Even today a third of the world does not have access to basic sanitation, resulting in water and soil pollution, and widespread health problems like cholera and dysentery. On the occasion of the World Toilet Day on 19 November, here’s an insight into the evolution of toilets in world history and efforts in India to bring sanitation to every household, from the man who is the brain behind the Sulabh Shauchalyas and well known for his wide-ranging work in sanitation to improve public health.

Sanitation is a concept that encompasses water supply, safe disposal of human waste, waste water and solid waste, control of vectors of diseases, domestic and personal hygiene. Consideration of the social, environmental and ecological aspects of sanitation is critical to ensure improvements in health and quality of life, as well as promoting sustainable development.

A UNICEF report has underlined that the sanitation problem is most acute in rural areas, where only 18% of the population worldwide has access to toilets. In the urban areas of the developing countries too, over 37% of the population lacks such facilities.

A comparison between toilet facilities available in urban and rural areas in India over two decades, viz. 1991 to 2011, shows that the situation in rural areas is not as encouraging as it could have been. But the level of satisfaction has increased with improvements. An increase of even a few percentage points is significant, considering the magnitude of the problem in India.

Toilets over the Ages
Toilets have been with humans ever since they left forests and decided to move ahead on the civilisational highway. In the forests, for thousands of years, humans defecated like other fellow animals. This open defecation continues in the human societies to some extent even today. However, some of the oldest civilizations viz. Egypt, India and Mesopotamia had developed toilets by the third millennium BC. Wet toilets were in use from 2,500 BC to 1,700 BC in India, Egypt, Mesopotamia and Crete.

At Mohenjodaro in modern Pakistan, one can see an extant flush type toilet of the Harappan settlements of 2,500 BC. After excretion, one would pour a bucket of water which would take the waste out of the town via a honey-comb drainage system. At some other sites of that civilization including Dholavira in Gujarat, people used well-constructed underground drains, now known as sewers. Every residential unit had a bathroom fitted with terracotta pipes to carry out wash water.

Unlike India, the Egyptians did not have a structured disposal system. Due to lack of water, they either waited for the Nile annual flood to sweep the waste away or they mixed fertile mud of the flood with...
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In about 1700 BC, in the Knossos Palace of Crete and Island in the Mediterranean Sea, there were flush toilets in the residential part of the queen. In his excavation, the famous archeologist Arthur Evans also found a ceramic bathtub in the queen’s bathroom. It was exclusively used by the queen and was directly connected with the drainage system. Like their Indian counterparts, the Greek royalty also used terracotta drain-pipes.

After the seventh century BC, Roman Europe made a significant contribution to the field of toilets, bath and drainage. In 615 BC, Emperor Lucius Tarquinius constructed Europe’s oldest sewer known as Cloaka Maxima in Rome. Earlier, it was open and meant for receiving ground water. Around the third century BC, the sewer was covered and waste water was also released into it. A portion of this old sewer is still operational.

Much later in 380 BC in Athenian Agora also sewers were constructed for the disposal of wastewater. Aristotle had advised his countrymen to throw away waste at least two kilometres away from the castle.

In 200 BC, in the Antonius Public Bath of Rome there were 1600 holes in planks over the flowing river water for defecation. Such river-top toilets were in use in some other parts of the world also, and this practice still continues in the hills and interiors of some countries including India. During this period, in public toilets in Rome, seats with holes in the middle were arranged in a semi-circular shape.

By the second century BC, the Romans had developed a very elaborate bath system. Their public bath was almost a complex with separate rooms for undressing/re-dressing, massage, hot/warm/cool water etc. Such baths were social centers where, besides freshening themselves, the beneficiaries also sat together and gossiped. In some warm water streams at several places in the Empire, both sexes took bath together. Both the developed cities of Pompeii and Herculaneous had all these facilities. However, they were erased in the Vesuvius volcano eruption of 84 BC. The excavations have unraveled them, as the volcanic ash worked as a safe cover to keep them intact.
In the field of sanitation, the Roman Empire is also known for some strange practices. Emperor Vespasianus imposed tax on toilets in 69 AD, perhaps the first in the world. Despite public opposition, he did not budge. In public toilets there, two users sat together without any cover between them. There was a pitcher full of water and a sponge-head stick for cleaning oneself. There was a stone tank which was filled with rain water.

Emperor Heliogabas was assassinated in his toilet. Around 315 AD, most of the 144 public toilets in Rome were W.C. type. In 395 AD, when the Roman Empire split, the countries of the eastern part like Syria, Turkey, etc. appear to have ignored the sanitation lessons of the western counterpart. The Eastern world reverted to the old practice of open defecation.

Around 1088 AD, a new experiment was made in the field of toilets. Toilets in the Lochister Fort in England were made in the fort wall. Such toilet seats had a

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Households by type of latrine facility</th>
<th>Absolute number</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Total number of Households</td>
<td>246,692,667</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Latrine facility within the premises</td>
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<td></td>
</tr>
<tr>
<td>A</td>
<td>Water Closet</td>
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<td></td>
<td></td>
<td>89,852,052</td>
<td>36.4</td>
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<td>29,471,391</td>
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<td></td>
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<td>5,621,776</td>
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<tr>
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</tr>
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<td></td>
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<td>4,461,06</td>
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<tr>
<td></td>
<td></td>
<td>2,606,278</td>
<td>1.1</td>
</tr>
<tr>
<td>C</td>
<td>Other Latrine</td>
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<td></td>
<td></td>
<td>794,390</td>
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<td>497,236</td>
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<tr>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>122,957,510</td>
<td>49.8</td>
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</tbody>
</table>

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slant ensuring the waste fell outside the peripheral wall either in the open barren land or in a surrounding moat. Such toilets were used in some forts of Rajasthan as well. The toilets were useful for security reasons as it was not advisable for the King and the nobility as also ladies of the nobles to go outside for defecation. For this reason only, Indian scriptures advised the Kings not to go for evacuation beyond the distance of an arrow-throw.

However, toilets and other sanitation arrangements were limited to only the privileged classes and the common man had no access to them. Consequently, the primitive practice of open defecation continued. The situation on the sanitation front was so grim that societies were repeatedly ravaged by health hazards. The devastating epidemics of plague in 1348 and 1350 decimated the European population almost by half. That is why, sanitarians call the period from the fifth to fifteenth century as the Black Age in the sanitation world history.

According to early excavators, in Mohenjodaro most toilets were post-cremation sump pots or burial urns. The top of this brick structure had a hole that was linked to a small drain that emerged out of the base into a basin of rectangular shape. Early excavators proposed this to be a toilet.

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(left)

Throne-like chamber pot

...
put on long maxi-like garments whose lower ends tended to touch this dirt. It is to prevent this that the fashion of putting on high heeled shoes ensued!

A German doctor Christian Fratzpautin even published a book in Latin entitled *Pharmacy of Stool*. In Paris in 1668, Police Commissioner Nicola-de-Ralen passed an edict ordering the construction of toilets in all houses. Later, in 1770 in Paris, all private houses were ordered to construct urinals within one month or face eviction.

With the beginning of the eighteenth century, a series of innovations started coming up in the field of toilets. Architect J.F. Brondel described the ideal toilet as one that was next to the bedroom, having a covered seat and the whole system was attached to the wall so that it was hidden. Later he also introduced valve-type toilet in British style. In 1739, at a ball in Paris, a covered seat and the whole system was attached to the wall so that it was hidden.

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The path-breaking invention of John Harrington was forgotten for nearly 179 years when Alexander Cummings, a watch-maker of London came with the first patent in 1775. It was his initiative that the WC once again caught public imagination. The Harrington piece was simple enough, without any mechanism to stop the foul smell from coming back to the bathroom. Cummings provided an ‘S’ type trap due to which some water always remained in the pan working as a seal, preventing the spread of the foul smell. This bend kept improving in the coming times.

Only two years after that Thomas Prosser got registered a second patent, which was an improvement on Cummings’ WC. Through a circular cock, water level could be regulated. When the lever was pulled, waste was flushed. This design, called “pan closet”, suppressed the foul smell completely. Its drawbacks were that the sound of pan revolution was high and its cleaning power was less. In 1778, this design was perfected by Joseph Bramah, and was to remain the most satisfactory water closet for the next several years.

In the coming days, several sanitarians like Joseph Blumer, James Grease, David Lease, Architect Jellow, Thomas Launtry, John Athlay, John Bin and some others from 1778 to 1793 came forward with their patents for further improving the toilet and making it user-friendly. John Athlay produced a WC in which water was supplied automatically as the user sat on it.

There were many other sanitary heroes in the nineteenth century -- inventors, engineers, producers, manufacturers and architects -- who had to fight for sanitary law reforms. It was George Jennings who first applied the sanitary technology to public conveniences. He had introduced his ideas at the Great Exhibition of 1851, with his “Monkey Closets” in the retiring rooms at Hyde Park and later at Sydenham. This was despite the strongest objections, with him being told that the visitors were not coming to the exhibition merely to wash. He was later to be awarded a gold medal for his much needed contributions to sanitary technology.

By the 1890s, Jennings and his followers had improved toilet-related sanitation devices on public thoroughfares all over England. Thirty-six towns and many others are listed in the catalogue of 1895 as having been improved by public conveniences.

George Jennings had also supplied his toilets to thirty railway companies in England, USA, Buenos Aires, Cape Town and Mexico. The streets of Paris, Berlin and Florence were provided with public urinals devised by him. Jennings’ ideas were revolutionary: firstly, conveniences were built underground with cast iron arches and railings to mark their whereabouts. Those built above-ground were distinctive little buildings in their own right with their pillars, panels and lamps. He built the urinals in slate and also devised the central pillar with urinals around it, saving space and water. Seeing the Jennings catalogues of designs of superb urinals, one can say that they are little temples of convenience.

In the last quarter of the nineteenth century, there was a trend to produce ornamental water closets, baths and basins. The wealth from colonies to the European countries and the emergence of ceramic as the raw material paved the way for such costly experiments. The toilets appeared in a dazzling variety of pattern with names like ‘Ruby Hispani’, ‘Natural Wild Rose’, ‘Pencelled Blackthrone’, ‘Peacock Blue Poppy’ and ‘Japanesque’.

In the Sulabh Effluent Treatment Technology, the effluent is passed through a sedimentation tank where solid particles settle, they are then passed through an aeration tank to reduce the biochemical demand (BOD).
The men responsible for this decorative explosion were also responsible for developing the water closets that we use today. Hellyer improved Bramah’s valve closet nearly hundred years after Alexander Cummings patent and gave it the famous name of Optimus. He produced sixteen of them with slight variations in their workings from Optimus A to Optimus P. This series of toilets were produced till the outbreak of the Second World War when production came to a standstill because of a tight economic situation. The extant pieces can be seen today in museums only.

The Gladstone Museum of Pottery, Trent, England has several decorated toilets on display. When in demand, they were installed in Buckingham Palace, Windsor Castle, Hampton Court Palace, Holyrood House and Osborne for Queen Victoria, in Marlborough House, Windsor, Buckingham Palace and Balmoral for Edward VII. They were also installed for George V, the Czar of Russia, the King of Siam, the Duke of Wellington, in the British Parliament, the Royal Courts of Justice and the War office.

Thereafter, Hellyer’s ‘wash out’ closet, Daniel Thomas Bostels’ ‘Excelsior’, Thomas Twyford’s ‘National’, and his ceramic pedestal version called ‘Unitas’ and the pieces of several others like those of Edward John, Thomas Crapper and John Shanks also became quite popular.

With the growing demand from the sanitary loving people several factories came up to meet the supply. They produced hundreds of innovations and variations on the water closet. Today only four are made: the ‘wash-down’ and the ‘symphonic’, the ‘squatting bowl’ and the ‘wash-out’ for the suppliers abroad.

Of late, there have been further changes in toilet technology. Due to global warming and paucity of water, WCs are becoming a luxury. Therefore, there is a frantic search for water-free toilets. Some innovations have come from USA and South Africa, but they are not only costly but also not culturally acceptable.

**Human Waste Management in India**

In the Pauranic period, religious sanction existed prohibiting people from defecating near human habitation. It was suggested that people go at some distance from their houses for defecation. People would dig a small pit in the ground, put some grass and leaves in it. After defecating here, they would again put some grass and leaves over the excreta in the pit and fill it with soil.

In the Mauryan period, there was a law stating that a person could be fined up to 100 Pun (monetary unit) if he defecated in the open and 10 Pun if he urinated in public. However, exemption was given to those who were sick or on medicines.

In the Mughal period also, practices both of defecation in the open and manual
Mahatma Gandhi wanted to end the practice of defecation in the open and manual cleaning of human excreta by human scavengers. He appealed to the people to keep India clean and restore the dignity of the untouchables. Gandhiji advocated the use of trench latrines, which he himself was using while he was in Phoenix Ashram in Durban, South Africa. He asked his followers and freedom fighters to use trench latrines in their homes as far as possible and also suggested adoption of the practice of *tatti pe mitti* i.e. covering human excreta with soil so that flies do not sit on human faeces and to prevent foul smell spreading.

During the British period there was introduction of sewerage and septic tank systems. But these innovations could not be adopted on a large scale because of the heavy cost of construction and maintenance, as well as the need for enormous quantities of water for flushing. Even during the British period, defecation in the open and manual cleaning of human excreta continued.

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Cleaning of human excreta by human scavengers prevailed. Some members of the feudal class and the upper segment of the merchant class resorted to defecation in a confined place to ensure privacy. This led to the necessity of engaging persons to clean excreta, which in turn created the scavenging community.

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Over the years, a number of committees were formed to look into the matter. They suggested improvements in the working conditions of the scavengers, but did not talk about the need to eliminate manual cleaning of excreta.

It is at this point, in 1970, that I founded Sulabh International Social Service Organisation. Until I became an adult, I lived in a village. There was hardly a household with toilet facility and villagers did the necessities in the open. Members of our family, including myself were no exception.

Later, as part of the Gandhi Centenary Celebration Committee in Bihar, I had first-hand experience of manual scavenging as a member of the Scavengers Liberation Cell.

At around this time, I also read a book by Wagner of WHO titled *Excreta Disposal for Rural Areas in Small Communities*, which advocated installation of alternately used pour flush compost pit privy. Reasoning that if the design was suitable in one set of conditions (rural areas) then its adoption in similar conditions elsewhere i.e. urban areas may be feasible, I advocated its installation both in urban and rural areas.

Sulabh design based toilets was decided to be initiated all over Bihar and in 1978 it was recommended to be adopted in other States of the country.

**Sulabh Technology**

Sulabh has the credit of making nearly 1.3 million toilets by constructing new or converting bucket toilets into Sulabh design based two-pit toilets. The two-pit pour-flush compost toilet has encouraged girls to attend schools full time and has reduced their dropout rate from school. It has also helped women to defecate with privacy, dignity and security.

What has helped most the spread of Sulabh two-pit pour-flush compost toilet
Design is the delivery mechanism. Sulabh takes upon itself the responsibility of:

- Processing paperwork relating to receipt of funds by the beneficiary under the low income related subsidy programme of the government for construction of household toilets
- Doing quality construction work
- Obtaining certificate from the beneficiary and
- Undertaking free of cost defect removal work of any construction for a given period of years.

There also is the necessity of a toilet by the floating population at places of congregation viz. markets, railway and bus stations, cinemas or at special events like sports events, etc. For this, building community toilets was essential. Sulabh has taken up construction of new public...
toilets as also running and maintaining existing public toilets.

By now Sulabh has constructed and maintains nearly 8000 public toilet complexes all over the country. Construction and maintenance of such a large number is primarily due to efficient round-the-clock maintenance.

More recently, a biogas plant was attached to the public toilets and Sulabh Effluent Treatment Device. The unique feature of the biogas technology is that the plant is human excreta based and has a fixed dome. The biogas is used for cooking, lighting mantle lamps for street lighting, and warming oneself in winters.

In the Sulabh Effluent Treatment Technology, the effluent is passed through a sedimentation tank where solid particles settle, they are then passed through an aeration tank to reduce the biochemical demand (BOD). Then, sand filtration separates suspended particles, and water is passed through the charcoal bed which makes the effluent colourless and odourless. Subsequently, pathogens are killed by passing through the U.V. chamber. This effluent can be used for horticulture and kitchen garden watering purposes. The effluent is thus processed and recycled.

The most important part of the entire system is the excreta disposal mechanism. In the Sulabh design toilet there is on-site disposal facilitated by alternate use of the two pits. Of the two, one pit is put to use, which takes two to three years to fill up. When this happens, the flow of excreta to the pit is blocked by placing across a brick in the channel through which the excreta flows into the first pit. The second pit is then put to use, taking approximately two to three years to get filled up. During this period the excreta in the first pit dries up.

This system results in dispensing with the necessity of engaging a scavenger as dried excreta can be taken out by the householder himself. The lattice formation of the brick lining ensures absorption of carbon dioxide and traces of methane and ammonia. The on-site disposal facility of the two-pit system ensures combining storage and disposal stages making the usefulness of the system unique. The human waste gets converted to manure with nitrogen, potassium and phosphorus.

The biogas digester linked to public toilet and attached with Sulabh Effluent Treatment device ensures that the BOD of the toilet effluent is reduced to a purity of less than 10 mg/l. The gases in the bio-digester plant are methane, carbon dioxide, hydrogen sulphide and trace gases.

The commonality in the two systems is: a) in both the systems gases produced are not allowed to escape into the atmosphere, and b) in both the technologies good soil nutrients are produced viz. phosphorus, nitrogen and potash and can be used for horticulture and kitchen garden purposes.

Whereas in the two-pit technology carbon-dioxide gets absorbed in the soil facing the pit, the methane from the biogas plant gets burnt when used for cooking or for lighting purposes. The two-pit system is ideal for individual households. The community toilet with biogas plant attached to the Sulabh Effluent Treatment device is most suited for hostels, hospitals, high-rise buildings, etc.

Dr Bindeshwar Pathak, the brain behind Sulabh International, is a Padma Bhushan recipient. He has also received the Energy Globe Award, the Dubai International Award for Best Practices, and the Indira Gandhi Priyadarshini Award for Environment. Stockholm Water Prize was awarded to him in 2009. In June 2013, he also received the Legend of Planet award from the French senate in Paris. Dr Pathak is founder of the Sulabh International Social Service Organisation, Sulabh Gram, Mahavir Enclave, Palam-Dabri Marg, New Delhi–110045; Email: sulabhinfo@gmail.com/sulabhinfo1@gmail.com