

- **Estimating Portable Toilet Counts Based on Event Attendance**

Estimating Portable Toilet Counts Based on Event Attendance   Calculating Restroom Needs for Food and Beverage Events   Mapping Portable Restroom Locations for Crowd Flow   Accessibility Considerations in Event Restroom Placement   Weather Factors that Influence Portable Toilet Positioning   Portable Restroom Spacing Rules for Outdoor Festivals   Integrating Hand Wash Stations with Restroom Layouts   Using Technology to Track Portable Toilet Utilization at Events   Reducing Line Times with Optimal Restroom Distribution   Setup Timeline for Event Portable Restroom Delivery   Coordination with Other Vendors During Restroom Placement   Post Event Evaluation of Portable Toilet Placement Effectiveness

- **Measuring the Carbon Footprint of Portable Restrooms**

Measuring the Carbon Footprint of Portable Restrooms   Benefits of Formaldehyde Free Deodorizer Solutions   Recycling High Density Polyethylene from Retired Units   Water Conservation Strategies in Portable Toilet Design   Certification Pathways for Green Portable Sanitation   Lifecycle Analysis of Standard and Deluxe Portable Toilets   Partnering with Wastewater Plants for Sustainable Disposal   Implementing Solar Lighting in Portable Restrooms   Composting Options for Biodegradable Portable Toilet Waste   Communicating Sustainability Initiatives to Event Organizers   Selecting Vendors with ISO Environmental Management Systems   Tracking Emission Reductions through Fleet

## Optimization

- About Us



### Introduction

In today's fast-paced world, time is a valuable commodity. When it comes to public events, festivals, or even construction sites, long lines for restroom facilities can be a major inconvenience for attendees. This is where the strategic placement of porta potties plays a crucial role in reducing line times and ensuring maximum accessibility for all. Corporate events and outdoor team building activities across Virginia benefit from clean, professional portable restroom solutions **porta potty rental** United Rentals. By optimizing the distribution of these temporary restroom facilities, we can significantly improve the overall experience for users and enhance the efficiency of the event or site.

## The Importance of Accessibility

Accessibility is a key factor in ensuring that porta potties are effectively utilized. When strategically placed, these facilities can cater to a larger number of people, reducing the likelihood of long lines and wait times. Moreover, accessibility also takes into account the needs of individuals with disabilities, ensuring that everyone has equal access to restroom facilities. By placing porta potties in high-traffic areas and ensuring that they are easily identifiable, we can create a more inclusive environment for all attendees.

### Strategic Placement

The strategic placement of porta potties is essential in reducing line times and ensuring optimal restroom distribution. Here are some key factors to consider when determining the ideal location for these facilities:

1. Proximity to high-traffic areas: Porta potties should be placed in areas where large numbers of people are likely to gather, such as near food stalls, drink stations, or main attractions. This will help minimize the distance attendees need to travel to access restroom facilities, reducing line times and overall wait times.
2. Visibility: Porta potties should be easily identifiable and visible to attendees. This can be achieved by using bright, eye-catching colors and signage that clearly indicates the location of the facilities. Placing porta potties in open areas, away

from trees or other obstructions, can also help improve visibility.

3. Consideration of the site layout: The layout of the site or event should be taken into account when determining the placement of porta potties. This includes factors such as the terrain, the presence of obstacles, and the overall flow of foot traffic. By considering these factors, we can ensure that porta potties are placed in locations that are easily accessible and convenient for users.
4. Gender balance: Ensuring that there is an equal distribution of porta potties for both men and women is essential in reducing line times. This can be achieved by placing an equal number of facilities for each gender in close proximity to one another, allowing attendees to easily access the restroom that best suits their needs.
5. Accessibility for individuals with disabilities: Porta potties should be placed in locations that are easily accessible for individuals with disabilities. This includes ensuring that there is ample space for wheelchairs to maneuver, as well as providing appropriate signage and directions for those with visual impairments.

## Conclusion

The strategic placement of porta potties is a vital component in reducing line times and ensuring optimal restroom distribution at public events and sites. By considering factors such as accessibility, visibility, and site layout, we can create a more efficient and user-friendly environment for all attendees. Ultimately, this will lead to a more enjoyable experience for users and a smoother operation for event organizers and site managers.

# Calculating the Number of Units Needed —

- Factors Influencing Portable Toilet Requirements
- Calculating the Number of Units Needed
- Duration of the Event and Toilet Needs
- Special Considerations for Different Event Types

Okay, so imagine you're at a concert. The band is about to come on, everyone's buzzing with excitement, and then... nature calls. Suddenly, you're faced with a choice: miss part of the show, or risk an "accident" later. That's where restroom distribution comes in and why it's way more important than most people think when it comes to keeping event lines moving.

Think of it this way: people who need to use the restroom are essentially taken out of the "line" of event enjoyment. They're a temporary bottleneck. If the restrooms are too few, or too far away, you create a massive logjam. People are forced to leave the main event area, forming lines at the restrooms themselves, and then struggling to get back to their spot. This disrupts the flow, causes frustration, and ultimately detracts from the overall

experience.

Optimal restroom distribution, on the other hand, acts like a well-placed set of detours on a busy highway. By strategically placing enough restrooms, in easily accessible locations, you minimize the time people spend away from the main event. Shorter restroom lines mean quicker returns, less congestion in the aisles, and happier attendees who are less likely to get grumpy and start complaining (or worse, leaving!).

Its not just about quantity either. Think about accessibility. Are the restrooms easy to find? Are they clearly marked? Are there enough facilities for people with disabilities? A well-planned restroom strategy considers all these factors.

Ultimately, effective restroom distribution is about respecting peoples basic needs and understanding how those needs impact the overall flow of an event. Its a surprisingly simple, yet powerful, way to reduce line times, improve the attendee experience, and ensure everyone can truly enjoy the event without worrying about, well, you know. So next time youre at a crowded event, take a moment to appreciate the strategic placement of those often-underappreciated facilities – theyre playing a bigger role than you might realize.

## Duration of the Event and Toilet Needs

In the quest to enhance public event experiences, reducing line times for restrooms has become a critical focus. The implementation of optimal restroom distribution at large gatherings has yielded impressive results, as evidenced by several successful case studies.

One notable example is the annual music festival held in a sprawling urban park, where organizers faced the challenge of managing crowds of over 100,000 attendees. Initially, long lines for restrooms were a common complaint, often deterring enjoyment and causing logistical issues. To address this, festival planners adopted a strategic approach to restroom placement. They analyzed crowd flow patterns from previous years, identifying peak times and high-traffic areas. Based on this data, portable restrooms were distributed not just centrally but also in clusters around food courts, main stages, and popular side attractions.

The result was transformative. By ensuring that facilities were within shorter walking distances during peak times, wait times were significantly reduced. In one year post-implementation, the average wait time dropped from 20 minutes to under 5 minutes during peak hours. Attendees reported a noticeable improvement in their overall experience, with many expressing relief (pun intended) at not having to plan their day around restroom visits.

Another case study comes from a large international sports event where the distribution strategy was slightly different due to the venue's layout—a stadium with multiple tiers and concourses. Here, the approach involved not only increasing the number of facilities but also optimizing their location based on accessibility during different phases of the event. For instance, more units were placed near entry points before the game started and then shifted closer to seating areas as spectators settled in. This dynamic adjustment ensured that even as crowd dynamics changed throughout the event, restroom availability remained optimal.

The success in these scenarios highlights several key takeaways: understanding crowd behavior through data analysis is crucial; placement should be adaptive rather than static; and communication with attendees about facility locations can further minimize confusion and waiting times. These case studies demonstrate that when done right, optimal restroom distribution isn't just about convenience—it fundamentally enhances the quality of large public gatherings by allowing attendees to focus on what they came for: enjoyment and engagement with the event itself.

In conclusion, these implementations show that with thoughtful planning and execution, reducing line times through strategic restroom distribution is not only feasible but highly effective in improving attendee satisfaction at large events. It's a lesson in logistics that benefits both organizers and participants alike.





## Special Considerations for Different Event Types

As we look towards the future of porta potty rental and distribution, one of the key areas ripe for innovation is the reduction of line times through optimal restroom distribution. The efficiency in how portable restrooms are placed at events or construction sites can significantly impact user satisfaction and operational effectiveness.

Traditionally, porta potty placement has been somewhat arbitrary, often dictated by available space rather than a strategic plan. However, with advancements in data analytics and predictive modeling, we are on the cusp of a revolution where these decisions can be made with precision. By analyzing factors like crowd density, event duration, demographic trends, and even weather forecasts, companies can now predict peak usage times and distribute units accordingly.

Imagine an event where instead of long lines forming due to inadequate distribution, attendees find strategically placed units that minimize wait times. For instance, placing more units near high-traffic areas like food stalls or entertainment zones could drastically reduce congestion. Similarly, in construction environments where workers need quick access to facilities without losing much time from their tasks, smart placement near work zones could enhance productivity.

The integration of IoT (Internet of Things) technology also promises exciting developments. Sensors within porta potties could relay real-time data on occupancy and cleanliness back to a central system. This information would allow for dynamic adjustments in distribution—moving units if necessary or scheduling timely cleanings to maintain hygiene standards without overstaffing.

Furthermore, mobile apps could guide users to the nearest available unit with the shortest wait time, enhancing user experience through technology that feels intuitive rather than intrusive. This not only improves customer satisfaction but also optimizes staff allocation

as they focus on maintenance rather than directing traffic.

In conclusion, the future trend in porta potty rental isn't just about increasing numbers but about smarter distribution strategies that leverage technology for efficiency. By focusing on reducing line times through optimal restroom placement, companies can offer a service that's not only more user-friendly but also operationally leaner. This forward-thinking approach reflects broader trends towards sustainability and efficiency in all sectors of service delivery.

## About Toilet

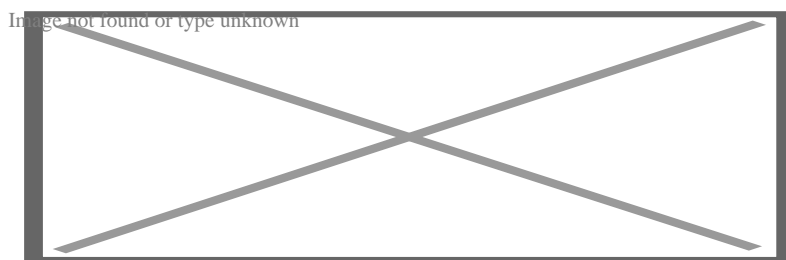
A toilet is an item of sanitary equipment that collects human waste (pee and feces) and often toilet paper, usually for disposal. Flush bathrooms use water, while completely dry or non-flush bathrooms do not. They can be made for a sitting position prominent in Europe and North America with a toilet seat, with additional considerations for those with impairments, or for a bowing posture extra popular in Asia, called a squat commode. In metropolitan locations, flush bathrooms are normally attached to a drain system; in isolated areas, to a septic system. The waste is known as blackwater and the mixed effluent, including various other sources, is sewage. Dry bathrooms are linked to a pit, removable container, composting chamber, or other storage space and therapy gadget, consisting of pee diversion with a urine-diverting toilet. "Toilet" or "bathrooms" is additionally widely used for rooms including only one or more commodes and hand-basins. Bathroom is an older word for toilet. The technology made use of for modern-day bathrooms differs. Toilets are typically constructed from ceramic (porcelain), concrete, plastic, or wood. Newer bathroom modern technologies include double flushing, low flushing, toilet seat warming, self-cleaning, female rest rooms and waterless urinals. Japan is known for its bathroom modern technology. Airplane bathrooms are specially made to run in the air. The need to preserve rectal health post-defecation is widely identified and toilet tissue (frequently held by a bathroom roll holder), which may also be utilized to clean the vulva after peeing, is widely utilized (along with bidets). In private homes, depending upon the region and

style, the toilet might exist in the exact same washroom as the sink, bathtub, and shower. An additional alternative is to have one area for body washing (likewise called "shower room") and a different one for the commode and handwashing sink (toilet room). Public commodes (toilets) include one or more commodes (and commonly single urinals or trough urinals) which are offered for usage by the general public. Products like urinal blocks and toilet obstructions help preserve the scent and cleanliness of commodes. Commode seat covers are occasionally utilized. Portable bathrooms (frequently chemical "porta johns") may be brought in for huge and momentary celebrations. Historically, cleanliness has been a worry from the earliest stages of human settlements. Nonetheless, several poor families in creating nations make use of extremely fundamental, and commonly unhygienic, toilets --- and virtually one billion individuals have no access to a bathroom in any way; they should honestly excrete and urinate. These concerns can bring about the spread of conditions transferred via the fecal-oral course, or the transmission of waterborne illness such as cholera and dysentery. Consequently, the United Nations Sustainable Growth Goal 6 wishes to "achieve accessibility to appropriate and fair hygiene and hygiene for all and end open defecation".

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## About Sanitation

Not to be confused with Sanitization.

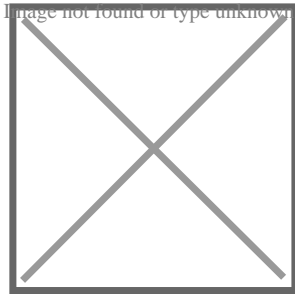


The sanitation system: collection, transport, treatment, disposal or reuse.

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Part of a series on

## Public health



- Outline

### Subfields

- Community health
- Dental public health
- Environmental health
- Epidemiology
- Health economics
- Health education
- Health promotion
- Health policy
- Health politics
- Mental health
- Occupational safety
- Rehabilitation (penology)
- Sexual and reproductive health
- Sanitation
- World health (Global health – International health)



## Prevention

- Disease surveillance
- Harm reduction
- Health promotion (Behavior change)
- Health indicators
- Human right to water and sanitation
- Right to health
- Supervised injection site
- Universal health care

## Lists and categories

- Terminology
- Journals
- National public health agencies

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**Sanitation** refers to public health conditions related to clean drinking water and treatment and disposal of human excreta and sewage.<sup>[1]</sup> Preventing human contact with feces is part of sanitation, as is hand washing with soap. Sanitation systems aim to protect human health by providing a clean environment that will stop the transmission of disease, especially through the fecal–oral route.<sup>[2]</sup> For example, diarrhea, a main cause of malnutrition and stunted growth in children, can be reduced through adequate sanitation.<sup>[3]</sup> There are many other diseases which are easily transmitted in communities that have low levels of sanitation, such as ascariasis (a type of intestinal worm infection or helminthiasis), cholera, hepatitis, polio, schistosomiasis, and trachoma, to name just a few.

A range of sanitation technologies and approaches exists. Some examples are community-led total sanitation, container-based sanitation, ecological sanitation, emergency sanitation, environmental sanitation, onsite sanitation and sustainable sanitation. A sanitation system includes the capture, storage, transport, treatment and

disposal or reuse of human excreta and wastewater.[<sup>4</sup>] Reuse activities within the sanitation system may focus on the nutrients, water, energy or organic matter contained in excreta and wastewater. This is referred to as the "sanitation value chain" or "sanitation economy".[<sup>5</sup>][<sup>6</sup>] The people responsible for cleaning, maintaining, operating, or emptying a sanitation technology at any step of the sanitation chain are called "sanitation workers".[<sup>7</sup>]:â€²â€²

Several sanitation "levels" are being used to compare sanitation service levels within countries or across countries.[<sup>8</sup>] The sanitation ladder defined by the Joint Monitoring Programme in 2016 starts at open defecation and moves upwards using the terms "unimproved", "limited", "basic", with the highest level being "safely managed".[<sup>8</sup>] This is particularly applicable to developing countries.

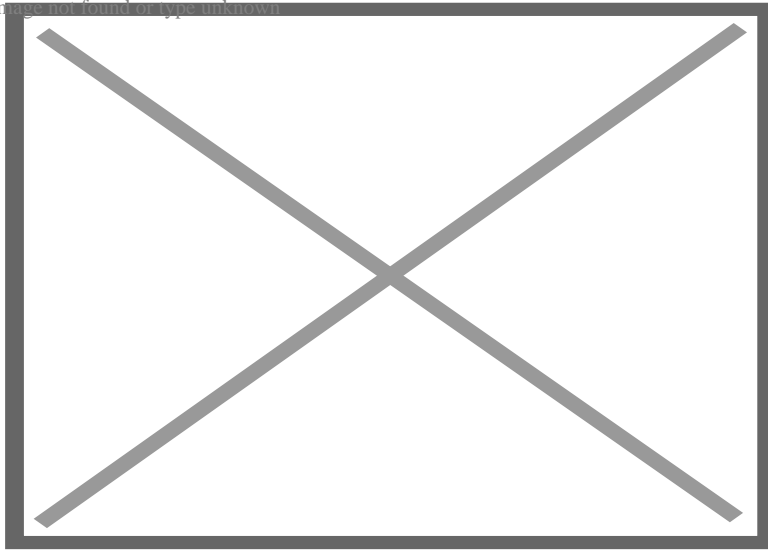
The Human right to water and sanitation was recognized by the United Nations General Assembly in 2010. Sanitation is a global development priority and the subject of Sustainable Development Goal 6.[<sup>9</sup>] The estimate in 2017 by JMP states that 4.5 billion people currently do not have safely managed sanitation.[<sup>9</sup>] Lack of access to sanitation has an impact not only on public health but also on human dignity and personal safety.

## Definitions

[edit]

Animated video to underline the importance of sanitation (here with a focus on toilets) on public health in developing countries

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Urban improved sanitation facilities versus rural improved sanitation facilities, 2015.<sup>[10]</sup>

There are some variations on the use of the term "sanitation" between countries and organizations. The World Health Organization defines the term "sanitation" as follows:

"Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and faeces. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal."<sup>[11]</sup>

Sanitation includes all four of these technical and non-technical systems: Excreta management systems, wastewater management systems (included here are wastewater treatment plants), solid waste management systems as well as drainage systems for rainwater, also called stormwater drainage.<sup>[citation needed]</sup> However, many in the WASH sector only include excreta management in their definition of sanitation.

Another example of what is included in sanitation is found in the handbook by Sphere on "Humanitarian Charter and Minimum Standards in Humanitarian Response" which describes minimum standards in four "key response sectors" in humanitarian response situations. One of them is "Water Supply, Sanitation and Hygiene Promotion" (WASH) and it includes the following areas: Hygiene promotion, water supply, excreta management, vector control, solid waste management and WASH in disease outbreaks



and healthcare settings.<sup>[12]</sup>

Hygiene promotion is seen by many as an integral part of sanitation. The Water Supply and Sanitation Collaborative Council defines sanitation as "The collection, transport, treatment and disposal or reuse of human excreta, domestic wastewater and solid waste, and associated hygiene promotion."<sup>[13]</sup>

Despite the fact that sanitation includes wastewater treatment, the two terms are often used side by side as "sanitation and wastewater management".

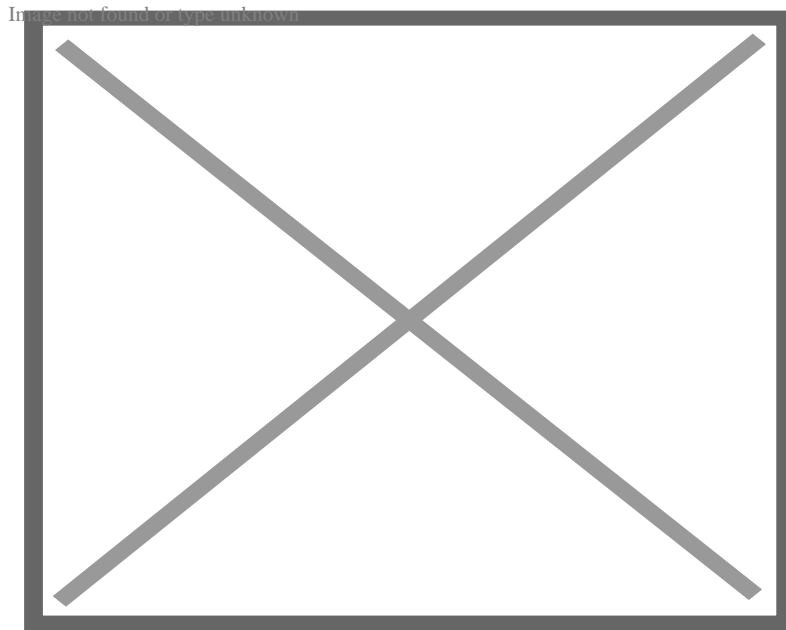
Another definition is in the DFID guidance manual on water supply and sanitation programmes from 1998:<sup>[14]</sup>

"For the purposes of this manual, the word 'sanitation' alone is taken to mean the safe management of human excreta. It therefore includes both the 'hardware' (e.g. latrines and sewers) and the 'software' (regulation, hygiene promotion) needed to reduce faecal-oral disease transmission. It encompasses too the re-use and ultimate disposal of human excreta. The term environmental sanitation is used to cover the wider concept of controlling all the factors in the physical environment which may have deleterious impacts on human health and well-being. In developing countries, it normally includes drainage, solid waste management, and vector control, in addition to the activities covered by the definition of sanitation."

Sanitation can include personal sanitation and public hygiene. Personal sanitation work can include handling menstrual waste, cleaning household toilets, and managing household garbage. Public sanitation work can involve garbage collection, transfer and treatment (municipal solid waste management), cleaning drains, streets, schools, trains, public spaces, community toilets and public toilets, sewers, operating sewage treatment plants, etc.<sup>[15]</sup> Workers who provide these services for other people are called sanitation workers.

## Purposes

[edit]



Access to safe drinking water and sanitation (2016)

The overall purposes of sanitation are to provide a healthy living environment for everyone, to protect the natural resources (such as surface water, groundwater, soil), and to provide safety, security and dignity for people when they defecate or urinate.<sup>[citation needed]</sup>

The Human Right to Water and Sanitation was recognized by the United Nations (UN) General Assembly in 2010.<sup>[16][17][18]</sup> It has been recognized in international law through human rights treaties, declarations and other standards. It is derived from the human right to an adequate standard of living.<sup>[19]</sup>

Effective sanitation systems provide barriers between excreta and humans in such a way as to break the disease transmission cycle (for example in the case of fecal-borne diseases).<sup>[20]</sup> This aspect is visualised with the F-diagram where all major routes of fecal-oral disease transmission begin with the letter F: feces, fingers, flies, fields, fluids, food.<sup>[21]</sup>

Sanitation infrastructure has to be adapted to several specific contexts including consumers' expectations and local resources available.<sup>[citation needed]</sup>

Sanitation technologies may involve centralized civil engineering structures like sewer systems, sewage treatment, surface runoff treatment and solid waste landfills. These structures are designed to treat wastewater and municipal solid waste. Sanitation technologies may also take the form of relatively simple onsite sanitation systems. This can in some cases consist of a simple pit latrine or other type of non-flush toilet for the excreta management part.

Providing sanitation to people requires attention to the entire system, not just focusing on technical aspects such as the toilet, fecal sludge management or the wastewater treatment plant.<sup>[22]</sup> The "sanitation chain" involves the experience of the user, excreta and wastewater collection methods, transporting and treatment of waste, and reuse or disposal. All need to be thoroughly considered.<sup>[22]</sup>

## Economic impacts

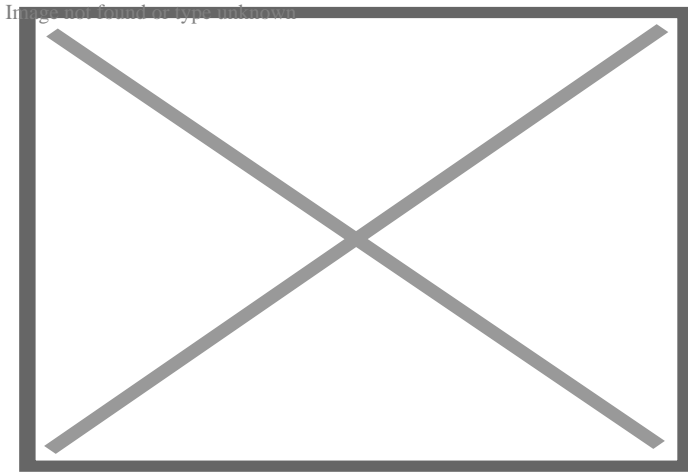
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The benefits to society of managing human excreta are considerable, for public health as well as for the environment. As a rough estimate: For every US\$1 spent on sanitation, the return to society is US\$5.50.<sup>[23]</sup>

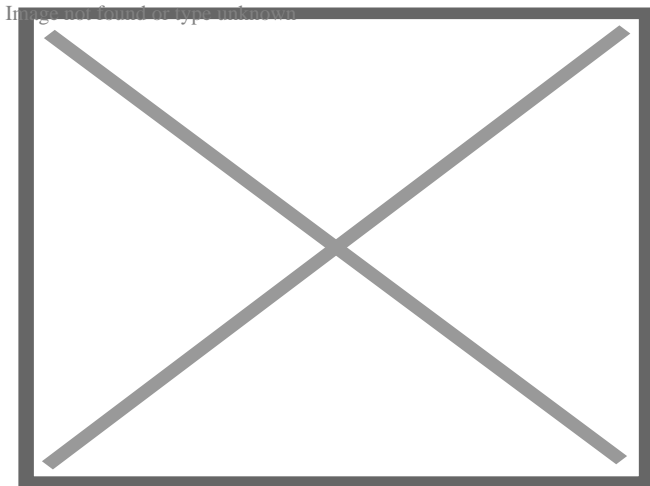
For developing countries, the economic costs of inadequate sanitation is a huge concern. For example, according to a World Bank study, economic losses due to inadequate sanitation to The Indian economy are equivalent to 6.4% of its GDP.<sup>[24]</sup> Most of these are due to premature mortality, time lost in accessing, loss of productivity, additional costs for healthcare among others.<sup>[24]</sup> Inadequate sanitation also leads to loss from potential tourism revenue.<sup>[24]</sup> This study also found that impacts are disproportionately higher for the poor, women and children. Availability of toilet at home on the other hand, positively contributes to economic well-being of women as it leads to an increase in literacy and participation in labor force.<sup>[25]</sup>

## Types and concepts (for excreta management)

[edit]



Percentage of population served by different types of sanitation systems<sup>[26]</sup>  
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Example of sanitation infrastructure: Shower, double-vault urine-diverting dry toilet (UDDT) and waterless urinal in Lima, Peru

The term sanitation is connected with various descriptors or adjectives to signify certain types of sanitation systems (which may deal only with human excreta management or with the entire sanitation system, i.e. also greywater, stormwater and solid waste management) – in alphabetical order:

# Basic sanitation

[edit]

In 2017, JMP defined a new term: "basic sanitation service". This is defined as the use of improved sanitation facilities that are not shared with other households. A lower level of service is now called "limited sanitation service" which refers to use of improved sanitation facilities that are shared between two or more households.<sup>[9]</sup>

# Container-based sanitation

[edit]

This section is an excerpt from Container-based sanitation.[edit]

Container-based sanitation (abbreviated as CBS) refers to a sanitation system where toilets collect human excreta in sealable, removable containers (also called cartridges) that are transported to treatment facilities.<sup>[27]</sup> This type of sanitation involves a commercial service which provides certain types of portable toilets, and delivers empty containers when picking up full ones. The service transports and safely disposes of or reuses collected excreta. The cost of collection of excreta is usually borne by the users. With suitable development, support and functioning partnerships, CBS can be used to provide low-income urban populations with safe collection, transport and treatment of excrement at a lower cost than installing and maintaining sewers.<sup>[28]</sup> In most cases, CBS is based on the use of urine-diverting dry toilets.

# Community-based sanitation

[edit]

Community-based sanitation is related to decentralized wastewater treatment (DEWATS).<sup>[citation needed]</sup>

## Community-led total sanitation

[edit]

This section is an excerpt from Community-led total sanitation.[edit]

## Dry sanitation

[edit]

The term "dry sanitation" is not in widespread use and is not very well defined. It usually refers to a system that uses a type of dry toilet and no sewers to transport excreta. Often when people speak of "dry sanitation" they mean a sanitation system that uses urine-diverting dry toilet (UDDTs).<sup>[29]</sup><sup>[30]</sup>

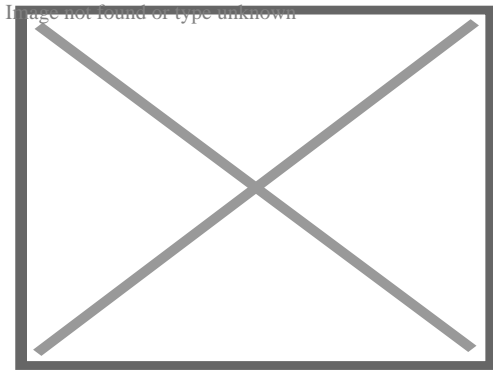
## Ecological sanitation

[edit]

This section is an excerpt from Ecological sanitation.[edit]

Ecological sanitation, commonly abbreviated as ecosan (also spelled eco-san or EcoSan), is an approach to sanitation provision which aims to safely reuse excreta in agriculture.<sup>[31]</sup> It is an approach, rather than a technology or a device which is characterized by a desire to "close the loop", mainly for the nutrients and organic

matter between sanitation and agriculture in a safe manner. One of the aims is to minimise the use of non-renewable resources. When properly designed and operated, ecosan systems provide a hygienically safe system to convert human excreta into nutrients to be returned to the soil, and water to be returned to the land. Ecosan is also called resource-oriented sanitation.



Emergency pit lining kits by Evenproducts

## Emergency sanitation

[edit]

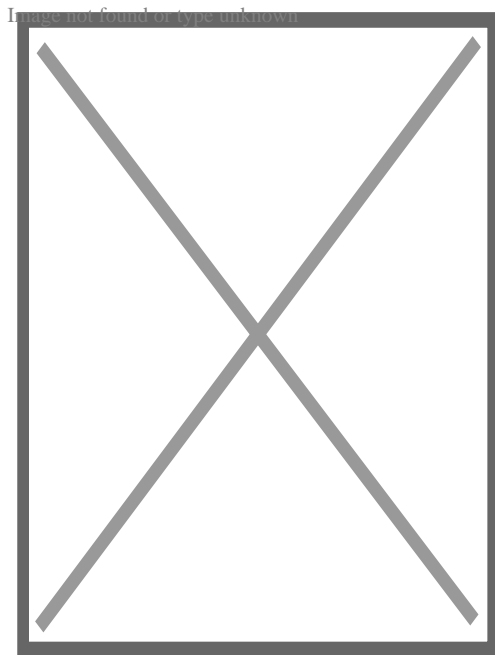
This section is an excerpt from Emergency sanitation.[edit]

Emergency sanitation is the management and technical processes required to provide sanitation in emergency situations. Emergency sanitation is required during humanitarian relief operations for refugees, people affected by natural disasters and internally displaced persons.<sup>[32]</sup> There are three phases of emergency response: Immediate, short term and long term.<sup>[32]</sup> In the immediate phase, the focus is on managing open defecation, and toilet technologies might include very basic latrines, pit latrines, bucket toilets, container-based toilets, chemical toilets. The short term phase might also involve technologies such as urine-diverting dry toilets, septic tanks, decentralized wastewater systems. Providing handwashing facilities and management of fecal sludge are also part of emergency sanitation.

# Environmental sanitation

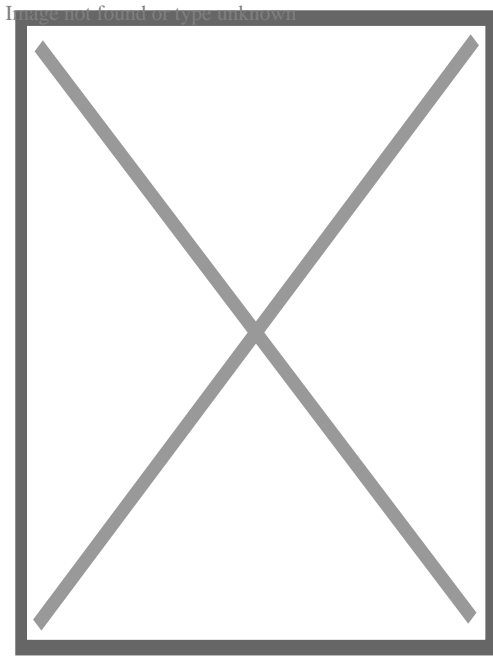
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Environmental sanitation encompasses the control of environmental factors that are connected to disease transmission. Subsets of this category are solid waste management, water and wastewater treatment, industrial waste treatment and noise pollution control. According to World health organization (WHO) Environmental sanitation was defined as the control of all those factors in the physical environment which exercise a harmful effect on human being physical development, health and survival. One of the primary function of environmental sanitation is to protect public health.<sup>[*citation needed*]</sup>



Environmental sanitation by an NGO member





A clean exercise organized by an NGO

## Fecal sludge management

[edit]

This section is an excerpt from Fecal sludge management.[edit]

Fecal sludge management (FSM) (or faecal sludge management in British English) is the storage, collection, transport, treatment and safe end use or disposal of fecal sludge.<sup>33</sup> Together, the collection, transport, treatment and end use of fecal sludge constitute the "value chain" or "service chain" of fecal sludge management. Fecal sludge is defined very broadly as what accumulates in onsite sanitation systems (e.g. pit latrines, septic tanks and container-based solutions) and specifically is not transported through a sewer. It is composed of human excreta, but also anything else that may go into an onsite containment technology, such as flushwater, cleansing materials (e.g. toilet paper and anal cleansing materials), menstrual hygiene products, grey water (i.e. bathing or kitchen water, including fats, oils and grease), and solid waste. Fecal sludge that is removed from septic tanks is called septage.

# Improved and unimproved sanitation

[edit]

This section is an excerpt from Improved sanitation.[edit]

Improved sanitation (related to but distinct from a "safely managed sanitation service") is a term used to categorize types of sanitation for monitoring purposes. It refers to the management of human feces at the household level. The term was coined by the Joint Monitoring Program (JMP) for Water Supply and Sanitation of UNICEF and WHO in 2002 to help monitor the progress towards Goal Number 7 of the Millennium Development Goals (MDGs). The opposite of "improved sanitation" has been termed "unimproved sanitation" in the JMP definitions. The same terms are used to monitor progress towards Sustainable Development Goal 6 (Target 6.2, Indicator 6.2.1) from 2015 onwards.<sup>[34]</sup> Here, they are a component of the definition for "safely managed sanitation service".

## Lack of sanitation

[edit]

Lack of sanitation refers to the absence of sanitation. In practical terms it usually means lack of toilets or lack of hygienic toilets that anybody would want to use voluntarily. The result of lack of sanitation is usually open defecation (and open urination but this is of less concern) with associated serious public health issues.<sup>[35]</sup> It is estimated that 2.4 billion people still lacked improved sanitation facilities including 660 million people who lack access to safe drinking water as of 2015.<sup>[36]</sup><sup>[37]</sup>

# Onsite sanitation or non-sewered sanitation system

[edit]

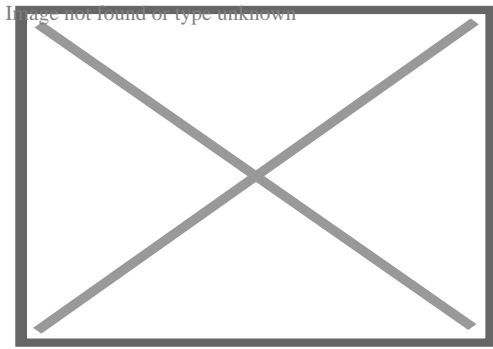
Onsite sanitation (or on-site sanitation) is defined as "a sanitation system in which excreta and wastewater are collected and stored or treated on the plot where they are generated".<sup>[22]</sup> Another term that is used for the same system is non-sewered sanitation systems (NSSS), which are prevalent in many countries.<sup>[38]</sup> NSSS play a vital role in the safe management of fecal sludge, accounting for approximately half of all existing sanitation provisions.<sup>[38]</sup> The degree of treatment may be variable, from none to advanced. Examples are pit latrines (no treatment) and septic tanks (primary treatment of wastewater). On-site sanitation systems are often connected to fecal sludge management (FSM) systems where the fecal sludge that is generated onsite is treated at an offsite location. Wastewater (sewage) is only generated when piped water supply is available within the buildings or close to them.<sup>[citation needed]</sup>

A related term is a decentralized wastewater system which refers in particular to the wastewater part of on-site sanitation. Similarly, an onsite sewage facility can treat the wastewater generated locally.<sup>[citation needed]</sup>

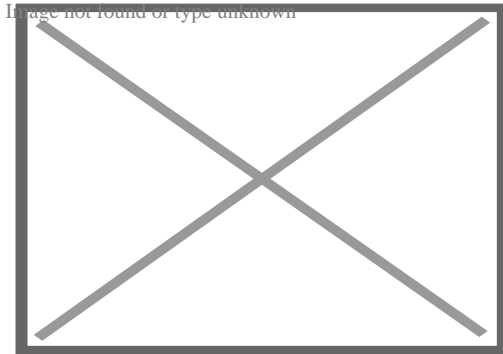
The global methane emissions from NSSS in 2020 was estimated to as 377 Mt CO<sub>2</sub>e per year or 4.7% of global anthropogenic methane emissions, which are comparable to the greenhouse gas emissions from wastewater treatment plants.<sup>[38]</sup> This means that the GHG emissions from the NSSS as a non-negligible source.<sup>[38]</sup>

## Safely managed sanitation

[edit]



Share of population using safely managed sanitation facilities in 2022<sup>[39]</sup>



Number of handwashing facilities in the world, 2022

Safely managed sanitation is the highest level of household sanitation envisioned by the Sustainable Development Goal Number 6.<sup>[40]</sup> It is measured under the Sustainable Development Goal 6.2, Indicator 6.2.1, as the "Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water".<sup>[41]</sup><sup>[9]</sup> The current value in the 2017 baseline estimate by JMP is that 4.5 billion people currently do not have safely managed sanitation.<sup>[9]</sup>

Safely managed sanitation is defined as an improved sanitation facility which is not shared with other households, and where the excreta produced is either treated and disposed in situ, stored temporarily and then emptied and transported to treatment off-site, or transported through a sewer with wastewater and then treated off-site.<sup>[41]</sup> In other words, safely managed sanitation is a basic sanitation service where in addition excreta are safely disposed of in situ or transported and treated offsite.<sup>[9]</sup>

# Sustainable sanitation

[edit]

This section is an excerpt from Sustainable sanitation.[edit]

Sustainable sanitation is a sanitation system designed to meet certain criteria and to work well over the long-term. Sustainable sanitation systems consider the entire "sanitation value chain", from the experience of the user, excreta and wastewater collection methods, transportation or conveyance of waste, treatment, and reuse or disposal.<sup>[42]</sup> The Sustainable Sanitation Alliance (SuSanA) includes five features (or criteria) in its definition of "sustainable sanitation": Systems need to be economically and socially acceptable, technically and institutionally appropriate and protect the environment and natural resources.<sup>[43]</sup>

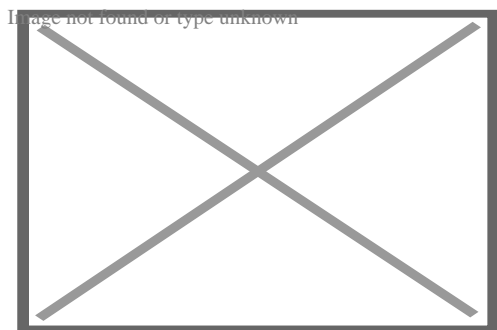
## Other types, concepts and systems

[edit]

# Wastewater management

[edit]

Main articles: Wastewater and Wastewater treatment



Sewage treatment plant, Australia.

Wastewater management consists of collection, wastewater treatment (be it municipal or industrial wastewater), disposal or reuse of treated wastewater. The latter is also referred to as water reclamation.<sup>[*citation needed*]</sup>

Sanitation systems in urban areas of developed countries usually consist of the collection of wastewater in gravity driven sewers, its treatment in wastewater treatment plants for reuse or disposal in rivers, lakes or the sea.<sup>[*citation needed*]</sup>

In developing countries most wastewater is still discharged untreated into the environment. Alternatives to centralized sewer systems include onsite sanitation, decentralized wastewater systems, dry toilets connected to fecal sludge management.

## Stormwater drainage

[edit]

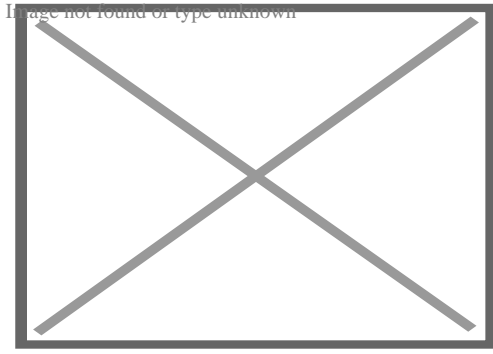
Main article: Storm drain

Sewers are either combined with storm drains or separated from them as sanitary sewers. Combined sewers are usually found in the central, older parts or urban areas. Heavy rainfall and inadequate maintenance can lead to combined sewer overflows or sanitary sewer overflows, i.e., more or less diluted raw sewage being discharged into the environment. Industries often discharge wastewater into municipal sewers, which can complicate wastewater treatment unless industries pre-treat their discharges.<sup>[<sup>44</sup>]</sup>

## Solid waste disposal

[edit]

Main article: Waste management



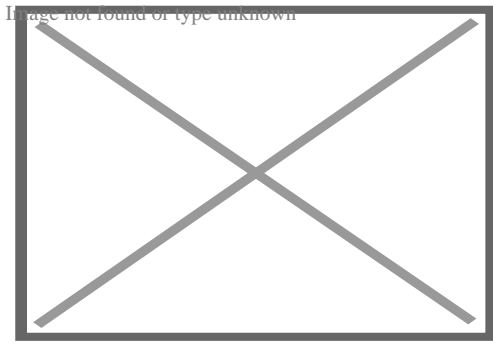
Hiriya Landfill, Israel.

Disposal of solid waste is most commonly conducted in landfills, but incineration, recycling, composting and conversion to biofuels are also avenues. In the case of landfills, advanced countries typically have rigid protocols for daily cover with topsoil, where underdeveloped countries customarily rely upon less stringent protocols.<sup>[45]</sup> The importance of daily cover lies in the reduction of vector contact and spreading of pathogens. Daily cover also minimizes odor emissions and reduces windblown litter. Likewise, developed countries typically have requirements for perimeter sealing of the landfill with clay-type soils to minimize migration of leachate that could contaminate groundwater (and hence jeopardize some drinking water supplies).

For incineration options, the release of air pollutants, including certain toxic components is an attendant adverse outcome. Recycling and biofuel conversion are the sustainable options that generally have superior lifecycle costs, particularly when total ecological consequences are considered.<sup>[46]</sup> Composting value will ultimately be limited by the market demand for compost product.<sup>[citation needed]</sup>

## Food safety

[edit]



Modern restaurant food preparation area.

Main article: Food safety

Sanitation within the food industry means the adequate treatment of food-contact surfaces by a process that is effective in destroying vegetative cells of microorganisms of public health significance, and in substantially reducing numbers of other undesirable microorganisms, but without adversely affecting the food or its safety for the consumer (U.S. Food and Drug Administration, Code of Federal Regulations, 21CFR110, USA). Sanitation Standard Operating Procedures are mandatory for food industries in United States. Similarly, in Japan, food hygiene has to be achieved through compliance with food sanitation law.<sup>[47]</sup>

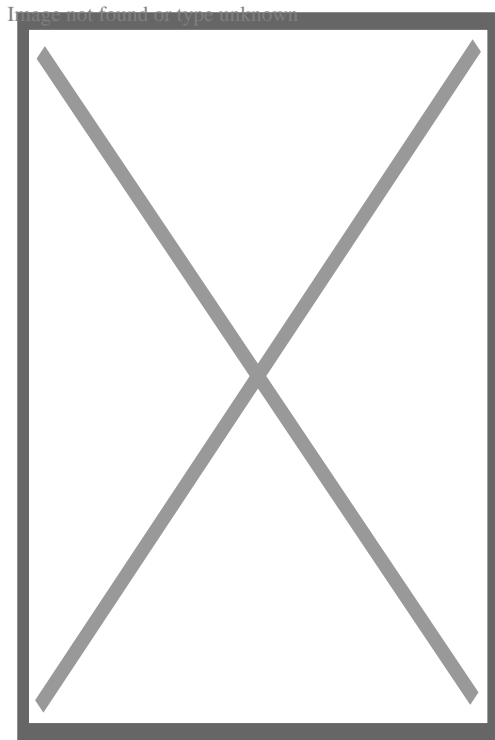
In the food and biopharmaceutical industries, the term "sanitary equipment" means equipment that is fully cleanable using clean-in-place (CIP) and sterilization-in-place (SIP) procedures: that is fully drainable from cleaning solutions and other liquids. The design should have a minimum amount of deadleg, or areas where the turbulence during cleaning is insufficient to remove product deposits.<sup>[48]</sup> In general, to improve cleanability, this equipment is made from Stainless Steel 316L, (an alloy containing small amounts of molybdenum). The surface is usually electropolished to an effective surface roughness of less than 0.5 micrometre to reduce the possibility of bacterial adhesion.

## Hygiene promotion

[edit]



## Further information: Hygiene



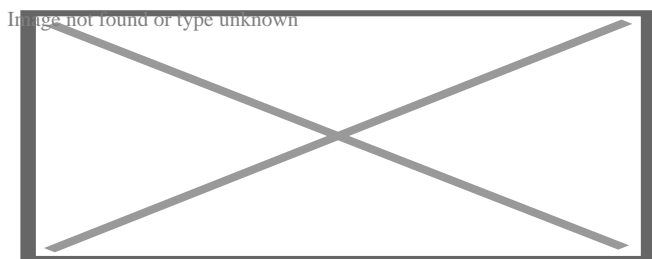
### Hygiene education (on proper handwashing) in Afghanistan

In many settings, provision of sanitation facilities alone does not guarantee good health of the population. Studies have suggested that the impact of hygiene practices have as great an impact on sanitation related diseases as the actual provision of sanitation facilities. Hygiene promotion is therefore an important part of sanitation and is usually key in maintaining good health.<sup>[49]</sup>

Hygiene promotion is a planned approach of enabling people to act and change their behavior in an order to reduce and/or prevent incidences of water, sanitation and hygiene (WASH)<sup>[50]</sup> related diseases. It usually involves a participatory approach of engaging people to take responsibility of WASH services and infrastructure including its operation and maintenance. The three key elements of promoting hygiene are; mutual sharing of information and knowledge, the mobilization of affected communities and the provision of essential material and facilities.<sup>[12]</sup>

## Health aspects

[edit]



The "F-diagram" (feces, fingers, flies, fields, fluids, food), showing pathways of fecal-oral disease transmission. The vertical blue lines show barriers: toilets, safe water, hygiene and handwashing.

A video shedding light on the unsafe and undignified working conditions of many sanitation workers in India

Main article: WASH § Health aspects

This section is an excerpt from WASH § WASH-attributable burden of diseases and injuries.[edit]

The WHO has investigated which proportion of death and disease worldwide can be attributed to insufficient WASH services. In their analysis they focus on the following four health outcomes: diarrhea, acute respiratory infections, malnutrition, and soil-transmitted Helminthiasis (STHs).<sup>[51]</sup> These health outcomes are also included as an indicator for achieving Sustainable Development Goal 3 ("Good Health and Well-being"): Indicator 3.9.2 reports on the "mortality rate attributed to unsafe water, sanitation, and lack of hygiene".

In 2023, WHO summarized the available data with the following key findings: "In 2019, use of safe WASH services could have prevented the loss of at least 1.4 million lives and 74 million disability-adjusted life years (DALYs) from four health outcomes. This represents 2.5% of all deaths and 2.9% of all DALYs globally."<sup>[51]</sup> Of the four health outcomes studied, it was diarrheal disease that had the most striking correlation, namely the highest number of "attributable burden of disease": over 1 million deaths and 55 million DALYs from diarrheal diseases were linked with lack of WASH. Of these deaths, 564,000 deaths were linked to unsafe sanitation in particular.

## Environmental aspects

[edit]

# Indicator organisms

[edit]

When analyzing environmental samples, various types of indicator organisms are used to check for fecal pollution of the sample. Commonly used indicators for bacteriological water analysis include the bacterium *Escherichia coli* (abbreviated as *E. coli*) and non-specific fecal coliforms. With regards to samples of soil, sewage sludge, biosolids or fecal matter from dry toilets, helminth eggs are a commonly used indicator. With helminth egg analysis, eggs are extracted from the sample after which a viability test is done to distinguish between viable and non viable eggs. The viable fraction of the helminth eggs in the sample is then counted.

## Climate change

[edit]

Main article: WASH § Climate change aspects

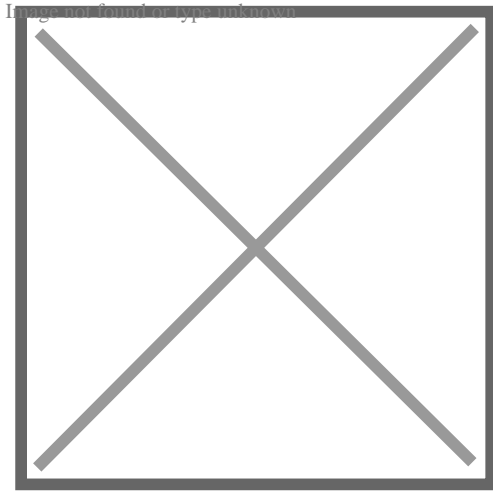
## Global mechanisms

[edit]

# Sustainable Development Goal Number 6

[edit]

Further information: Sustainable Development Goal 6



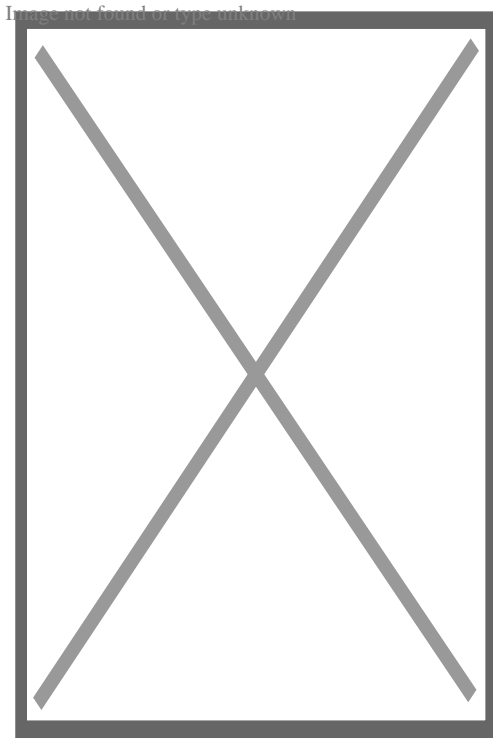
United Nations SDG 6 Logo

In the year 2016, the Sustainable Development Goals replaced the Millennium Development Goals. Sanitation is a global development priority and included Sustainable Development Goal 6 (SDG 6).<sup>[9]</sup> The target is about "clean water and sanitation for all" by 2030.<sup>[52]</sup> It is estimated that 660 million people still lacked access to safe drinking water as of 2015.<sup>[36][37]</sup>

Since the COVID-19 pandemic in 2020, the fight for clean water and sanitation is more important than ever. Handwashing is one of the most common prevention methods for Coronavirus, yet two out of five people do not have access to a hand-washing station.<sup>[53]</sup>

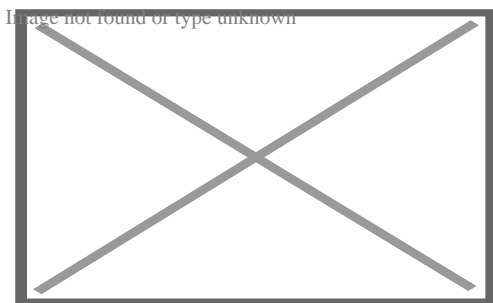
### **Millennium Development Goal Number 7 until 2015**

[edit]



Example for lack of sanitation: Unhygienic pit latrine with ring slab in Kalibari community in Mymensingh, Bangladesh

The United Nations, during the Millennium Summit in New York in 2000 and the 2002 World Summit on Sustainable Development in Johannesburg, developed the Millennium Development Goals (MDGs) aimed at poverty eradication and sustainable development. The specific sanitation goal for the year 2015 was to reduce by half the number of people who had no access to potable water and sanitation in the baseline year of 1990. As the JMP and the United Nations Development Programme (UNDP) Human Development Report in 2006 has shown, progress meeting the MDG sanitation target is slow, with a large gap between the target coverage and the current reality.



Modified logo of International Year of Sanitation, used in the UN Drive to 2015 campaign logo

In December 2006, the United Nations General Assembly declared 2008 "The International Year of Sanitation", in recognition of the slow progress being made towards the MDGs sanitation target.<sup>[54]</sup> The year aimed to develop awareness and more actions to meet the target.

There are numerous reasons for this gap. A major one is that sanitation is rarely given political attention received by other topics despite its key importance. Sanitation is not high on the international development agenda, and projects such as those relating to water supply projects are emphasised.<sup>[55]</sup>

The Joint Monitoring Programme for Water Supply and Sanitation of WHO and UNICEF (JMP) has been publishing reports of updated estimates every two years on the use of various types of drinking-water sources and sanitation facilities at the national, regional and global levels. The JMP report for 2015 stated that:<sup>[36]</sup>

- Between 1990 and 2015, open defecation rates have decreased from 38% to 25% globally. Just under one billion people (946 million) still practise open defecation worldwide in 2015.
- 82% of the global urban population, and 51% of the rural population is using improved sanitation facilities in 2015, as per the JMP definition of "improved sanitation".<sup>[56]</sup>

## Initiatives to promote sanitation

[edit]

In 2011 the Bill & Melinda Gates Foundation launched the "Reinvent the Toilet Challenge" to promote safer, more effective ways to treat human waste.<sup>[57]</sup> The program is aimed at developing technologies that might help bridge the global sanitation gap (for example the Omni Processor, or technology for fecal sludge management). In 2015, the Bill & Melinda Gates Foundation published their "Water, sanitation, and hygiene strategy portfolio update and overview" called "Building demand for sanitation".<sup>[58]</sup>

The latest innovations in the field of public health sanitation, currently in the testing phase, comprise – use of 'locally produced alcohol-based hand rub'; 'novel latrine improvement'; and 'container-based sanitation'. Centers for Disease Control and Prevention (CDC), the national public health agency of the United States has recognized the stated three initiatives.

## Capacity development

[edit]

Capacity development is regarded as an important mechanism to achieve progress in the sanitation sector.<sup>[59]</sup> For example, in India the Sanitation Capacity Building platform (SCBP) was designed to "support and build the capacity of town/cities to plan and implement decentralized sanitation solutions" with funding by the Bill & Melinda Gates Foundation from 2015 to 2022.<sup>[60][61]</sup> Results from this project showed that capacity development best happens on the job and in a learning organization culture.<sup>[62]</sup> In a government capacity development initiative, it is critical to have an enabling policy and program funding to translate capacity development input into program and infrastructure outputs. Capacity development aims to empower staff and institutions, develop a learning strategy, learning content and training modules, as well as strengthened partnerships and institutions of learning.<sup>[62]</sup> The Capacity Development Effectiveness Ladder Framework (CDEL) identifies five critical steps for capacity development interventions: Developing original learning content, partnerships for learning and outreach, learning strategy, visioning change and designing solutions, contribution to capacity development discourse.<sup>[62][63]</sup>

### Costs

[edit]

A study was carried out in 2018 to compare the lifecycle costs of full sanitation chain systems in developing cities of Africa and Asia. It found that conventional sewer systems are in most cases the most expensive sanitation options, followed, in order of cost, by sanitation systems comprising septic tanks, ventilated improved pit latrines (VIP), urine diversion dry toilets and pour-flush pit latrines.<sup>[64]</sup> The main determinants of urban sanitation financial costs include: Type of technology, labour, material and utility cost, density, topography, level of service provided by the sanitation system, soil condition, energy cost and others (distance to wastewater treatment facility, climate, end-use of treatment products, business models, water table height).<sup>[64]</sup>

Some grassroots organizations have trialled community-managed toilet blocks whose construction and maintenance costs can be covered by households. One study of Mumbai informal settlements found that US\$1.58 per adult would be sufficient for construction, and less than US\$1/household/month would be sufficient for maintenance.<sup>[65]</sup>

## History

[edit]

Further information: History of water supply and sanitation, Toilet § History, and History of waste management

Major human settlements could initially develop only where fresh surface water was plentiful, such as near rivers or natural springs. Throughout history people have devised systems to get water into their communities and households, and to dispose (and later also treat) wastewater.<sup>[66]</sup> The focus of sewage treatment at that time was on conveying raw sewage to a natural body of water, e.g. a river or ocean, where it would be diluted and dissipated.

The Sanitation in the Indus Valley Civilization in Asia is an example of public water supply and sanitation during the Bronze Age (3300–1300 BCE). Sanitation in ancient Rome was quite extensive. These systems consisted of stone and wooden drains to collect and remove wastewater from populated areas—see for instance the Cloaca



Maxima into the River Tiber in Rome. The first sewers of ancient Rome were built between 800 and 735 BCE.<sup>[67]</sup>

**By country**

[edit]

- v
- t
- e

Water supply and sanitation by country

- Afghanistan
- Algeria
- Angola
- Argentina
- Australia
- Azerbaijan
- Bangladesh
- Belgium
- Belize
- Benin
- Bhutan
- Bolivia
- Bosnia and Herzegovina
- Brazil
- Burkina Faso
- Cambodia
- Canada
- Chile
- China
- Colombia
- Costa Rica
- Cuba
- Democratic Republic of the Congo
- Denmark
- Dominican Republic
- Ecuador
- Egypt
- El Salvador
- Ethiopia
- France
- Georgia
- Germany
- Ghana
- Greece
- Grenada
- Guatemala

## Society and culture

[edit]

There is a vast number of professions that are involved in the field of sanitation, for example on the technical and operations side: sanitation workers, waste collectors, sanitary engineers.

## See also

[edit]

- List of abbreviations used in sanitation
- List of countries by proportion of the population using improved sanitation facilities
- List of water supply and sanitation by country
- Environmental health
- Water pollution
- Water security
- Self-supply of water and sanitation
- Sustainable Sanitation Alliance
- World Toilet Day

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[edit]


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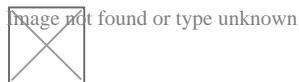
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- Sanitation and Wastewater Atlas of Africa
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Public health

- Auxology
- Biological hazard
- Chief medical officer
- Cultural competence
- Deviance
- Environmental health
- Eugenics
  - History of
  - Liberal
- Euthenics
- Genomics
- Globalization and disease
- Harm reduction
- Health economics
- Health literacy
- Health policy
  - Health system
  - Health care reform
- Housing First
- Human right to water and sanitation
- Management of depression
  - Public health law
  - National public health institute
- Health politics
- Labor rights
- Maternal health
- Medical anthropology
- Medical sociology
- Mental health (Ministers)
- Occupational safety and health
- Pharmaceutical policy
- Pollution
  - Air
  - Water
  - Soil
  - Radiation

## **General**

**Preventive  
healthcare**

- Behavior change
  - Theories
- Drug checking
- Family planning
- Harm reduction
- Health promotion
- Human nutrition
  - Healthy diet
  - Preventive nutrition
- Hygiene
  - Food safety
  - Hand washing
  - Infection control
  - Oral hygiene
- Needle and syringe programmes
- Occupational safety and health
  - Human factors and ergonomics
  - Hygiene
  - Controlled Drugs
  - Injury prevention
  - Medicine
  - Nursing
- Patient safety
  - Organization
- Pharmacovigilance
- Reagent testing
- Safe sex
- Sanitation
  - Emergency
  - Fecal–oral transmission
  - Open defecation
  - Sanitary sewer
  - Waterborne diseases
  - Worker
- School hygiene
- Smoking cessation

	<ul style="list-style-type: none"> <li>○ Biostatistics</li> <li>○ Child mortality</li> <li>○ Community health</li> <li>○ Epidemiology</li> <li>○ Global health</li> <li>○ Health impact assessment</li> <li>○ Health system</li> </ul>
<b>Population health</b>	<ul style="list-style-type: none"> <li>○ Infant mortality</li> <li>○ Open-source healthcare software</li> <li>○ Multimorbidity</li> <li>○ Public health informatics</li> <li>○ Social determinants of health <ul style="list-style-type: none"> <li>○ Commercial determinants of health</li> <li>○ Health equity</li> <li>○ Race and health</li> </ul> </li> <li>○ Social medicine</li> <li>○ Case-control study</li> <li>○ Randomized controlled trial</li> <li>○ Relative risk</li> </ul>
<b>Biological and epidemiological statistics</b>	<ul style="list-style-type: none"> <li>○ Statistical hypothesis testing <ul style="list-style-type: none"> <li>○ Analysis of variance (ANOVA)</li> <li>○ Regression analysis</li> <li>○ ROC curve</li> <li>○ Student's <math>t</math>-test</li> <li>○ <math>Z</math>-test</li> </ul> </li> <li>○ Statistical software</li> </ul>

**Infectious and  
epidemic  
disease  
prevention**

- Asymptomatic carrier
- Epidemics
  - List
- Notifiable diseases
  - List
- Public health surveillance
  - Disease surveillance
- Quarantine
- Sexually transmitted infection
- Social distancing
- Tropical disease
- Vaccine trial
- WASH
- Food

**Food hygiene  
and  
safety  
management**

- Additive
- Chemistry
- Engineering
- Microbiology
- Processing
- Safety
- Safety scandals
- Good agricultural practice
- Good manufacturing practice
  - HACCP
  - ISO 22000

**Health  
behavioral  
sciences**

- Diffusion of innovations
- Health belief model
- Health communication
- Health psychology
- Positive deviance
- PRECEDE–PROCEED model
- Social cognitive theory
- Social norms approach
- Theory of planned behavior
- Transtheoretical model

**Organizations,  
education  
and history**

**Organizations**

**Education**

- Caribbean
  - Caribbean Public Health Agency
- China
  - Center for Disease Control and Prevention
- Europe
  - Centre for Disease Prevention and Control
  - Committee on the Environment, Public Health and Food Safety
- Russia
  - Rospotrebnadzor
- India
  - Ministry of Health and Family Welfare
- Canada
  - Health Canada
  - Public Health Agency
- U.S.
  - Centers for Disease Control and Prevention
  - Health departments in the United States
  - Council on Education for Public Health
  - Public Health Service
- World Health Organization
- World Toilet Organization
- (Full list)
- Health education
- Higher education
  - Bachelor of Science in Public Health
  - Doctor of Public Health
  - Professional degrees of public health
  - Schools of public health
- History of public health in the United Kingdom
- History of public health in the United States
- History of public health in Australia
- Sara Josephine Baker
- Samuel Jay Crumbine
- Carl Rogers Darnall



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