

INSTITUTE OF SECRETARIATE TRAINING & MANAGEMENT

**TRAINING COURSE
ON
WATER SANITATION & HEALTH**

**READING MATERIAL
FOR
SANITATION
VOL.II**

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and
Management**

TRAINING COURSE

WATER SANITATION AND HEALTH

Reading Material for WATER

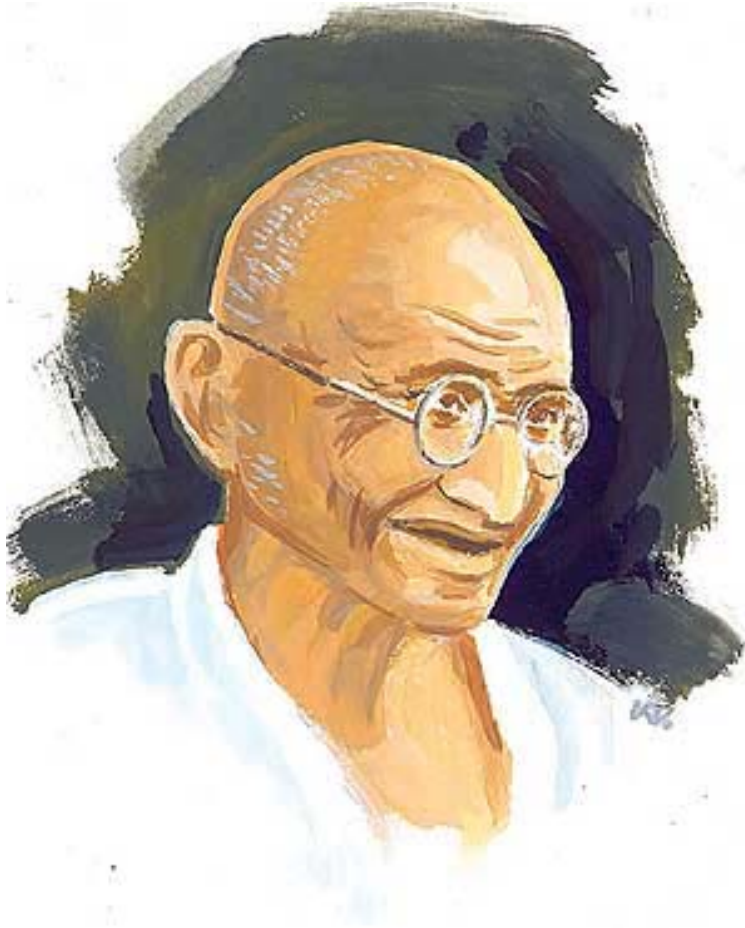
Vol 1

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Chapter 1

INTRODUCTION



*Cleanliness is next to
godliness*

Mahatma Gandhi

The Ministry of Urban Development has enacted the National Urban Sanitation Policy with a vision that **“All Indian cities and towns become totally sanitized, healthy and live-able and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women.”**

As India is a signatory to the Millennium Development Goals (MDGs) she aims to extend access to improved sanitation to half the Urban population by 2015 and 100% by 2025. This implies extending coverage to households without improved sanitation, and providing proper sanitation facilities in public places to make cities open-defecation free.

The policy proposes to address some key sanitation issues as follows:

Poor Awareness: Sanitation has been accorded low priority and there is poor awareness about its inherent linkages with public health.

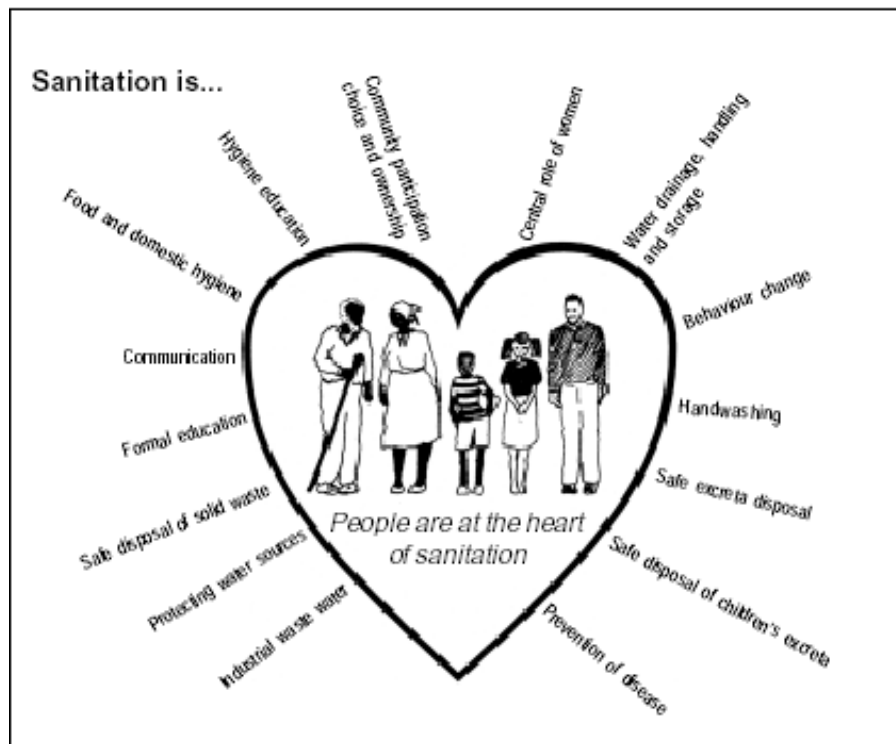
Social and Occupational aspects of Sanitation: Despite the appropriate legal framework, progress towards the elimination of manual scavenging has shown limited success, Little or no attention has been paid towards the occupational hazard faced by sanitation workers daily.

Fragmented Institutional Roles and Responsibilities: There are considerable gaps and overlaps in institutional roles and responsibilities at the national, state, and city levels.

Lack of an Integrated City-wide Approach: Sanitation investments are currently planned in a piece-meal manner and do not take into account the full cycle of safe confinement, treatment and safe disposal.

Limited Technology Choices: Technologies have been focussed on limited options that have not been cost-effective, and sustainability of investments has been in question.

Reaching the Un-served and Poor: Urban poor communities as well other residents of informal settlements have been constrained by lack of tenure, space or economic constraints, in obtaining affordable access to safe sanitation. In this context, the issues of whether services to the poor should be individualised and whether community services should be provided in non-notified slums should be addressed. However provision of individual toilets should be prioritised. In relation to “Pay and Use” toilets, the issue of subsidies inadvertently reaching the non-poor should be addressed by identifying different categories of urban poor.



Lack of Demand Responsiveness: Sanitation has been provided by public agencies in a supply-driven manner, with little regard for demands and preferences of households as customers of sanitation services.

(The goals of the policy and components may kindly be seen in Appendix 1)

1. WHAT IS SANITATION?

The policy also defines Sanitation as as safe management of human excreta, including its safe confinement treatment, disposal and associated hygiene-related practices. While this policy pertains to management of human excreta and associated public health and environmental impacts, it is recognized that integral solutions need to take account of other elements of *environmental sanitation*, i.e. solid waste management; generation of industrial and other specialized/ hazardous wastes; drainage; as also the management of drinking water supply.

2. WHAT IS THE PRESENT SCENARIO IN DELHI?

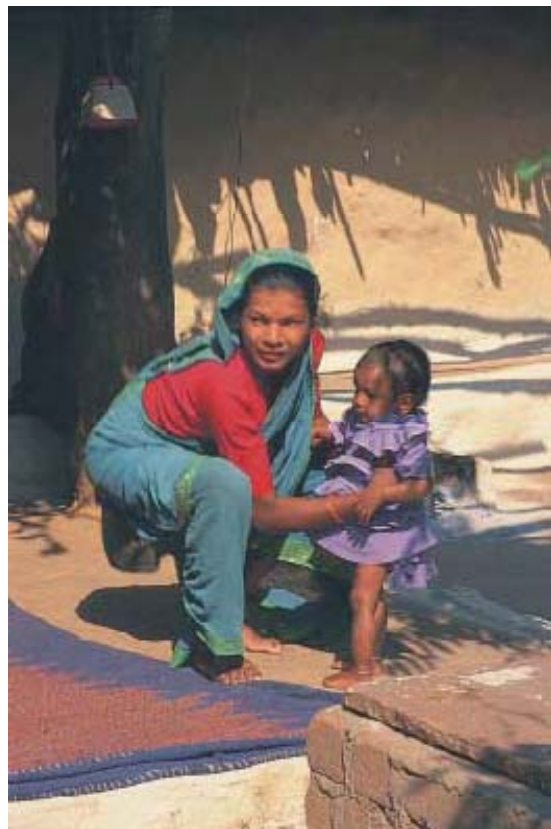
Only 55 per cent of Delhi's population is served by sewerage system and sewage treatment facilities are provided for only a small proportion of the sewage generated. Delhi Jal Board is responsible for treatment and disposal of wastewater. There is growing lag between wastewater discharges and treatment capacities. Further, due to inadequate infrastructure for wastewater collection and other operational problems, even the current capacities of Sewage Treatment Plants (STPs) are underutilised. Unabated discharge of treated and untreated wastewater from different sources is responsible for excessive deterioration of surface water quality.

Solid waste collection and disposal is the responsibility of local bodies including Municipal Corporation of Delhi, New Delhi Municipal Council and Delhi Cantonment Board in their respective areas. In 1996, the amount of waste generated was estimated at 8000 tonnes per day, out of which 30 per cent remained uncollected. In the recent years, the Municipal Corporation of Delhi has been taking proactive steps to involve non-governmental organisations to organise door to door collection of garbage.

TOILETS

A report titled 'Profiling "Informal City" Of Delhi' made by the NGO WaterAid states some findings about toilets in a few sample slum areas as follows:

- ❖ Majority (62%) of the adult population in informal settlements is dependent on individual toilet facilities for their sanitation needs. Community toilet facilities have also emerged as a sanitation facility used by the adults in the



- slums with 18 per cent of the adult population using this type of facility.
- ❖ In JJ clusters, households depend on community level toilet facilities for their sanitation needs and due to absence/inadequate provisions/poor maintenance rendering the facility useless they have to resort to defecation in the open.
 - ❖ Of the 160 households surveyed across eight informal settlements in Bhalaswa and Badli ward, 99 (62%) have individual toilets. Of these while a majority (75) have a septic tank based disposal system, which is based on a redundant technology and is creating environmental pollution within the settlements, in the neighbourhood and also contributing to pollution at the city level.
 - ❖ The inadequate provision of toilet seats results in a very high number of people being dependent on one toilet seat. The situation is further worsened due to the poor level of maintenance of the available toilet facilities that renders many toilet seats useless and thus further increases the pressure on the existing infrastructure. The present ratio of persons per toilet seat ranges from 94 in Bhalaswa (resettlement colony) to as high as 592 in B. D. Patil Nagar (JJ cluster). The ratios are much higher than acceptable norms or standards.
 - ❖ The Focus Group Discussions revealed that the informal settlements faced various problems due to inadequate and inappropriate provisions, as well as poor operation and maintenance of community toilet blocks. Some of problems that were cited in the course of the discussions with the communities are outlined under:
 - Inadequate provision of toilets results in long waiting time especially during the morning hours.
 - In communities where resident have to walk some distance as the toilet blocks are located away from the home, problems were encountered particularly by the women. The women cited that walking long distances with a water can or bucket, invites sniggering and teasing from bystanders.
 - The poor level of maintenance of the toilet blocks in communities seems to be a universal complaint.
 - The conditions inside the toilets were described to be very unhygienic and pathetic.
 - The public toilet blocks are largely lacking in the facilities which are essential for the proper functioning like water, electricity and waste bins. Other facilities which would make them useful and accessible to all sections of the society are squatting pans for children, urinals for men and bathrooms.
 - In communities where the MCD does not attend to the O&M of the toilet blocks, the toilets may be left unattended and serviced only when the situation deteriorates considerably. Largely, communities have devised their own systems of O&M through the initiative of the CBO or the users themselves.
 - No cognisance is taken of the needs of special groups like handicapped/aged in the design of the toilets.
 - ❖ The issues related to poor sanitation for women are manifold and were forcefully put forth by women during FGDs:
 - Owing to unclean and overloaded toilets and lack of electricity in toilet blocks, women often change their body clocks to answer nature's call.
 - Women use *mishri*, or tobacco as a laxative which being tobacco-based causes other complications such as mouth ulcers, mouth cancer, etc. Women

control their intestinal urges and school their bodies leading to lifelong constipation for many of them.

- Most women, conscious of the practices employed, were totally unaware of the long-term health implications and the impact of poor sanitation and hygiene on life expectancy.
 - There is a lack of gender sensitivity amongst planners and engineers. Women's sanitation.
 - needs are different from those of men and this needs to be first internalised as a concept and then incorporated in planning and implementation.
- ❖ Only 32 households (20%) pay for using toilet facilities.
 - ❖ There is a high aspiration level in slum communities (as revealed in the FGDs) to have individual toilet facilities where there are community level facilities or no facilities at all.

DRAINAGE

In the same study WaterAid reported –In a majority of households surveyed in the informal settlements the main activities/uses resulting in generation of wastewater are washing and bathing. In 143 households (89.38%) the activities generating wastewater within the house are bathing and washing. In only 16 households, (10 %) toilets are located within the houses and are contributing to generation of wastewater. Of these 16 households, nine are in Bhalaswa Gaon (urban village), four in Rajeev Nagar (unauthorised colony), two in Bhalaswa (resettlement colony) and only one in Ambedkar Nagar (resettlement colony).

The informal settlements covered in Bhalaswa and Badli wards have different types of drainage systems, namely, open kutchra and open pucca drains. Depending on the level of community initiatives taken to upgrade the drainage system there has been a progression from its most rudimentary stage that is, open kutchra to open pucca. Majority of the households in the wards covered (119, 74.38%) have access to open pucca type of drainage system. 26 per cent of the houses have access to open kutchra drains.

THE KEY FINDINGS REGARDING THE DRAINAGE IS:

- ❖ In majority of the households surveyed the main activities/uses resulting in generation of wastewater are washing and bathing.
- ❖ The informal settlements have different types of drainage systems present, namely, open *kutchra* and open *pucca* drains. Depending on the level of community initiatives taken to upgrade the drainage system there has been a progression from the rudimentary, open *kutchra* to open *pucca*. Majority of the households in the informal settlements covered (119, 74.38%) have access to open *pucca* type of drainage system and 26 per cent of the houses have open *kutchra* drains.
- ❖ The different actors involved in the maintenance of the drainage system in the informal settlements include municipality, private sweepers and community. Majority of the households (88; 55%) depend on the municipality to undertake the maintenance of the drainage in their settlement. A sizeable proportion of the households (45 households; 28.13%) have taken the onus of maintaining the drainage system on their own. Only 12

households (7.50%) have employed a private sweeper to clean and maintain the drainage system in their area.

- ❖ The frequency of cleaning of the drains varies from daily to monthly. Majority (129 households; 80.63%) of the households reported that the frequency of cleaning drains was weekly.
- ❖ Of the total households, majority (56.25%) are not at all satisfied with the condition of the drainage system. There is a high level of dissatisfaction among communities with respect to the drainage system and its maintenance. The level of satisfaction is dependent on the frequency of cleaning with households that have access to daily cleaning reporting a higher level of satisfaction as compared to others.
- ❖ Majority of the households (131; 81.88%) do not make payment for maintenance of the drainage system as they themselves are undertaking the cleaning of the drains. Wherever payment is made it is in the range of Rs 10-20 per month.

SOLID WASTE MANAGEMENT

SYSTEM OF GARBAGE MANAGEMENT

There is an absence of an organised system of garbage collection by the municipal authorities in all the slums surveyed in the two wards. Majority of the households are indulging in dumping of garbage in the absence of any organised system of garbage collection.

PLACE OF DISPOSAL OF GARBAGE

Majority of the households are indulging in dumping of garbage in the absence of any organised system of garbage collection. The households are dumping garbage at a variety of locations including by-lanes, drains, nallas, open area, near toilets, and in municipal bins. The most common place for dumping by individual households is the municipal bin.

FREQUENCY OF CLEARANCE OF GARBAGE BY THE MUNICIPAL AUTHORITY

The communities voiced their dissatisfaction with the low and irregular frequency of clearance of garbage from their settlements by the municipal staff. The frequency of garbage clearance from the slum communities varies from daily, alternate day to twice a week. While a large proportion (41%) of the households reported that the garbage is cleared on a daily basis there are an equally large proportion which report that the frequency of clearance varies from twice a week to once in 15 days. If the environmental sanitation situation in slums is to be improved there is a need to ensure a regular frequency of clearance of the municipal bin preferably daily irrespective of the land ownership and legal status. Further, the location of the municipal bin should be planned in consultation with the community. While the clearance of the garbage is the responsibility of the local body there is a need to create an awareness among the slum communities to ensure that they change their current practices and organise a settlement level collection system and its subsequent dumping in the municipal bin.

PROBLEMS FACED BY RESIDENTS DUE TO INADEQUATE DISPOSAL OF GARBAGE

Improper clearance of garbage has far reaching environmental health implications as the garbage leads to proliferation of disease spreading vectors like mosquitoes, rats, flies. Discussions with the communities revealed other aspects which act as irritants like the smell and the sight of filth.

KEY FINDINGS: SOLID WASTE MANAGEMENT

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PERSONAL HYGIENE

Most people understand hygiene as “cleanliness”, but there is not enough clarity on the life saving or priority hygiene practices and how they prevent diseases. This training module is intended to promote such understanding, providing the type of information that hygiene promoters could provide to their communities, in easy language and simple methods guidance for trainers, to help them understand and disseminate the routes of infectious disease transmission, identifying “risk practices” and advising on effective hygiene practices. This module is not intended as a prescription for promoting improved hygiene in communities, but rather as guidance material from which readers use to adapt to local context they work in.

The module brings together sanitation related all aspects of hygiene and looks at it from the point of view of the individual and family and what they need to understand and know in order to protect themselves from infection. The emphasis is on “what”, “why” and “how” of hygiene and related behaviour change. If hygiene promotion is to be effective, and behaviour is to be sustainable ideally community should play a role, and the purpose of this module is enabling them through capacity building.



Chapter 2

HUMAN WASTE

HUMAN WASTE

Open defecation is responsible for more than 50 different kinds of diseases like typhoid, cholera, dysentery and diarrhea. Around 80% diseases spread from sick people to healthy ones through human excreta.

PROPER DISPOSAL OF HUMAN WASTE

Various types of options for disposal of human excreta are as follows:

- ❖ Sewerage
- ❖ Septic Tank
- ❖ Sulabh Shauchalya
- ❖ Electric Toilet
- ❖ Portable Toilet

SEWERAGE

- Ideal but expensive
- Impractical for India
- High maintenance and construction cost
- Disposal creates breeding sites for mosquitoes

SEPTIC TANKS

- Also expensive
- Requires scavenger or someone to clean them
- Cleaning involves health risk also

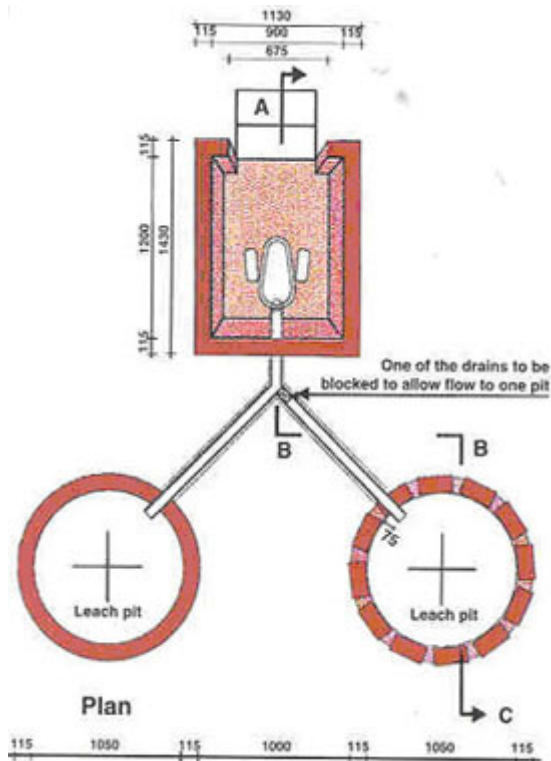
SULABH SHAUCHALYA

It is a low cost pour flush toilet developed by Dr. Bindeshwar Pathak, a sociologist. He is a social reformer and founder of the Sulabh International Social Service Organisation.

Sulabh Shauchalya consists of a sloping pan and a trap with waterseal. Human excreta is carried from the pan into leach pits through pipes or covered low drains. The pits are lined with stones, bricks or rings, with numerous gaps or holes. When one pit is full, excreta is diverted into the second. After 18 months, the contents from the full pit can be used as manure and the pit is reused.



The overall design of the toilet is flexible and can be modified depending upon the size, location and cost of the toilet desired.



Sulabh Shauchalaya (Two pit Pour flush Latrine) consists of a pan with a steep slope 25° - 28° and a trap with 20 mm water seal needing 1.5 to 2 litres of water for flushing. The pan and trap of conventional design, which are used with flushing cisterns, should not be used in a pour flush latrine with leach pits, as it would need more water for flushing and the pit may not function properly.

The excreta is carried into leach pits through pipes or cover drains; one pit is used at a time. The liquid infiltrates into the soil through the holes in the pit lining. When one pit is full, excreta is diverted to the second pit. In about 18 months period, the content of the filled pit gets digested and becomes a safe organic manure for handling. The pit can then be conveniently emptied and is ready to be put back into use, after the second pit is full. Thus the pits can be used alternatively and continuously. The sludge from the pit is a good manure for use in

horticulture and agriculture. The cost of emptying the pit can be recovered partially from the cost of manure in the pit. This technology opened new possibilities to promote sanitation, especially in developing countries like India.

ADVANTAGES

The following are the advantages of Sulabh Shauchalaya over other technologies:

- Hygienically and Technically appropriate; Socio-culturally acceptable.
- Low cost and easy to construct with locally available materials.
- Design and specifications can be modified to suit the user's needs and affordability.
- It eliminates mosquito, insect and fly nuisance; Can be constructed in different physical, geological and hydrogeological conditions; free from health hazards and does not pollute surface or ground water, if proper precautions and safeguards are taken during construction.

- It can be located within the house as it is free from foul smell and fly/mosquito nuisance; Can be constructed on upper floors of houses also.
- Pits are generally designed for 3 years desludging interval, but if desired they can be designed for longer periods or it can be reduced to even 2 years.
- The maintenance of Sulabh Shauchalaya's is easy and simple and it costs very little.
- It needs only 1.5 to 2 litres of water for flushing compared to 12 - 15 litres required by conventional flush toilets.
- Less space than is required for septic tank latrine.
- It does not need scavengers for cleaning pits or disposal of sludge; This can be done by the householders himself or by a labourer; makes available rich fertilizer and soil conditioner.
- It can be easily connected to sewers; A low volume flushing cistern can be attached to avoid pour flushing.
- No vent pipe is required in Sulabh Shauchalaya's, as gases disperse into the soil thereby removing the nuisance of foul smell spreading in the neighbourhood.



WHY TWO PITS?

Single leach pits are appropriate only if they can be desludged mechanically by a vacuum tanker, since their contents are not pathogen free. In two pit system, since one pit is used at a time, the filled up pit can be cleaned manually even by the householder himself because of the long period of digestion which makes it pathogen free and eradicates foul smell.

In a single pit system, desludging has to be done almost immediately after the pit has been filled to enable its reuse; This involves handling of fresh and indigested excreta which can be hazardous to health.

If a dipper with a larger single pit is provided, de-sludging operation will be difficult and there will be more chances of pollution especially where ground-water table is high.

OPERATION AND MAINTENANCE

Operation and maintenance of Sulabh Shauchalaya is very easy and simple:

- Before use, wet the pan by pouring little quantity of water.
- After defecation pour 1.5 to 2 litres of water in the pan for flushing.
- Pour about half a litre of water in the pan after urination.
- The pan should be cleaned once a day with a brush/ broom and with soap powder periodically.
- One pit is to be used at a time by plugging the mouth of the other drain.
- Kitchen/ bathroom wastewater or rainwater should not be allowed to enter the pits.
- Other solid waste like kitchen waste, rags, cotton, sweepings etc. should not be thrown in the pan; This could block the latrine.
- To remove choking in the trap, do rodding from the pan and the rear side by means of a split bamboo stick.
- When the pit in use is full, the flow should be diverted to second pit and the filled up pit should be desludged after 1.5 to 2 year rest period.
- The first pit can then be put to reuse when second pit is full.

IMPACT OF SULABH TECHNOLOGY

Sulabh technology has made a tremendous impact on the lives of people especially those living in slums/ squatter settlements and those who have no toilet facilities. One evidence of the impact is that the toilet facilities created by Sulabh are now being used by over 12 million people everyday all over the country. The impact is still more on the minds of the people and decision makers at National and Global levels, where the importance of low cost sanitation technology is being realised. Sulabh's technology has been accepted as a "Model" at the *Habitat Conference at Istanbul* (June, 1996) and at many other National conferences.

The lives of scavengers and the status of sanitation is higher today than at any time in history, raising the hope that scavenging may soon be a word to be read in History books. Sulabh has so far constructed and converted over 1.2 million household toilets to Sulabh two pit pour flush latrines. 5,500 Public toilets have been constructed by Sulabh are now being used by more than 12 million people everyday.

Over 50,000 scavengers have been liberated from the demeaning task of carrying excreta as head load. Over 5,000 wards and family members of the liberated scavengers have been given vocational training and resettled in other jobs. Sulabh also runs a system of Sulabh Public Schools which provides education at par with the best in the country to these bereaved people at no cost and thus helps them join the mainstream of the society.

As many as 240 towns have been made scavenging free. There has been a dramatic change in the physical environment of the towns where the Sulabh system is in operation. In the towns which have become scavenging free, all dry (or bucket) household privies have been converted into the new two pit pour flush Sulabh Toilets. The houses which had no latrines too have been provided with sanitary toilets and for those who could not afford or space was a constraint, well managed community toilets have been provided. Thus the pumping of fresh pathogenic night soil into water bodies has been stopped, leading to the improvement of the physical environment. Sulabh's innovativeness is best demonstrated in the public toilet systems operated on the *Pay and use* basis which is self sustaining. Along with public

toilets, Sulabh provides bathing, washing and urinal facilities with separate compartments for men and women. Some other amenities like cloak room, public telephone, primary health care, drinking water, school for children in slums etc. have also been provided at community toilets.

The user charge is nominal; The disabled, children, women and those who cannot pay are exempted from the fee for use of Sulabh facilities. The authorities, therefore, do not have to provide funds for the maintenance of public toilets for a period upto 30 years, which is a unique example of community participation in maintenance of sanitation facilities. In addition, these toilet blocks have provided dignity and safety by provided facilities for defecation and bathing in privacy, especially for women who are the greatest beneficiaries

CASE STUDY

Once resigned to a life of drudgery and humiliation, women scavengers in western India are now coming out of this demeaning occupation. Sulabh International, a non-profit group working to improve sanitation in the country runs a vocational training centre that provides them with alternative livelihood options.

Alwar, Rajasthan: Till 2003, the manual scavengers of Alwar, mostly women treated as untouchables, went from house to house, carrying buckets of human excreta on their heads.

Born into a family engaged in the profession of scavenging for ages, Usha recalls, “With a veil covering our faces, we would walk miles with the tray full of excreta on our heads till we managed to find a place to dispose it off.”



Married at a young age of 8 years she often missed a normal life like others as was never allowed to enter a temple and also faced trauma when people called her "Bhangan", "Jamadarni" or Harijan.

“Even rickshaw pullers who knew us would refuse to take us and people never served us water in a glass”, she recalls.

Usha Chaumar, Sushila Chauhan, Maya Sangelia, Laxmi Nanda and other such women scavengers now hope for a new life of dignity, as they undergo rehabilitation through special skill development and vocational training.

A new lease of life

Nai Disha (meaning new direction), a vocational training centre in Alwar district, Rajasthan, is an organisation with a difference. Its vision is to change the lives of those who – by virtue of birth alone – bear the burden of shame and hatred by others throughout their lifetime.

The centre has been successful in taking out women scavengers from the pits of the demeaning occupation. Training by Nai Disha (set up under the Sulabh Sanitation

Movement) provided chance to these women to give up scavenging and to join the adult education programme.

Santosh Singh, Project Officer of International Centre for Women and Child, Alwar, told that in the absence of any alternative source of livelihood, these women are offered a monthly stipend of Rs. 2,000 by Nai Disha so that they do not revert back to their old profession.

The two year training is followed by one year period of rehabilitation so that they get sufficient time for their economic empowerment.

These women today have acquired training and skills into various segments, such as food processing, cutting and tailoring, candle making, applying mehndi, embroidery, beauty care and in functional literacy.

They not only sign their cheques but also market the products on a profit earning basis. Singh introduces many women scavengers at the centre who have now learnt to interact with the bank and operate their accounts in a Alwar based bank.

Usha has opened up a workplace where they impart beauty tips and teach embroidery and stitching to other women of the area. Having herself transformed to a normal human being who has self-respect and dignity, she now wants to help others. She said that there are numerous girls who approached her and wanted to know how their lives can be changed.

Dehumanised

No human degradation could be more cruel and inhuman than the one suffered by scavengers. In 1925, Mahatma Gandhi said that “sanitation was more important than independence.”

Employing manual scavengers to clear human excreta is punishable under the law, yet many institutions, private and public, continue to do so with impunity.

In 1993, Indian Parliament passed the Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, which tendered even voluntary employment of manual scavengers for removing excreta an offence.



Chapter 3

SOLID WASTE MANAGEMENT

SOLID WASTE MANAGEMENT

COLLECTION

1) Dustbin with lid

The dustbin should be of plastic or metal and should be as big as could accommodate sufficient quantity. It should be lined with cover to limit problems with flies or other insects. But it should not be small enough to be carried and should be not easily destroyed.

2) Transport

Wheel Barrow

Garbage should be transferred in specially designed refuse lorry. Smaller quantity can be carried by wheel barrow which are hand driven carts.

3) Treatment and composting

It consists of organic refuse matter which includes domestic and agricultural wastes (grass leaves, vegetable waste, left over food, cow dung etc.) with layer of earth. The process is repeated and finally it is covered with earth. The top should be about 1 ½ ft. above ground.

The size of pit varies according to the amount garbage collected and space available.

For small domestic purposes, the size of the compost should be about one meter in length, one m in width and 0.8 m in depth. The garbage is covered with a layer of earth, the upper surface is about 2 ft above the ground so that it does not allow water to enter. The size of compost depends upon availability of space. At the house hold level, size can be 1 m long, 1m deep. It is converted into manure in 6 months time.

4) NADEP composting (composting on large scale)

This is an ideal technology or method to take care of both the organic household refuse and the agricultural refuse. This is a simple, economical and non-polluting technology.

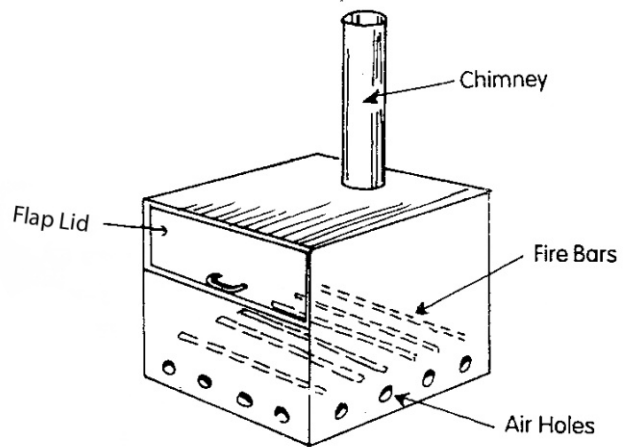
Construction

- Compact the area underneath the tank
- Put holes in the tank. To speed up, each hole should be 2X1 ft. Remove the fourth brick of every 3rd row. Plaster the inside walls and with floor with mud and cow dung to help prevent leaching into the surrounding soil. This takes one day. Allow the plaster to dry fully before using the tanks.
- Fill with 1350 kg agriculture waste, 92 kg cow dung, fine dry earth 1675 kg remove stone, glass or inorganic items, put 1350 ltrs water This should be in layers one over the other.

- Make 12-14 layers of all the items in above order out of the total material.
- Seal the mound of earth with cow dung, smooth and paste it.
- Fill any small cracks after drying with cow dung and mud paste.

Decomposition

- Put a temporary shed 2-3. This protects the pile from direct sunlight and rain, and will maintain humidity.
- After 90-120 days, the mature compost looks dark and rich. To use sieve it through thick mesh to remove undegraded pieces.
- One tank of 180 cc would be enough to manure 6 acre.



Simple Incinerator
भस्मीकरण उपकरण

5) INCINIRATORS



भस्मीकरण उपकरण

They are used to burn garbage, but may create air pollution therefore proper training should be taken to use it. They can be made of brick lining or metal.

- Simple incinerator
- Bin incinerator
- Rotary incinerator

Court stipulates that every hospital with more than 50 beds must use incinerator or other disposal equipment.

6) Vermiculture

Biodegradable garbage like leaf , grass, vegetable peelings, left over food, etc can be converted into manure with the help of earthworms.

The organic waste is kept in wooden boxes or earthen ditch, layer of organic waste is kept on the bottom. It is divided into 4-8 parts depending upon the size. Bunch of worms is placed in each part and again covered with waste. Water is sprinkled to make it moist. In due course it gets converted into manure. It is very nutritive manure and economically viable and successful.

There is a great demand of this manure in the market . it can be tried with the help of government or some funding agencies.



Barriers in total Urban Waste Management

Non-segregation of waste at source is a major issue in the chain of waste management. Individual households have an erroneous notion that garbage disposal is entirely the job of civic authorities. People, especially housewives, feel it irksome to segregate wet or bio-degradable waste from non-biodegradable waste like plastic bottles, glass, cans, wrappings, aluminium foil sachets, etc. The excuse is that they do not have bins which should be provided and they do not have time to segregate. A plastic covered bin and an ordinary cardboard box would suffice. They do not understand that a few minutes of their time would eliminate hours of sorting out the accumulated waste. Besides this, such an operation near a municipal dump (dhalao) by the ragpickers leads to unhygienic conditions, attracting cattle, dogs, insects and flies. We tend to walk past a dhalao, close our noses to the terrible stink but do not take time off to reflect as to what we can do to prevent such a situation.

The communities or Residents Welfare Associations (RWAs) give a very low priority to Solid Waste Management (SWM). For them security, water, lighting, etc. are more important. Although, most localities have parks within their boundary, somehow the very idea of composting waste at these locations seems to be an anathema. Those residents who reside near the parks have violent objection, citing foul smell and general unhygienic conditions. Ignorance breeds an attitude of resistance against any initiative. They do not understand that if the place is kept clean and kitchen waste in pits is covered with dried leaves the presence of foul smell is eliminated. Those who do understand the value of composting at source do not volunteer to help in any way and are content by saying "keep up the good work and we are with you".

Ragpickers, who are generally migrants in towns and cities, have a large contribution in waste management. It is a huge unorganised task force mainly comprising migrants from West Bengal, Assam and Bangladesh. As they start their work in the early hours of the morning they are looked upon with suspicion and any theft or trespass in colonies is blamed on them. The police and security agencies take advantage and extract whatever available money from them. In Delhi alone there are 1,00,000 to 1,50,000 ragpickers who save MCD Rs. 8 to 9 lakhs daily. At a smaller scale, in other towns and cities, these ragpickers are contributing substantially towards clean environment. As quite a few are foreign nationals and are involved in nefarious activities, they do not wish to come into the limelight. After collection of waste they do the segregation in the open, take away the recyclables, leaving the area dirty. SWM, to be successful, has to integrate them, make full use of them, thus providing them livelihoods to live with dignity and not as pariahs of society.



Municipal Corporations/Municipalities have the biggest stake in SWM. However, even with a large force of *safai karamcharis* they are unable to carry out their task due to various reasons. In Delhi, as per the admission of MCD, 30 per cent of the 50,000 workforce are on leave at any one time. As a result 1500 tonnes of garbage lies uncollected every day. Most of the *safai karamcharis* working in localities show up for 3 hours in the morning. They are not accountable to the RWA's and the total responsibility of a clean residential area devolves on nobody. These *karamcharis* are paid government employees. However, they exploit the weaker sections of the society by not allowing them to take part in the management of the waste. They purchase rickshaws and fix up a door-to-door collection rate of Rs. 30 to 40 per month, making a neat Rs. 6,000/- per month in a locality of 200 residents, They employ a ragpicker to do the collection work who makes a living by selling recyclable waste which may be Rs. 50 to 100 a day. If this practice of sub-letting is banned, three to four women ragpickers can be given this task, provided proper uniform and given badges of identification. They would be made responsible for collection and general cleanliness of the locality 7 days a week, 365 days a year. They will also be responsible for not allowing any unidentified person coming in the locality. In addition, they can be

trained for vermi-composting which will earn revenue for the RWA. The Municipal Authorities should also be made responsible for setting up retail outlets for marketing the compost at a negotiated price. With the huge savings in manpower, equipment and transportation, besides earnings through sale of compost, a part of the municipal budget should be allocated for tree plantation, landscaping, improving the general cleanliness of slum areas and providing better amenities like public latrines, proper drainage with soak pits, an efficient sewage system etc., which are so essential for an eco-city. Once awareness is created among citizens it will become a second nature to keep their towns clean, green and healthy.

The Namakkal Experience

Namakkal is a small district HQ town of Tamil Nadu, situated on the main highway from Salem to Dindigul. It is the first municipality in the country involved in privatisation of all components in SWM. By institutionalisation of door-to-door collection with segregation at source, manufacturing of vermi-compost from organic waste and sale of recyclable from inorganic waste, Namakkal has the distinction of becoming the only zero garbage town in the country. In order to achieve this they follow a ten point charter :

1. Extend the scheme of door to door collection with segregation to entire town and make the streets and roads garbage free.
2. Introduce night sweeping at bus stand and important roads, etc., and maintain cleanliness 24 hours.
3. Extend the scheme of door-to-door collection and sweeping on Holidays and Sundays and make the town clean on all days by continuous sweeping.
4. Make the parks and burial grounds beautiful and attractive through NGO and voluntary agencies.
5. Remove encroachments on all roads and streets.
6. Prevent road-side hotels, lorry repair shops, etc., on the national highway and maintain it beautifully by planting trees.
7. Remove pigs and dogs from the town.
8. Levy service charges on hotels, Kalyanamandapams, commercial complexes and garbage generating industries.
9. Manufacturing of Vermi-compost from organic waste through voluntary organization / private agencies on B.O.T. basis, sell the inorganic recyclable garbage and convert the compost yard into Nandavanam.
- 10 Engage two mob-up teams with two auto model carriers to remove the waste then and there, round the clock, and make the town garbage free.

Since door-to-door collection is being done by private groups, municipal safai karamcharis have been engaged for night sweeping on main roads, bus stand, markets and industrial areas. This activity is also being done on all Sundays and holidays. Sanitary inspectors have been appointed to impose spot fines upon those who resort to littering. For vermi-composting a unit has been set up 2 kms outside the town over an area of 8.53 acres. The compost is either sold or utilised for parks / gardens under the supervision of the municipal authorities.

This experiment has been successful due to a holistic approach with all agencies cooperating together under the leadership of the District Collector. The committee includes the district administration, the municipality, consortium of NGOs, women self-help groups, schools, market associations, industrial associations, RWAs and ragpickers. Although Namakkal is a small town, with a population of 60 to 70,000, it is having two major industries – body-building of 60 per cent of CNG tankers in the country and a very large and well-organised poultry industry. Hence, if no effort was made the town would have virtually turned into a garbage ridden town. Now an awareness has been

created where every citizen accepts the responsibility of keeping the town clean and ensuring that nothing is thrown anywhere except in a bin.

Solutions

As utilisation of municipal solid waste is everybody's responsibility a holistic view has to be taken to achieve the desired results. NGOs have ample expertise in this field and can be usefully entrusted as consultants to bring out the desired results. In every town a pilot programme should be carried out and the success story should be circulated to other localities for replication. As a start, government housing localities should be selected like police lines, residential areas of government institutions, university and college campuses, etc., where local or outside interference is non-existent. Once a demonstrable unit is functional, nearby RWA office bearers could be invited for seeing for themselves the benefits. In turn, the RWAs should be given incentives for setting up the infrastructure and initial functioning of the unit, till they can themselves stand on their feet.

Children from the local schools should be trained for catalysing community action. Parent eco-clubs should be formed and during parents / teachers meeting, the involved NGOs could brief them on the benefits of usefully utilising waste. Some of these parents may be office bearers of their RWA and they can influence other residents to implement the scheme.

Ragpickers in a particular town (except those who are foreigners) should be systematically inducted into the scheme by allotting them localities with more interaction with RWAs. In this way, a large number of marginalised sections of the society will be provided with decent livelihoods. This will enable them to integrate into the mainstream of society and prevent them from carrying out unlawful activities. If women are employed, it will free the children from such tasks and they can then attend schools and at least get basic education leading to a decent employment. It will also prevent them from being exploited by law enforcement agencies. As they will be registered, the RWAs will be able to ensure their good conduct and in case of any mishap the culprits can easily be traced and brought to book.

Better coordination between RWAs and municipal authorities is essential. The municipal supervisor attached to a locality should be made accountable for its overall cleanliness and a part of the municipal budget could be allotted to the RWA for expenditure. A sense of cooperation and removal of suspicions, without incrimination, would help immensely. To make the scheme a success, the legislators (M.P., MLA, and Municipal Councillors) have to hold hands, irrespective of their party affiliations and render full support to the civil administrator (District Collector) to make things work. Finally, it has to be remembered that **waste is wealth** and a business package for sustenance of the scheme will be an incentive for the creation of a clean and healthy town / city.

SEGREGATION OF WASTE

What are biodegradable and non biodegradable wastes?

Biodegradable wastes decompose into soil.

- Kitchen food scraps
- Garden waste
- Paper and egg shells
- Human and animal waste
- cardboard boxes



Non-biodegradable wastes take a long time or never to decompose.

- metal cans
- bottles

- toxic chemicals
- plastic products
- metal scraps

In general, differences are based on whether or not the action of "a biological agent" can cause the waste in question to be "degraded" to some acceptable level.

Biodegradable means that natural processes can break down the material into their natural components. Whereas, non-biodegradable materials would not be affected by natural processes that would break the material down. Plastic usually is non-biodegradable, because there are very few natural processes that could break the plastic down into smaller elements, whereas something like wood, will rot and decay and be recycled back into the soil.

Biodegradable implies that the material will be destroyed/dissembled by biological and/or natural elements. Nitric Acid rain manufactured in thunderstorms, Oxygen in the air, ultraviolet light in sunlight, and all kinds of microscopic "critters" in the atmosphere and soil which "chomp" on all kinds of materials [including some petroleum products] are acting.

Non-biodegradable implies that the material is totally immune from attack by any biological/natural elements and therefore, will exist forever in essentially the same form for ever. The wastes which cannot be degraded or which cannot be completely destroyed are non biodegradable wastes. Non-biodegradable wastes are just its opposite

The MCD installs green colored Bins for biodegradable material which should be thrown in that.

POLYTHENE BAGS



Polythene bags can best be defined as a NON-BIODEGRADABLE substance that is used by the majority of Delhiites as packing materials. Despite the fact that they are cheap as well as light, they are hazardous in the following ways;

- The fact that they are non biodegradable makes them hard to dispose and as a result, they can act as breeding places for many of the disease germs which, sooner than later cause an epidemic in the

surrounding people.

- The fact that they are very light also makes it very easy for them to be blown from place to place and as a result, the unending littering of the environment.

- Some of these bags have been used by a number of ignorant or careless people as mobile toilets considering their light nature. These mobile toilets are then carelessly thrown away to unknown areas which, also makes work of the concerned parties rather hard.

- These polythene bags have over time been proven to be environmentally unfriendly considering the time taken for their decomposition. As a result of this time spent they can cause further problems like blocking water penetration into the soil which in turn affects food growth and development. They were one of the reasons for flooding of Mumbai during heavy rains a few years ago.

THEY HAVE BEEN BANNED AND THEIR USE IS ILLICIT AND ATTRACTS HEAVY FINE!!

As an alternative of having to suffer the unending plight of environmental down fall, we would suggest that an alternative means of packaging materials should be encouraged like jute, cloth and paper bags. Polythenes are therefore the most outstanding of all the waste in the homes of most Indians and are hard to dispose off. They affect the environment in a number of ways with some very adverse effects.

CAUSES OF POOR POLYTHENE WASTE DISPOSAL

Polythene in India is cheap and therefore the majority of the Indians can afford them. They are therefore widely used as packing bags in the country with the biggest percentage of the users in the urban areas.

In addition the polythene bags are easy to carry and therefore most of the people find them very convenient to carry and portable. As a result they are widely used in the country.

Most of the people in the country also find them easy to dispose off after use. They are very light and someone can easily throw away the polythene after use. This has increased on the abundance of the polythene waste. In addition they can also be recycled after use i.e. they can be used again for another purpose.



Ignorance of the people who don't care about the effects of proper waste disposal and who may not know about the effects of improper waste disposal. They therefore dump the polythene bags carelessly.

They block and clog the drainage system and do not allow the rain water to pass during rains and cause puddling on roads in cities

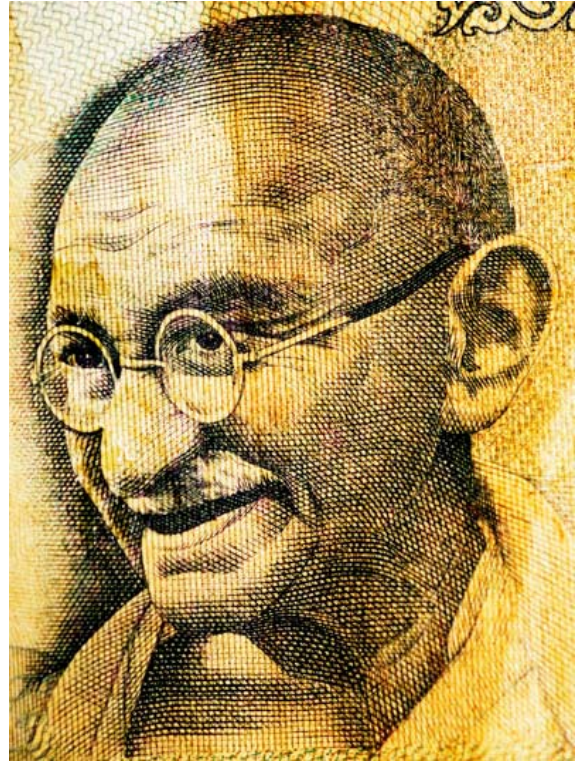
Negligence of some of the people who have the I don't care attitude towards proper waste management. Although literate but with no concern for the environment at all, they therefore deposit the polythene bags anywhere after use.

Lack of strict enforcement of laws as regards the dumping of polythene bags is another reason. The people who are seen throwing away or using the polythene bags in town should be punished.



Chapter 4

CLEANLINESS



Importance of washing hands

Hands spread an estimated 80% of common infectious diseases like the common cold and flu. For example, when you touch a doorknob that has the flu virus on it and then touch your mouth, you can get sick. But these disease-causing germs slide off easily with good hand

washing technique. Hand washing is easy to learn, cheap and incredibly effective at stopping the spread of disease causing germs. Hand washing is a simple habit, something most people do without thinking. Yet hand washing, when done properly, is one of the best ways to avoid getting sick.

This simple habit requires only soap and water. Good, frequent hand washing is the single best way to prevent the spread of many common diseases. Washing your hands is the best way to STOP germs from spreading.

Environment our house and outside are full of germs and we have some power in stopping the germs from spreading. Children are especially susceptible to germs. A germ reduced classroom will reduce students from missing school and learning.



The dangers of not washing your hands

Despite the proven health benefits of hand washing, many people don't practice this habit as often as they should – even after using the toilet. Throughout the day you accumulate germs on your hands from a variety of sources, such as direct contact with people, contaminated surfaces, foods, even animals and animal waste. If you don't wash your hands frequently enough, you can infect yourself with these germs by touching your eyes, nose or mouth. And you can spread these germs to others by touching them or by touching surfaces that they also touch, such as doorknobs.

Infectious diseases that are commonly spread through hand-to-hand contact include the common cold, flu and several

gastrointestinal disorders, such as infectious diarrhea. While most people will get over a cold, the flu can be much more serious. Inadequate hand hygiene also contributes to food-related illnesses, such as salmonella and E. coli infection, which can cause symptoms of nausea, vomiting and diarrhea.



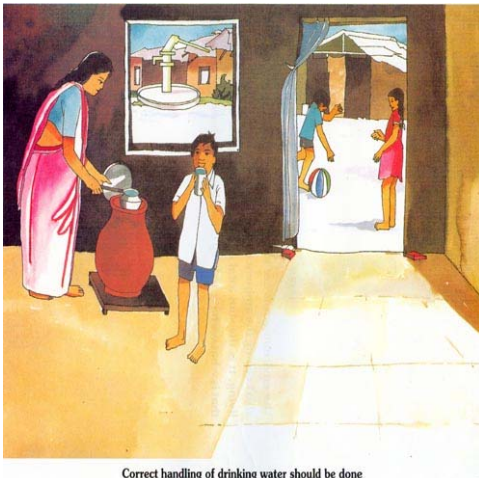
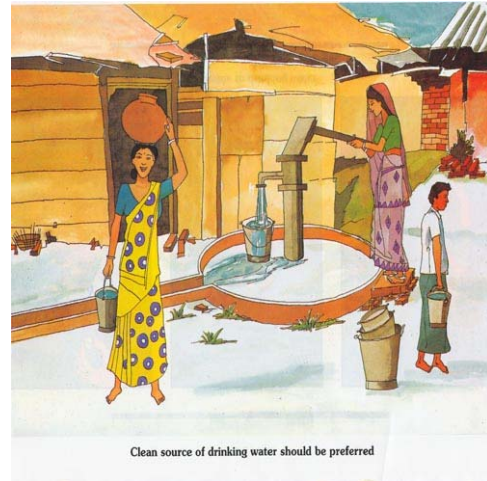
When should you wash your hands?

Although it's impossible to keep your bare hands germ-free, there are times when it's critical to wash your hands to limit the transfer of bacteria, viruses and other microbes. Always wash your hands:

- ✓ after using the toilet
- ✓ after changing a nappy – wash the nappy-wearer's hands, too
- ✓ after cleaning up a child who has gone to the bathroom
- ✓ after touching animals or animal waste
- ✓ before and after preparing food, especially before and
- ✓ immediately after handling raw meat, poultry or fish
- ✓ after blowing your nose
- ✓ after coughing or sneezing into your hands
- ✓ before and after treating wounds or cuts
- ✓ before and after touching a sick or injured person
- ✓ after handling rubbish
- ✓ when using public restrooms
- ✓ after playing or working outside
- ✓ before eating food

SAFE HANDLING OF WATER

1. Get from a clean source of drinking water, if it is a well it should be covered.
2. Clean dirty containers before filling of water.
3. Keep water containers covered all the time to prevent contamination from dust, flies, cockroaches and germs.
4. Use good dipping techniques either use a ladle with long handle to prevent dirty fingers touching the water.
5. Do not drink from the same container from which you are filling.



6. If the community has storage tanks or cisterns they should also be covered and cleaned.

7. Clean the water storage utensils regularly.

WHAT ARE GERMS?

Germs are tiny organisms that creep into our bodies and attack our immune system.

Unable to live on their own, germs invade our bodies and steal the nutrients and energy that our bodies produce. After gobbling up all of our nutrients and vitamins the germs leave behind their own harmful wastes called toxins. These toxins are the sources of our runny noses, high fevers, diarrhea and hoarse coughs.



Think back to the last time you were sick. Did you have a fever, runny nose, stomach ache, or throw-up often? Did you have to visit your doctor? Did you need medicine to help you get better.

Well... did you ever wonder why or how you became sick? Chances are that germs were the source of your illness.

There are many different kinds of germs, but the four most common are: bacteria, viruses, fungi and protozoa. Each of these types of germs cause different symptoms or illnesses. For instance, while bacteria germs cause minor illnesses such as ear infections, sore throats and cavities, viruses cause more serious diseases such as chicken pox, measles and the flu.



Although germs are everywhere, most of the time we don't realize that we have germs because they are so small that you need a microscope to see them. Germs spread through the air when someone coughs or sneezes. Or germs can also appear in bodily fluids like saliva, sweat and blood. The best way to avoid getting germs is stay away from these areas

where germs spread. But the most easiest way to protect yourself from germs is to wash your hands with soap and water frequently. You should always soap up your hands with suds after using the bathroom, after touching money, after playing outside or after visiting a sick friend or relative.

Our bodies are pretty amazing. Day after day, they work hard — digesting food, pumping blood and oxygen, sending signals from our brains and our nerves, and much more. But there is a group of tiny invaders that can make our bodies sick — they're called germs.

WHAT TYPES OF GERMS ARE THERE?

Germs are found all over the world, in all kinds of places. There are four major types of germs: bacteria, viruses, fungi, and protozoa. They can invade plants, animals, and people, and sometimes they make us sick.

Bacteria are tiny, one-cell creatures that get nutrients from their environments in order to live. In some cases that environment is a human body. Bacteria can reproduce outside of the body or within the body as they cause infections. Some infections bacteria cause include sore throats (tonsillitis or strep throat), ear infections, cavities, and pneumonia. But not all bacteria are bad. Some bacteria are good for our bodies — they help keep things in balance. Good bacteria live in our intestines and help us use the nutrients in the food we eat and make waste from what's left over. We couldn't make the most of a healthy meal without these important helper germs! Some bacteria are also used by scientists in labs to produce medicines and vaccines.

Viruses need to be inside living cells to grow and reproduce. Most viruses can't survive very long if they're not inside a living thing like a plant, animal, or person. Whatever a virus lives in is called its host. When viruses get inside people's bodies, they can spread and make people sick. Viruses cause chickenpox, measles, flu, and many other diseases. Because some viruses can live for a while on something like a doorknob or countertop, be sure to wash your hands regularly!

Fungi are multi-cell (made of many cells), plant-like organisms. Unlike other plants, fungi cannot make their own food from soil, water, and air. Instead, fungi get their nutrition from plants, people, and animals. They love to live in damp, warm places, and most fungi are not dangerous. An example of something caused by fungi is athlete's foot, that itchy rash that teens and adults sometimes get between their toes.

Protozoa are one-cell organisms that love moisture and often spread diseases through water. Some protozoa cause intestinal infections that lead to diarrhea (runny poop), nausea, and belly pain.

WHAT DO GERMS DO?

Once germs invade our bodies, they snuggle in for a long stay. They gobble up nutrients and energy, and can produce toxins (say: **tak-sinz**), which are like poisons. Those toxins can cause symptoms of common infections, like fevers, sniffles, rashes, coughing, vomiting, and diarrhea.

How do doctors figure out what germs are doing? They take a closer look. By looking at samples of blood and other fluids under a microscope or sending these samples to a laboratory for more tests, doctors can tell which germs are living in your body and how they are making you sick.

How Can You Protect Yourself From Germs?

Most germs are spread through the air in sneezes, coughs, or even breaths. Germs can also spread in sweat, saliva, and blood. Some pass from person to person by touching something that is contaminated, like shaking hands with someone who has a cold and then touching your own nose. So the best way to protect yourself from germs is to steer clear of the things that can spread them:

Cover your nose and mouth when you sneeze and cover your mouth when you cough to keep from spreading germs.

Remember the two words germs fear – soap and water. Washing your hands well and often is the best way to beat these tiny warriors. Wash your hands every time you cough or sneeze, before you eat or prepare foods, after you use the bathroom, after you touch animals and pets, after you play outside, and after you visit a sick relative or friend.

Using tissues for your sneezes and sniffles is another great weapon against germs. But don't just throw tissues on the floor to pick up later. Toss them in the trash and, again, wash your hands!

Now that you know the facts about germs, you may still pick up a cough or a cold once in a while, but you'll be ready to keep most of those invading germs from moving in.



WHO/UNICEF joint monitoring report 2010: Progress on Sanitation and Drinking Water

Fast facts

An improved sanitation facility is one that hygienically separates human excreta from human contact.

An improved drinking-water source is one that by the nature of its construction adequately protects the source from outside contamination, in particular from faecal matter.

All the information in this report is based on data available up to and including 2008

Sanitation

- 2.6 billion people or 39 per cent of the world's population live without access to improved sanitation. The vast majority live in Asia and sub-Saharan Africa.
- In the developed regions almost the entire population (99 per cent) used improved facilities as compared to 52 per cent in developing regions.
- At current rates of progress the world will miss the MDG sanitation target by almost 1 billion people, which claims to: "halve, by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation," by 13 per cent. And the MDGs are not the end of the sanitation challenge. Even if the target is met some 1.7 billion people will still not have access to improved sanitation facilities.
- Rural/urban disparities are particularly apparent in sub-Saharan Africa, and the Caribbean, Southern Asia and Oceania where improved sanitation coverage is highest among the urban population despite the vast majority living in rural areas.
- 751 million people share their sanitation facilities with other households or only use public facilities.

Open defecation

- A global decline in open defecation has been recorded. The proportion of the world's population that practices open defecation has declined by more than one third from 25 per cent in 1990 to 17 per cent in 2008.
- However some 1.1 billion people still defecate in the open. Eleven countries, (India, Indonesia, China, Ethiopia, Pakistan, Nigeria, Sudan, Nepal, Brazil, Niger and Bangladesh) are home to 81 per cent of them.
- Open defecation is largely a rural phenomenon, most widely practiced in Southern Asian and Sub-Saharan Africa. Even in these two regions, declines in open defecation have been recorded, with a fall from 66 per cent of the population in 1990 to 44 per cent in 2008 in Southern Asia, and a corresponding decline in Sub-Saharan Africa from 36 per cent to 27 per cent.

Water

- 5.9 billion people, or 87 per cent of the world's population, and 84 per cent of the population living in the developing world now use drinking water from safer, improved sources. At current trends the world will meet or even exceed the water MDG target.
- 3.8 billion people, or 57 per cent of the world's population, get their drinking water from a piped connection that provides running water in their homes or compound.
- Sub-Saharan Africa and the Oceania are the areas that are lagging behind. Just 60 per cent of the population in Sub-Saharan African and 50 per cent of the population in Oceania use improved sources of drinking-water.
- In China, 89 per cent of the population of 1.3 billion has access to drinking-water from improved sources, up from 67 per cent in 1990. In India, 88 per cent of the population of 1.2 billion has access, as compared to 72 per cent in 1990.