Six recommendations that can help key stakeholders address the significant obstacles in providing universal sanitation coverage in India. **(ADB, 2009)** and they are: For successful pro-poor sanitation programs, scaling up efforts is essential. Investments should be tailored to prioritize those in greatest need while exploring cost-effective solutions. Effective planning and sequencing are crucial, along with adopting community-based approaches whenever feasible. Additionally, fostering innovative partnerships can help drive investments and enhance program sustainability.

XIII. Conclusion

Ensuring universal sanitation is essential for public health, economic growth, and social equity. Despite significant progress, gaps persist, particularly in underserved regions, necessitating sustained investment, policy integration, and innovative solutions. Sanitation in India extends beyond infrastructure to include hygiene education, waste management, and environmental sustainability. Addressing these challenges requires a multi-faceted approach that combines infrastructure development, behavioural change initiatives, and policy reforms. Strengthening wastewater treatment, expanding sanitation worker training, and promoting community-led interventions are critical for long-term success. A cleaner and healthier future depends on the collective efforts of governments, private sectors, and communities to build resilient sanitation systems. Technological advancements, cross-sector collaboration, and sustainable practices will enhance public health, reduce inequalities, and mitigate environmental risks. With continued commitment and integrated solutions, India can achieve universal sanitation, fostering improved living standards and long-term socio-economic progress.

References

[1] Ahern, M., Bostrom, A., and Han, M. (2017). Environmental sanitation and health outcomes in urban India. *Environmental Health Perspectives*, 125(6), 047013.

[2] Ahern, M., Giesecke, C., and Iddings, M. (2017). The environmental and health impact of improved sanitation in rural communities. *Environmental Health Perspectives, 125*(9), 1050-1062. https://doi.org/10.1289/EHP2283

[3] Asian Development Bank. (2009). *India's sanitation for all: How to make it happen* (Series 18). Asian Development Bank.

[4] Bartram, J., and Cairncross, S. (2010). Hygiene, sanitation, and water: Forgotten foundations of health. *PLOS Medicine, 7*(11), e1000367. https://doi.org/10.1371/journal.pmed.1000367

[5] Bartram, J., Charles, K., Evans, B., O'Hanlon, L., and Pedley, S. (2018). Commentary on community-led total sanitation and human rights: Should the right to community-wide health be won at the cost of individual rights? *Journal of Water, Sanitation and Hygiene for Development, 8*(1), 1–3. https://doi.org/10.2166/washdev.2017.134

[6] Clasen, T., Alexander, K. T., Sinclair, D., and Davies, M. (2014). Interventions to improve water quality for preventing diarrhoea: Systematic review and meta-analysis. *The Lancet Infectious Diseases, 14*(7), 475-482. https://doi.org/10.1016/S1473-3099(14)70761-0

[7] Curtis, V., and Cairncross, S. (2003). Effect of washing hands with soap on diarrhea risk in the community: A systematic review. *The Lancet Infectious Diseases*, 3(5), 275–281.

[8] Gandhi, M.K. (1925). *The collected works of Mahatma Gandhi* (Vol. 26). Publications Division, Government of India.

[9] Gartner, A., Juran, J., and Waddington, H. (2015). Sanitation and public health in India: Status, challenges, and future directions. *Environmental Health Journal*, 23(3), 35-40.

[10] Gartner, S., Lanoix, J., and Bevan, J. (2015). Global sanitation: Waterborne diseases and the role of sanitation. *International Journal of Environmental Health Research, 25*(2), 195-210. https://doi.org/10.1080/09603123.2014.997286

[11] GoI (2008). *National Urban Sanitation Policy*. Ministry of Urban Development.

[12] Hutton, G., and Varughese, M. (2016). *The costs of meeting the 2030 Sustainable Development Goal targets drinking water, sanitation, and hygiene*. World Bank. https://doi.org/10.1596/24228

[13] Hutton, G., and Chase, C. (2016). *The economic impacts of sanitation in developing countries*. World Bank.

[14] Injury and Illness Prevention Program. (2005). *Environmental health and sanitation practices*. University of California.

[15] Institute for Health Metrics and Evaluation (IHME). (2021). *Global burden of disease study 2021*. IHME.

[16] Jasper, C., Le, T. T., and Bartram, J. (2012). Impact of sanitation and hygiene interventions on school attendance in low-income countries. *Journal of Water, Sanitation, and Hygiene for Development, 2*(4), 213–220. https://doi.org/10.2166/washdev.2012.067

[17] Joint Monitoring Programme (JMP). (2021). *Progress on household drinking water, sanitation, and hygiene 2000–2020: Five years into the SDGs*. WHO and UNICEF. https://washdata.org/report/jmp-2021-wash-households

[18] Joint Monitoring Programme for Water Supply and Sanitation. (n.d.). In *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Joint_Monitoring_Programme_for_Water_Supply_and_Sanitation

[19] Juran, R. (2017). The sanitation challenge: Strategies for addressing sanitation systems. *Journal of Environmental Health, 79*(4), 18-25.

[20] Kar, K., and Chambers, R. (2008). *Handbook on community-led total sanitation*. Plan UK. https://www.communityledtotalsanitation.org/resource/handbook-community-led-total-sanitation

[21] Luby, S. P., Agboatwalla, M., Feikin, D. R., and Painter, J. (2005). Effect of handwashing on child health: A randomized controlled trial. *The Lancet, 366*(9481), 225-233. https://doi.org/10.1016/S0140-6736(05)66966-6

[22] Mara, D., Lane, J., Scott, B., and Trouba, D. (2010). Sanitation and health. *PLoS Medicine, 7*(11), e1000363. https://doi.org/10.1371/journal.pmed.1000363

[23] Ministry of Health and Family Welfare. (2020). *Annual Report 2019-2020*. Ministry of Health and Family Welfare, Government of India.

[24] Ministry of Jal Shakti. (2020). *Annual Report 2020-21*. Ministry of Jal Shakti, Government of India.

[25] National Sample Survey Office (NSSO). (2018). *Household Survey on Drinking Water, Sanitation, Hygiene and Housing Conditions in India*. NSSO.

[26] NITI Aayog. (2020). *The State of India's Sanitation: An Overview*. NITI Aayog, Government of India.

[27] Priya, S. (2019). Sanitation workers and their role in public health. *International Journal of Public Health, 13*(4), 102-108.

[28] Prüss-Üstün, A., Bos, R., Gore, F., and Bartram, J. (2019). *Safer water, better health: Costs, benefits and sustainability of interventions to protect and promote health*. World Health Organization. https://www.who.int/water_sanitation_health/publications/safer-water/en/

[29] Saghir, J., and Santoro, A. (2018). Delivering on the promise of water, sanitation, and hygiene. *World Bank Group*. https://openknowledge.worldbank.org/handle/10986/29632

[30] Saghir, J., and Santoro, J. (2018). A global overview of sanitation and its impact on public health. *Water Resources Research*, 54(2), 165-174.

[31] Smiley, S. L. (2021). The determinants of access to sanitation: The role of human rights and the challenges of measurement. *Water, 13*(12), 1676. https://doi.org/10.3390/w13121676

[32] Sommer, M., Ferron, S., Cavill, S., and House, S. (2015). *Violence, gender, and WASH: A practitioner's toolkit*. WaterAid/SHARE Consortium. https://washmatters.wateraid.org/

[33] SuSanA. (2021). *The Sustainable Sanitation Alliance: A global network for sustainable sanitation*. Sustainable Sanitation Alliance. https://www.susana.org/en/

[34] Sustainable Development Goal 6. (n.d.). In *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Sustainable_Development_Goal_6

[35] Tilley, E., Ulrich, L., Lüthi, C., Reymond, P., and Zurbrügg, C. (2014). *Compendium of sanitation systems and technologies* (2nd ed.). Swiss Federal Institute of Aquatic Science and Technology (Eawag). https://www.eawag.ch/fileadmin/Domain1/Abteilungen/sandec/publikationen/Ecosan/Compendium.pdf

[36] UN. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.
[37] UNDP. (2019). *Water governance facility: Strengthening governance for water and sanitation services*. United Nations Development Programme. New York City, USA. https://www.undp.org/publications/water-governance-facility
[38] UNESCO. (2020). *The United Nations World Water Development Report 2020: Water and Climate Change*. United Nations Educational, Scientific and Cultural Organization, Paris, France. https://en.unesco.org/themes/water-security/wwap/wwdr/2020
[39] UN-Habitat. (2020). *The state of the world's cities 2020*. UN-Habitat.
[40] UNICEF Water, Environment and Sanitation. (1997). *The role of sanitation in promoting public health*.United Nations International Children's Emergency Fund. New York, USA.
[41] UNICEF. (2015). *Progress on sanitation and drinking water – 2015 update and MDG assessment*. World Health Organization (WHO). https://www.who.int/water_sanitation_health/publications/jmp-2015-update/en/
[42] UNICEF. (2016). *WASH in schools: A toolkit for improving water, sanitation, and hygiene in schools*. United Nations International Children's Emergency Fund, New York, USA, https://www.unicef.org/documents/wash-schools-toolkit
[43] UNICEF. (2017). *Water, sanitation and hygiene: A key to improving the lives of children*. United Nations International Children's Emergency Fund, New York, USA.
[44] UNICEF. (2019). *The state of the world's children 2019: Children, food and nutrition*. United Nations International Children's Emergency Fund, New York, USA.
[45] UNICEF. (2019). *The State of the World's Children 2019: Children, Sanitation, and Hygiene*. United Nations International Children's Emergency Fund, New York, USA.
[46] UNICEF. (2019). *Water under fire: For every child, water and sanitation in complex emergencies*. United Nations Children's Fund. https://www.unicef.org/reports/water-under-fire
[47] UNICEF. (2019). *Water, sanitation and hygiene: A key to improving the lives of children*. United Nations International Children's Emergency Fund.
[48] UNICEF. (2020). *The state of the world's children 2020: Children, water, and sanitation*. United Nations International Children's Emergency Fund.
[49] United Nations (UN). (2015). *The 2030 agenda for sustainable development*. United Nations.
[50] United Nations (UN). (2017). *World water development report 2017: Wastewater – The untapped resource*. UN.
[51] United Nations General Assembly. (2010). *The human right to water and sanitation* (A/RES/64/292). United Nations. Retrieved from https://undocs.org/A/RES/64/292
[52] United Nations. (2015). *The Millennium Development Goals Report 2015*. United Nations. https://www.un.org/millenniumgoals/
[53] United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations. https://sdgs.un.org/2030agenda
[54] United Nations. (2023). *Sanitation and gender equality: How improved sanitation benefits women and girls*. United Nations.
[55] UN-Water. (2020). *The United Nations World Water Development Report 2020: Water and Climate Change*. UNESCO. https://www.unwater.org/publications/un-world-water-development-report-2020/
[56] UN-Water. (2020). *UN-Water analytical brief on water, sanitation, and hygiene*. United Nations. https://www.unwater.org/publications/un-water-analytical-brief-on-wash
[57] Waddington, H., Snilstveit, B., White, H., and Fewtrell, L. (2009). Water, sanitation, and hygiene interventions to improve health outcomes: A systematic review of the evidence. *Journal of Water and Health*, 7(3), 359-381.
[58] Waddington, H., Snilstveit, B., White, H., and Fewtrell, L. (2009). Water, sanitation, and hygiene interventions to combat diarrhoeal disease: A systematic review of the evidence. *Journal of Development Effectiveness, 1*(3), 295-335. https://doi.org/10.1080/19439340903152242
[59] WELL. (1998). *Sanitation and public health*. WELL: Water and Environmental Sanitation Learning. https://www.lboro.ac.uk/well/resources/fact-sheets/
[60] WHO and UNICEF. (2015). *Progress on sanitation and drinking water: 2015 update and MDG assessment*. World Health Organization and United Nations International Children's Emergency Fund https://www.who.int/publications/i/item/9789241509145
[61] WHO and UNICEF. (2021). *Progress on household drinking water, sanitation, and hygiene 2000–2020: Five years into the SDGs*. World Health Organization and United Nations Children's Fund Joint Monitoring Programme. https://washdata.org/report/jmp-2021-wash-households
[62] WHO (2017). *Sanitation and health: Global burden of disease from inadequate sanitation*. World Health Organization.
[63] WHO (2020). *Sanitation and Health: Global Burden of Disease from Inadequate Sanitation*. World Health Organization.
[64] WHO (2020). *Sanitation and health: Why sanitation is key to global health goals*. World Health Organization.
[65] WHO and UNICEF. (2006). *Meeting the Millennium Development Goals: Sanitation and Health*. World Health Organization and United Nations International Children's Emergency Fund.
[66] WHO *Sanitation and environmental health: How sanitation systems protect public health*. World Health Organization.
[67] WHO. (1987). *Sanitation and Health*. World Health Organization. https://www.who.int/water_sanitation_health/publications/sanitation/en/
[68] WHO. (2002). *Sanitation and hygiene for all: A guideline*. World Health Organization. https://www.who.int/water_sanitation_health/sanitation/en/
[69] WHO. (2009). *Sanitation and health*. World Health Organization. Geneva, Switzerland.
[70] WHO. (2009c). *Sanitation and hygiene for global health*. World Health Organization. Geneva, Switzerland.
[71] WHO. (2016). *World health statistics 2016: Monitoring health for the SDGs*. World Health Organization. Geneva, Switzerland.
[72] WHO. (2017). *Sanitation and health*. World Health Organization. Geneva, Switzerland, https://www.who.int/news-room/fact-sheets/detail/sanitation
[73] WHO. (2017). *Water, sanitation, and hygiene in health care facilities: Status in low- and middle-income countries and a way forward*. World Health Organization. Geneva, Switzerland.
[74] WHO. (2018). *Hand hygiene: Why, how and when?* World Health Organization. Geneva, Switzerland.

[75] WHO. (2019). *Water, sanitation and hygiene (WASH)*. World Health Organization. Geneva, Switzerland, https://www.who.int/news-room/fact-sheets/detail/water-sanitation-and-hygiene
[76] WHO. (2020). *Sanitation and health*. World Health Organization. Geneva, Switzerland.
[77] WHO. (2020). *Sanitation and waste management systems in India*. World Health Organization. Geneva, Switzerland.
[78] WHO. (2020). *Sanitation: Global issues and response*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/sanitation, Geneva, Switzerland.
[79] WHO. (2020). *Water, sanitation, and hygiene*. World Health Organization. Geneva, Switzerland, https://www.who.int/news-room/fact-sheets/detail/water-sanitation-and-hygiene
[80] WHO. (2021). *Sanitation and health: Global burden of disease from inadequate sanitation*. World Health Organization. Geneva, Switzerland.
[81] WHO. (2021). *State of the world's sanitation: An urgent call to transform sanitation for better health, environments, economies, and societies*. World Health Organization. Geneva, Switzerland, https://www.who.int/publications/i/item/9789240014473
[82] World Bank. (2017). *Public-private partnerships for sustainable sanitation services*. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail
[83] World Bank. (2019). *India Sanitation: Challenges and Opportunities*. World Bank. Washington, D.C., USA.
[84] World Bank. (2019). *The hidden wealth of cities: Creating, financing, and managing public spaces*. World Bank Group. Washington, D.C., USA. https://doi.org/10.1596/978-1-4648-1449-5
[85] World Bank. (2020). *Sanitation and hygiene for all: A call to action*. World Bank. Washington, D.C., USA.