

5.2 Public “away from home” toilets



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Can public toilets be made attractive?
Can vandalism be avoided?

Learning objective: how to plan and implement sustainable toilets in public places.



A public toilet can meet the needs of a range of different user groups. This chapter is about public toilets which are for occasional ‘away from home’ users such as workers, commuters, tourists and shoppers, as well as local residents who do not have a toilet inside their home. The requirements for such toilets are more complex than for school toilets and toilets at workplaces, as discussed in Module 5.3. Public toilets should be available when the need arises, which means that they have to be strategically sited.

A significant proportion of any population needs to use the toilet frequently – every hour or so – and for many, the need comes suddenly and urgently. This applies to the elderly, the very young, pregnant women, those with incontinence, men with prostate problems and anyone experiencing illness-related urinary issues.

Public toilets present a challenge for every society, but they are a valued and essential service. Anyone who has had the sudden need for one knows that an available public toilet nearby is priceless. At the same time, authorities are cautious about investment and operational costs and want to provide toilets in the most cost-effective manner.

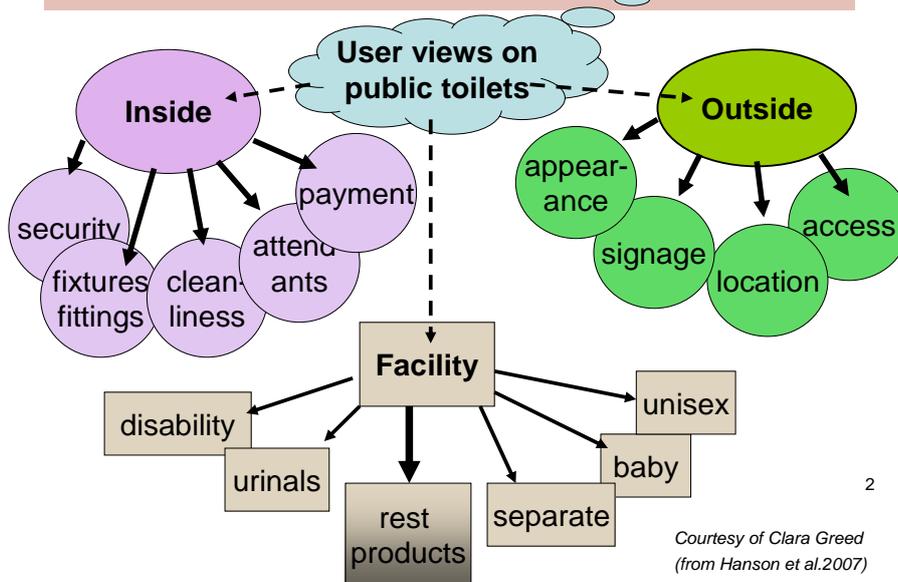
Many restaurants and shopping centres consider it good marketing practice to provide quality toilets to attract customers. Professional offices are now installing exclusive toilets and bathrooms for their staff in order to be competitive employers (*Financial Times*, Dec-08).

Consequently, there is a considerable difference in quality between traditional ‘on street’ public toilets, and the ‘off street’ toilets to which customers, guests and employees have access. If the government wants to get people out of their cars and onto public transport or back walking and cycling then public toilets are the ‘missing link’ in creating sustainable cities.

A chief from a district in Tanganyika (now called Tanzania) was asked what he found most interesting during his visit to the UK in the 1930s. His answer was: the clean public toilets! Things have changed since then! We will now discuss ways to think about planning and implementing sustainable public toilets.

A public toilet is part of a system

5.2 - 2



A public toilet does not exist in a vacuum; rather, it is part of the urban system and a key component of the built environment. This chapter looks at public toilet issues, highlighting the public toilet block within the wider context of its place in the city in terms of location, distribution and daily and seasonal opening hours. Importance is given to social, economic, environmental and design considerations in deciding on the best solution for a particular locality.

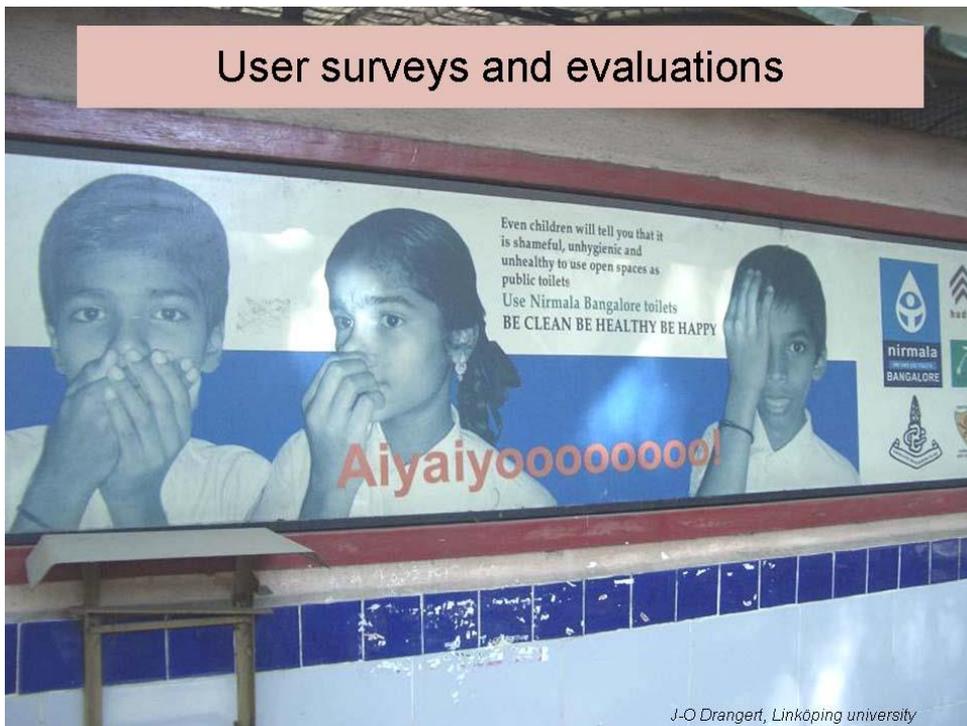
The demographics of different types of users require particular attention. This includes the needs of males and females, of an ageing society, of people with disabilities, and of other groups of people who do not fall neatly into abled or disabled categories, such as pregnant women, those with temporary impairments, physically large people, small people, children and babies. In creating sustainable, egalitarian and accessible public toilets, technical, design, hygiene, environmental, sanitation, maintenance and general management considerations are all important.

The mapping of the movement of people in an area, and estimates of their needs for a toilet or urinal can inform decisions on where to install facilities and how many of each kind. Gender, physical ability, and cultural aspects have to be taken into account. People are deterred from using public toilets if they are dirty or vandalised. Public toilets should be attractive, accessible and safe, so that needy users will visit them.

Even when a toilet block is available, there may be queues to enter and use the facilities. Waiting times may be considerable, especially at women's toilets. Frustrated users may rush to another toilet in another locality or go to a café and order a coffee to be allowed to use its toilet. All this has much to do with poor municipal planning and the low priority often given to sanitation in planning!

Vandalism is a major problem in public toilets, particularly those without attendants or security to keep an eye on the premises. If the toilet is not clean when users enter they have little sense of responsibility for tidying up before leaving. This is especially the case if people are afraid of catching germs and diseases by touching the toilet; this is all more so if there are no hand washing facilities. Furthermore, toilet design can make access difficult – for example, if entrances are narrow or down steep steps. Internal space standards may also deter users, as in the case of very small cubicles.

We will now deal with each issue shown in the picture above.



Public toilets may be assessed from a variety of perspectives including users' experiences, social equality, economic viability, environmental impact, and design suitability. Since excretion is a sensitive cultural issue in most societies, social, cultural and settlement patterns have to be considered in order to provide insight and understanding of the needs and reactions of users.

The poster in the picture above shows users being concerned about appearance, smell, and speech in relation to excretion. Interviews with users can provide valuable information about their perceptions, which are often very different from the toilet providers' perspective. The provider is more likely to be concerned with how to save money than with social considerations such as accessibility and adequate levels of provision. Below is an example of a survey which could be used to obtain information from toilet users. It includes 10 closed questions and one open question

Protocol for interview questions about perceptions among potential toilet users

1. ***Do you know where the nearest public toilet is? Yes / No***
This question helps the researcher to identify if people know where public toilets are in relation to the area where the survey is being conducted.
2. ***Do you ever use it? Yes/ No***
This question identifies if the respondent use the local public toilet.
3. ***What kind of condition is it in?***
For this question the research gives four possible responses. These are: Good, Adequate, Bad, Don't know.
4. ***Do you prefer to use private facilities (café, pub etc.)? Yes / No.***
This question helps to identify the type of facility people prefer.

5. ***Do you come to this area in the evening?*** Yes / No.
This question establishes the proportion of respondents that may need to use the facility outside normal working hours.
6. ***Do you think there is adequate toilet provision in the evening?*** Yes / No
This question then establishes the actual need.
7. ***Do you think this area has a problem with street urination?*** Yes / No
This question assesses whether inadequate toilet provision at night results in street fouling.
8. ***Would you use an automatic public convenience (superloo)?*** Yes / No
As many of the areas we look at only offered automatic public conveniences (APCs) this question establishes respondents' attitudes to such facilities.
9. ***Do you think there should be more on-street public toilets?*** Yes / No
This question gauges people's views about the adequacy of current provisions.
10. ***Would you be willing to pay for well maintained facilities?*** Yes / No
Finally we ask about people's attitudes to paying to use a public toilet. A supplementary question could be included about how much people would pay.

To capture any information people may have wanted to express that was not covered in the survey we add a final open question.

11 Is there anything you would like to add?

See Hanson, J., Bichard, J-A., and Greed, C. (2007) *The Accessible Toilet Resource*. UCL, London

User interview results

5.2 - 4

Ileostomy / Colostomy

Persona - Terry

VivaCity2020

Terry is 55 and has taken early retirement on grounds of ill health. He likes to visit the city centre for shopping and special events at galleries. Yet he has difficulty being away from home for any length of time due to the lack of toilet facilities that cater to his need

Terry has short bowel syndrome caused by the removal of his small intestine during surgery, and now he has to wear a ileostomy pouch. His ileostomy pouch can fill up very rapidly which means he sometimes requires toilet facilities urgently.

To empty his ileostomy pouch Terry has to kneel on one knee in front of the WC pan. He also needs access to a wash basin in order to wet some tissue that he uses to clean the opening of his ileostomy pouch after emptying it. Being able to access tissue for cleaning and drying his pouch is extremely important to him, as is having a clean dry floor to kneel on.

When out in the city centre, Terry relies on the toilets located in department stores, as there are no longer any local authority operated public toilets open. Although he finds the department store toilets to be immaculate, he also tires of having to rely on them and sometimes feels 'chained' to one area of the city.

Terry feels there is quite a variety of standards in design and management of away from home toilets, which he finds frustrating. His local shopping centre has toilets that are located on an upper floor and are difficult to reach in a hurry.

In addition, the toilets at the local bus station often have wet floors and poor standards of hygiene. A clean toileting area is extremely important for Terry as if his stoma is not cleaned adequately he can develop health problems.

Terry sometimes limits the amount of time he is away from home, to avoid having to empty or change his pouch in public facilities, especially as he often finds even the 'disabled' toilet does not adequately cater for his specific needs. Terry requires a clean shelf to set out his ostomy supplies, as well as access to hot water. All too often he finds that only cold water is available. Terry also requires the appropriate bin to dispose of his pouches. He often finds that such a bin is not provided in toilets and then he has no resort but to leave his soiled pouch in a disposal bag on the floor. Terry also requires a full length mirror so that he can check that his clothing is appropriately adjusted after changing or emptying his pouch.

Terry has a RADAR key but often finds even locked toilets are poorly maintained. Terry has also experienced problems if baby change facilities are included in the accessible toilet, as he has been challenged by mothers for using the facility. This is because Terry's disability is invisible and hidden under his clothing. Terry has found these situations extremely distressing and now tries to avoid accessible toilets that include baby changing fixtures.

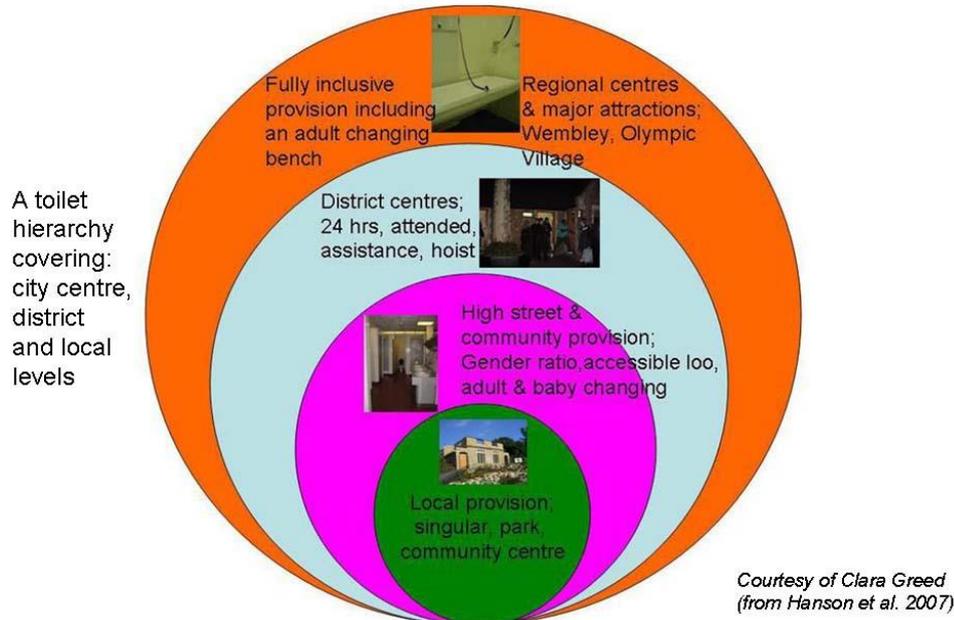
Courtesy of Clara Greed from Hanson et al. 2007

Most urban areas comprise people from several cultural backgrounds, both national and international. Longer interviews with various potential users of public toilets will enhance the understanding of the benefits and shortcomings of public toilets, as will in-depth discussions with focus groups comprised of particular categories of toilet users, such as the elderly, ethnic minorities and mothers with small children. The responses will help planners and other decision-makers to cater for groups with special needs when locating and designing public toilet blocks.

Interviews and focus-group discussions, where the group is challenged to discuss contentious issues, can be combined with various participatory methods such as mapping and problem identification exercises. A useful guide for interviews on sanitation issues is the handbook *Actions Speak* ([Boot and Cairncross, 1993](#)).

Location of toilet blocks and urinals

5.2- 5



Ideally, a survey should be conducted to indicate the movement patterns and volumes of people in the area and the characteristics of likely users in terms of age, gender and disability. Very often, however, the location is determined according to where there happens to be an available empty building plot. We will never be able to put toilets everywhere – only cars seem to be allocated unlimited space, which is why they dominate our cities!

Research highlights the importance of looking not just at individual toilet blocks in isolation, but at the wider geographical context of toilet provision to seek optimal locations and distribution within the city as a whole (Greed, 2003; Hanson et al, 2007; BTA, 2005). A hierarchy involving city-wide provision (macro level), local district and neighbourhood facilities (meso level) and the requirements for individual toilet block design and buildings (micro level) is shown in the picture above.

In the face of numerous challenges to adequate public toilet provision, including vandalism, disrepair and closure, a new approach has been tried in the UK and elsewhere called the Community Toilet Scheme. The municipality pays an annual fee (at present some 600 pounds per annum in the UK) to pubs, cafés, restaurants, fast-food places etc. if they open their off-street toilets to the public. This approach eases the problem, but there are many groups that may be left out – some religious people cannot visit places where alcohol or non-halal food is served and underage children are not admitted to pubs.

There is still a great need for traditional public toilets. In Western European countries with no strong tradition of public toilets provided by the government – for example, Belgium and Spain – there is already a greater acceptance of the general public being allowed to use toilets in shops, cafes, bars and restaurants without buying anything. In France and Italy, however, owners increasingly seek to restrict use to customers as tourist numbers grow.

A temporary improvement can be to place portable toilet units or urinals in strategic places. Proper planning is needed to find long-term solutions. In the long run it is usually better to invest in permanent toilet facilities that can meet the daytime needs of commuters, workers and shoppers as well as the night-time needs of drinkers and visitors.

The first step in developing a public toilet strategy is for the local authority to survey the existing public toilet provision. For example, existing, well-used toilet blocks should be identified and those that are under-used or in disrepair should also be noted with a view to reviewing their future. In addition, the survey should identify alleyways and secluded locations where there is strong evidence of street urination and therefore an unmet need – these are known to some as ‘wet spots’.

It will be possible to identify optimal locations for new toilet blocks by using the results of these mapping activities and the following additional research:

- Observe and count levels of usage, footfall, levels and volume of demand.
- Conduct social surveys to find out who needs toilets in particular locations. Look at the gender, age, and disability characteristics of users, or would-be users.
- Investigate when the toilets are most frequently used in terms of day, evening, rush hours, night-time usage.
- Investigate the surrounding area, in terms of land use, ‘attraction’ factors such as tourist features, shops, railway stations, and other centres of human activity that are likely to increase the ‘footfall’.
- Distribute a questionnaire to local community groups and to other relevant organisations. These might include public transport users, tourism groups, women’s organisations, retail business organisations, disabled and elderly organisations, as well as police and crime-concern groups.
- Analyse findings, weighing different factors in terms of demand, characteristics of user groups, local patterns of activity and rush-hours etc. Work out the optimal location, opening hours, and use of resources, recognising that resources are generally limited in terms of finance, plot availability and ongoing management and maintenance costs.
- In association with the local city planning department, highways and transportation departments and other relevant agencies, take all these factors into account to produce a plan for city-wide toilet provision. You can then use this in considering district and local demands, including actual design requirements of individual toilet blocks.

References for calculating the minimum public toilet room fixtures:

- *Global Guideline for practical public toilet design* at the World Toilet Organization website
- Greed, C., (2003) *Inclusive Urban Design: Public toilets*, Architectural Press
- Hanson, J., Bichard, J., and Greed, C., (2007) *The Accessible Toilet Resource Manual*, University College of London
- The British Standards 6465 ‘*Sanitary Installations*’ that give government standards on toilet provision, gender ratio, design and details.

Signage ~ how to find the place

5.2 - 6



Photos courtesy of Clara Greed

Map
showing
public
toilets



People who are new to a city need to be able to easily find the public toilets. Some people may find it awkward to ask for the way to a public toilet. Others (mainly young men) may choose to pee in the open instead of asking. Some examples of how to guide users are given below.

Signs can depict commonly recognised female and male figures. The distinction between male and female toilets is not always obvious, and in some places, one really has to look twice in order to know which door to choose! Simplification can also go too far if artists are involved. Signs are culture-specific and the pictures (bottom right and slide 1) may be amusing to some but offensive to others!

Moreover, signs may be drowned in all the commercial ads that are on display in our cities. Separate signposts for important places seem to overcome this problem (left picture).

One may wonder why, in many communities, the public toilet issue is so poorly addressed by planners, other professionals and councils. Do planners assume that potential toilet users are shopping, eating out or drinking and that shops, restaurants, pubs and cinemas are therefore more appropriate providers of toilets? This is not always the case and planners should actively promote the allocation of space for toilet blocks, and make sure that town plans contain sufficient provision for public toilets. Decision-makers may underestimate the political gains of being champions of the public toilet issue. There is no taboo against addressing this need that we all have from time to time.

Some towns have taken the task seriously and issued maps of existing public toilets and urinals (top right). This is likely to happen only in towns with good-quality toilets. A map is helpful for tourists and other visitors, so why not show the public toilets in tourist brochures and maps? In some countries nowadays public toilet information is available by mobile phone, satellite navigator and the internet. For example the whole of Australia is now covered by downloadable toilet maps, and the centre of London is covered by 'sat lav' which enables tourists to find the nearest toilet on their mobile phone.

Access to the toilet and urinal

5.2 - 7

New urinal stands behind a toilet block. The urinal is being used for defecation during night hours when the main toilet block is closed



J-O Drangert, Linköping university, Sweden



A toilet with accessories for many user groups

Courtesy of Clara Greed from Hanson et al. 2007

Once the overall toilet plan has been worked out, attention needs to be given to the specific design and operation of the individual toilet block. Before people can use a toilet they need to be able to gain access. Access relates to availability, opening hours and physical accessibility in respect of different toilet user groups (children, babies, teenagers, adults, elderly, disabled and so forth).

Availability is partially a question of resources, since a community can hardly afford to have a public toilet on every corner. It is also a question of what groups are being served by the available toilets. Long queues outside female toilets are too common to be acceptable. Research has shown that women, on average, take approximately twice as long as men to urinate, because of biological differences and clothing, and because at any one time around a quarter of all women of child-bearing age will be menstruating. Therefore, truly 'equal' provision will require a higher level of provision for women. In Japan, there are commonly twice as many public toilet facilities for women as there are for men. However, this must be adjusted to what proportion of men and women are present in the area served by a particular toilet block. Women comprise over 70% of toilet users in shopping centres and in social community settings, while men comprise over 80% of users in some sports, drinking, and leisure locations.

It is important to provide a range of toilet types within the block, to accommodate all types of people and to provide flexibility for changing demands. At least one disabled toilet should be provided wherever public toilets are installed. Baby-changing facilities may be provided within the women's and men's toilet block or provided as a separate facility between the two. If more than two urinals and washbasins are installed, one of them could be installed at a lower level to accommodate use by children and short people. Lack of provision of water inside the cubicles or beside the urinals for personal cleansing after using the toilet reduces access for some religious groups.

All users need to be able to get into the cubicle, turn around, and be able to sit on the seat, without their path being blocked by narrow doors, large toilet roll holders and sanitary disposal bins over-hanging the toilet seat. Many countries have inward opening doors in public toilets, and this immediately reduces the amount of space within the cubicle. In some cases the space between the edge of the door and the front of the toilet pan is so narrow that it is impossible to get in and sit down! Pregnant women have particular problems with getting into small cubicles and often seek to use the disabled toilet instead.

Some other people are not disabled but are too large to fit into or use a regular toilet cubicle. The growing proportion of citizens who are obese constitutes a new challenge for existing public toilets, but not for new ones since they can be built bigger. There is no excuse if members of the next generation find the door too narrow to enter or the cubicle too small for them to turn around! Poor design may also prevent people in wheelchairs from entering the toilet room, and the same goes for prams, and when you have shopping bags and other items that you cannot leave unattended outside the toilet or cubicle. Design rules need to be changed sooner rather than later to meet these needs adequately (as in the right picture).

Potential users may also be effectively deterred by untidiness, as shown in the left picture. This new urinal block is being used for defecation in the night, when the public toilet block is closed. Therefore it is important to provide at least one cubicle and urinal for night-time use when the rest of the toilet block is locked. In some localities there are no public toilets for women at all, or the facilities are so dirty and in such a state of disrepair that women decide to 'hang on' and not use them. Some women suppress the need to urinate for the whole day until they can use the toilet at home. This has health implications in terms of bladder strain and pelvic injury. Some women, especially the elderly, will not venture out at all without working out where the available toilets are likely to be found. They may decide not to travel out of their local area for fear of not being able to find a toilet.

Whilst these problems for women remain invisible and unheeded, male street urination is an obvious problem that local authorities have to deal with. In the evenings, porches and walls become urinals, and men do not seem to know that urine belongs to the soil, not to cement or stones! It would smell far less if men decided to pee on the soil under trees or bushes. Men have something to learn from dogs! In heavily built up areas, however, there may be no alternative, and the problem remains of the anti-social nature of urinating in public.

The toilet provider needs to weigh social, economic and design considerations when deciding what is the best option for a particular location. An existing substandard public toilet should not be closed down because it does not conform to modern access and design requirements, *unless* an alternative is made available. '*A second rate toilet is better than no toilet at all*'!

External appearance of the toilet or urinal

5.2 - 8



Excellent access to unisex street toilets in Waikato, New Zealand.

Courtesy of Clara Greed from Hanson et al. 2007



A block of urine-diverting toilets

Photo courtesy of Subburaman, Scope, India

The appearance of the toilet unit or urinal should be attractive to potential users. Architectural design could make the public toilet an interesting place. There is no limit to the aesthetic appeal of toilet blocks except conventional thinking. Why not become the town known to have the most fantastic public toilet blocks in the world? Toilet installations could be famous as public art and renowned architecture! Soft music could add value to the visitor's experience. They can be combined with coffee kiosks (as in the Netherlands, for example the Groningen market square); with small shops selling souvenirs (such as in Beijing's Tiananmen Square); with tourist information centres (as in Arizona, USA) or with local park facilities.

Toilet blocks should be open to light, clearly visible, with good circulation space around them to create a safe environment for users. Hiding public toilets down dark alleyways or behind bushes is asking for trouble! Some toilet providers plant low prickly bushes around toilets to prevent graffiti and vandalism. Trees can be also included, provided the branches do not overhang the toilet building, enabling vandals to climb on the roof. The two pictures above show good examples of an inviting, tidy entrance with clean floor and fair security. Some people do not like being seen entering a toilet, but this can be remedied more by public education than by design.

Payment or not?

5.2 - 9



Sulabh pay toilet with bath

A sign board about fees



Public pay toilet in Moscow with attendant. Urine diversion

J-O Drangert, Linköping University, Sweden

Toilets cost money. If the toilet block is kept clean and well maintained, users will appreciate it and be prepared to pay for the service, but the opposite is true if the unit is dirty and untidy. A public toilet is a service to the public. It is not an issue of human rights, but of human dignity. Thus, the quality of service is important.

An affordable direct or indirect fee for users requires that the costs for buildings, fixtures and staff are kept as low as possible while ensuring proper operation. We pay the cost for nice toilets in shopping centres as part of the bill when we purchase goods or services. We pay for access to off-street public toilets through local taxes. The council may pay for access to toilets in pubs, cafes, restaurants, fast-food places etc. through an annual fee (600 pounds per annum in the UK) to private operators if they make them available to the public. The famous Sulabh toilet complexes all over India charge 1 or 2 rupees to use the toilet. The income is used for upkeep of the block and to pay attendant salaries. In Durban, South Africa, slum dwellers pay a small monthly fee to support the janitor who takes care of their community toilet block. Overall, willingness to pay varies with the acuteness of the need. In many public toilets in Stockholm the franchiser charges US\$1.50 even if you only want to pee. With such an exorbitant fee the needy user thinks twice – if there is time for it – before entering the facility. It is more economical to go to a café and have a cup of coffee for almost the same price – and gain access to a decent toilet.

Charging people for using the toilet is often seen as a means of deterring anti-social users, but at the same time payment barriers can reduce accessibility to bona fide users and cause particular problems for children, the poor, and the elderly. Controlled entrance by turnstiles causes major problems for people carrying luggage, pregnant women, larger people and anyone (especially foreign tourists) who has not got the right change (coins) to open the turnstile. Once money is involved the challenge of accountability for fee collection comes to the fore. We discuss this more in connection with the next slide.

Management inside the toilet block

5.2 - 10



Courtesy of F. Garduño, Sarat, Mexico

Cleaning
of toilets



Dutch toilet with slogan

J-O Drangert, Linköping university, Sweden

Designing and building a public toilet block is only half the battle the other half is to manage, clean, repair and maintain it over many years. The municipality has the mandate to identify the need and decide on who is to provide or build the physical structure and how to manage and operate it. The block may be managed by an individual or a franchisee or municipal staff. Management issues are less of a problem when dealing with customer toilets in restaurants and pubs, since there is someone taking care of cleaning and surveillance for the whole building. In conventional public toilets, an attendant often does the same job, but nowadays many facilities are unsupervised with no staff on the premises.

A municipality may avoid a number of challenges by contracting the operation of an off-street toilet block to the highest bidder. A contract between the municipality and a franchisee may run for three years, during which the municipal can make inspections to check if the contract is being honoured. It becomes the contractor's problem to ensure entrance fee collection. He or she may solve the problem by making it a family business or by installing a complicated entrance gate to count the number of visitors. A franchisee is in a better position than municipal staff to judge whether a customer should pay or not. He or she can negotiate with poor customers, drunkards and potential vandals on the conditions for using the toilet.

Public toilets do not need to be stand-alone single-function buildings hidden away from public view. The operator is working in a competitive market and better service means higher incomes – but also higher costs. Usually, the toilet block is profitable since customers are prepared to pay. The operator may also offer related services such as showers and washing facilities, chairs and benches outside, a coffee shop, a public telephone, free condoms, a newspaper stand, and even a bank teller machine attached to the toilet block. They may sell toilet-related necessities, especially for women, such as cosmetics, soap, tampons and the like.

Such a multi-functional block blurs the preconceived ideas of what a toilet block is and may make it more attractive and cost-effective. Also, the attendant could gain prestige in the community.

Janitors, attendants and staff need recognition to carry out their work diligently. In Singapore, janitors are trained in some maintenance procedures and duly certified (www.worldtoilet.org). In South Africa, franchisees are trained in providing information to the users (www.toiletsshop.co.za.)

Management includes ensuring all components are kept clean at all times (top and bottom left). In some countries, records are kept concerning cleaning intervals, disinfection and maintenance and are available for inspection by supervisory staff. The dignity of attendants can be raised by building attractive and easy-to-clean toilet blocks. This has been proven for cleaners of toilets in shopping centres and well-known restaurants. Again, it is a management issue whether toilet cleaning and maintenance are given a high priority or not. The fact that a few users misbehave is no argument to let the toilet remain in a poor state to the disadvantage of well-behaved users.

Good public toilet management involves good maintenance and cleaning regimes, but also involves informing users about proper public toilet use. This could be built in with a printed flyer in the porcelain urinal that encourages men to pee on it. In this spirit are signs with a text that catches the interest of the visitor: “Use me well and keep me clean, I shall never tell what I’ve seen” (right) or “Please leave this toilet as you would expect to find it”. Another example is shown on picture on page 3. Public education through schools, television, and newspaper campaigns could raise the percentage of those who wash their hands after using the toilet above the present 30%. Many people do not flush, perhaps because the nob is dirty. A solution could be to have a flush operated by pushing the nob with the foot. A few people see public toilets as uncontrolled spaces which they vandalise. Therefore, we need to foster a new culture of care about what is happening while we are in the toilet block.

Some toilet providers tend to favour automatic toilet cleaning systems and high-tech solutions because they cut down on the costs of paying toilet cleaners, attendants and security staff. But this may be a false economy in the long run. The existing single unit public toilets that automatically clean themselves mechanically are hardly the answer to the management challenge for two reasons. They are very expensive and they require a constant and high-pressure supply of water. Moreover, many people are scared to use them, and wonder what would happen if the washing starts too early or if the door opened unexpectedly!

Five such toilets were installed in a borough in London at an annual running cost of 85 000 pounds, and it turned out that each visit to the toilet cost the municipality 8 pounds or US\$12! Experience shows that it is often cost effective to hire an attendant, since vandalism is kept down and the number of visitors is higher when the place is kept clean and feels secure. Research has shown that attendants can reduce vandalism and anti-social behaviour by 60% ([Greed and Daniels, 2002](#)). Indeed high-tech solutions, especially automatic ones, frequently break down and then the whole unit is out of order and inaccessible. With traditional toilets, one malfunction does not shut down the whole facility and usually it is still possible to use the toilet until the plumber arrives.

Security and privacy

5.2 - 11

Ultra-blue light to prevent syringe injection

*Courtesy of Clara Greed
(from Hanson et al. 2007)*



Less privacy may reduce vandalism & improve safety



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A public toilet has to provide personal security and reduce the risk of psychological and physical attack. When it comes to physical security, the responsibility falls squarely on the operator. He or she provides the lighting, not only illuminated entrances and exits, but also walkways, paths, parking spaces and other areas where the public may require access to the toilets. Lighting should be sufficient to avoid trips or falls, to enable people to see what they are doing, and to discourage vandalism and the creation of areas for hiding. Walls, partitions and decorations of trees and plants should be selected so as to prevent the creation of areas of concealment. Prickly bushes planted alongside the outer walls can deter vandals and graffitiists, and provided they are low they will not restrict visibility.

As for cubicle design, people like to know they can shut the door properly and feel secure, but at the same time they do not want to feel they will not be able to open the bolt from the inside. Therefore good design of locks, bolts, levers and handles is very important. On locking the door an indicator should change from 'green' to 'red' which is the internationally accepted sign to show if the cubicle is 'vacant' or 'engaged'.

The gap under the door should not be so large that people can see what is going on inside, but a small gap is acceptable for cleaning purposes. Simple louvers (bottom right) allow daylight and air to pass through the cubicle. The user can see out to some extent but outsiders cannot see inside unless they lie on the floor or street. Such louvers can be made of metal, wood or cement.

The presence of a vigilant attendant contributes a lot to how safe users feel and reduces the opportunity for vandalism and antisocial behaviour. However many people have difficulty urinating if the toilet attendant is too near or if the attendant is of the opposite sex. Some men suffer from paruresis (piss-shyness) and prefer to use an enclosed cubicle where no-one is watching them, whereas many women are happy to have a woman attendant in the toilet block as she can also keep an eye on children or push chairs whilst the mother is using the toilet.

Cubicles, urinals and mirrors should be sited away from the line of sight of people especially if there is a separate waiting area. It should not be possible to look directly into the toilet, or at the urinals when passing the door, and so the door needs to be located in a position that prevents this or a screening wall may need to be installed. It is particularly important to keep facilities for women and men separate in public, on-street locations where users are complete strangers.

There are different requirements for men and women. In many societies men are “allowed” to be seen in a peeing posture (left picture) or squatting behind a long robe. This would not be possible for women. Ideally all toilets should provide secure levels of internal privacy and separation between facilities for women and men. Social, cultural and religious factors, including modesty need to be taken into account. For example, in tropical locations, in order to increase ventilation it used to be commonplace to leave a space at ground level around the toilet so the outer wall did not reach the ground. However this deterred many women from squatting down and using the toilets as they feared they would be seen by men passing by outside. This problem could easily be solved with louvers. It is also not advisable, particularly in traditional societies, to locate the women’s toilet directly next to the men’s or to have a situation in which women have to go past the entrance to the men’s toilets to reach their own toilets. The reasons are women’s concerns about personal safety, about having their path blocked, and about being accused of mixing with males who are not family members.

A special challenge may relate to drug taking and sex in public toilets, activities which have a strong impact on normal users. Visibility and exposure may counter such behaviours and make them less likely to occur – for example in the urinals shown in the left picture and in busy shopping centres. Some toilets have ultra-blue lights, which make it impossible to find the veins for injecting drugs (top right). However, blue light also creates reduced visibility for common users checking on hygiene and safety conditions in the toilet. This is particularly problematic for those checking for blood and other discharges in the urine. Such lighting solutions are not recommended, and drug addicts have found that if they mark their veins with highlighter pens they can still see them under ultraviolet light. Ultraviolet lighting also reduces the sense of personal safety which is so important within the toilet.

Cleanliness

5.2 - 12



A brightly lit, easy to clean toilet in which all cracks are sealed to prevent stagnant urine and water

Courtesy of Clara Greed from Hanson et al. 2007



Water "tap" for washing hands using 0.1 litre per hand wash

J-O Drangert, Linköping university, Sweden

Talking about cleanliness, people are put off by what they see. We find it disgusting if there are faecal stains left in the toilet bowl, or if the previous user did not flush. Urine left on the sitting ring or on the floor is quite disturbing, and even a clean piece of tissue paper left on the floor can be a problem. The ideal, therefore, is an attendant who checks such things between each use! But worse still are the invisible germs: the pathogens and bacteria that lurk in dirty toilets.

In many public toilets hygiene standards are far below acceptable safety levels, and therefore users often take special precautions. They use a piece of toilet paper to open the door to the cubicle, avoid sitting on the toilet seat or cover it with toilet paper, and also use paper to turn the water tap on and off. Users may bring their own toilet paper, because there is likely to be none available or it is stacked in a dirty container that only dispenses one sheet at a time. This is particularly important for women, as many 'blot' their most intimate parts after urination whereas men generally only use toilet paper after defecation. To dry their hands, toilet users may simply shake them in the open air, wipe them on their clothing or put them in their pockets. This is because the towel provided is too dirty, the paper towels have run out, or the electric hand-dryer does not work. Many public toilets lack paper or hand drying towels so people carry 'wet wipes' and nowadays also anti-bacterial cleansing gel with them.

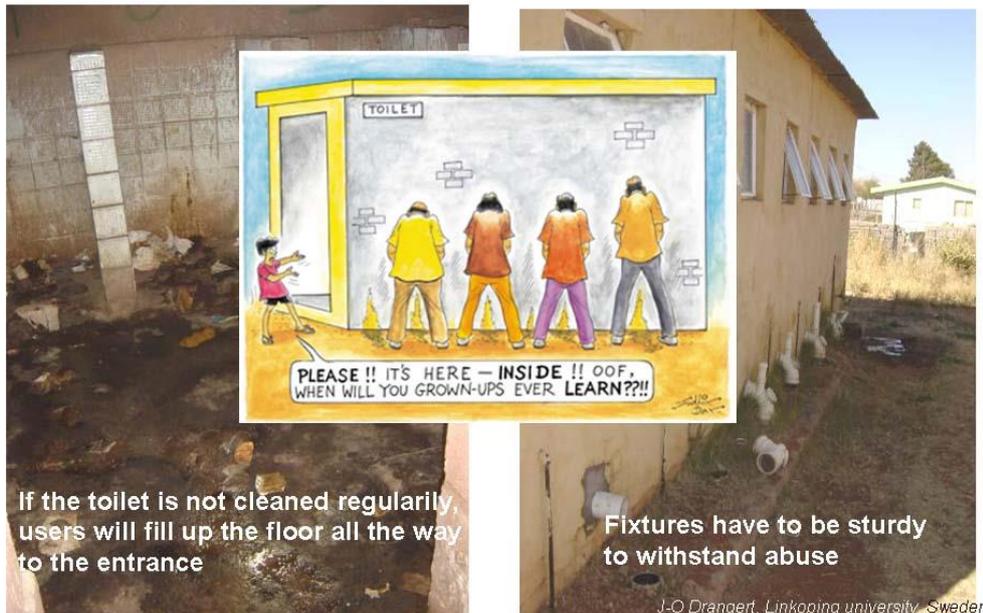
Hand washing is probably the most important health-preserving measure, yet only about 30% of people wash their hands after using the toilet. Washing is made more hygienic with self-closing delayed taps or touchless electronically controlled taps. The same benefit could be achieved with the simple device shown in the picture to the right. The lower section of the container handle has been plugged and a small hole pierced just above the plug. When the container is tilted forward (with a push of the user's foot or hand) water enters the handle and when the user releases the container it moves back to its equilibrium position. Water pours out slowly from the hole in the handle until the handle is empty. The next user tilts the container and water enters the handle again. The container has to be filled with water regularly, but so little water is used for each hand wash that the container will last for 50–100 washes! Our perception of how much water is needed is often exaggerated. A striking example comes from Niger, where the widespread river blindness disease can be prevented by washing the eyes several times a day. When asked how much water one wash takes, affected villagers responded "at least one litre and we cannot afford that". Practical trials showed that they needed only 0.1 litres. This surprised them and they became convinced that they actually had enough water to wash their eyes frequently!

Toilets should be designed from the outset to facilitate the easy cleaning and maintenance of fixtures and fittings. Architects should consult with cleaning experts as to whether their design is easy to clean. There should always be a slight gradient of floors towards a central drain to prevent puddles of stagnant water. There should be no ‘gaps’ or cavities between pipes and the floor, to prevent standing urine or water and dirt. This will also reduce bad odours in the toilet block. Smooth and hardy surfaces on fixtures and floors make cleaning easy, but floors should not be too smooth or people may slip. Ideally, public toilets should match the standard that is common in toilets in shopping centres. These are often spacious and well lit, and are visited by a constant flow of customers, which in itself improves user behaviour. The facility is usually tiled and attended between each use. Whilst white or lightly coloured tiles give an airy feel to the building, they are more likely to be subject to graffiti than textured tiles in darker colours, but these, on the other hand are harder to clean. For people with visual impairment coloured tiles that help differentiate the walls from the door are helpful. There are good and bad results for every toilet design decision!

There is anecdotal evidence that men do not perform as well as women when it comes to ‘leaving the toilet as clean as when you entered’. In particular they may spray the seat, or leave the seat up after using the toilet. This indicates that there are too few urinals in relation to toilets, and that the toilet in the cubicle is being used as a urinal. Drunken men complicate cleanliness of public toilets and urinals by being sick and peeing all over the floor.

Fixtures in the cubicle and urinal – and vandalism

5.2 - 13



If the toilet is not cleaned regularly, users will fill up the floor all the way to the entrance

Fixtures have to be sturdy to withstand abuse

J-O Drangert, Linköping university, Sweden

It is generally true that the cleaner a toilet is, the more careful the users are likely to be. In contrast, if the toilet cubicle is dirty there is great risk of misuse and vandalism. Again, the role of an attendant becomes crucial. If flush toilets are installed, there must be a constant supply of pressurised water, otherwise misuse is invited as seen in the pictures. The problem of dirty toilet seats may be solved by using squatting-type toilets. In fact, squat toilets are the most ergonomically effective and also the least likely to be vandalised, and they can be used by both men and women, who can choose to stand, hover or squat over them as they wish. Unfortunately they are not popular because they are seen as old-fashioned and backward. For example they are being phased out in France where 'Turkish toilets' used to be widespread. In developing countries, upright toilet bowls are seen as a sign of modernity. Still, many toilet blocks in the world contain both options, for example, in Japan modern high-tech toilet blocks are likely to include a predominance of squat toilets.

Space is needed for manoeuvring, turning, removing and replacing clothing, and for hanging bags, brief cases or baggage. Hooks, shelves or other such devices should be provided. Also, a can with a lid to dispose sanitary pads saves the users from throwing them in the toilet. A trash bin in the cubicle makes most users throw trash there instead of in the toilet or on the floor. In this way potential blockages are avoided. But care should be taken to ensure that disposal bins in cubicles are kept clear of the toilet itself, so that women in particular can sit on the toilet seat without rubbing against the bin, as is the case where sanitary waste bins are squeezed in between the wall and the toilet pan in women's toilets.

Vandalism in public toilets is widespread (pictures). The local authority usually responds by closing down the facilities altogether. A better alternative would be to have better surveillance and a toilet attendant. Also, all installations in the cubicle and urinal room have to be able to withstand misuse and vandalism, and therefore all fixtures, accessories, and surfaces should be constructed of durable materials resistant to heavy usage, excessive weight, and possible abuse such as spray painting. Estimates suggest that the initial construction cost is only 40% of the financial cost of providing a toilet over a 10 year period. Therefore, the extra expense of providing good fixtures will reduce the maintenance costs, and be cost-effective.

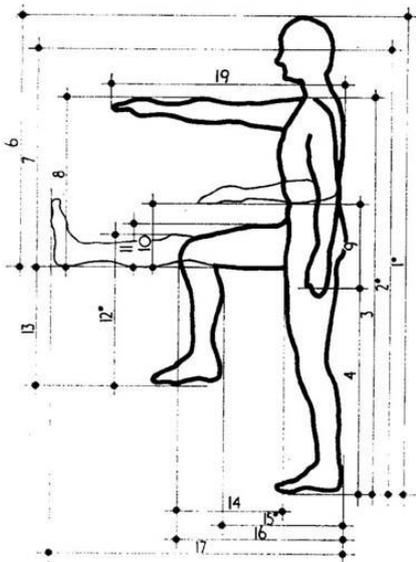
Careful thought should be given to the use of materials, as porcelain is the most likely to break and be vandalised, whereas aluminium, steel and other metals are more durable, and modern hardened plastic and polyurethane materials are lighter, cheaper and easier to install. Toilet bowl breakages often occur in countries where people have been accustomed to squat, so they squat on the toilet seat, causing the toilet pan to crack and collapse unless it is very sturdily built. Therefore, local habits and cultural traditions must always be taken into account when choosing fixtures.

One of the most important features is ventilation. Natural ventilation occurs through windows, doors, louvres or other openings to the outdoors. The risk of causing bad odours in the vicinity is present, and a vent pipe can send gases higher into the air where they are diffused before reaching anyone's nose. A vent pipe should reach at least two metres above the highest point of the roof(s). Winds and large differences in temperature between the indoors and outdoors improve the effectiveness of the vent pipe. If the temperature is low during the night or part of the year, the outside part of the vent pipe should be insulated (see slide 2.7-6).

If the cubicles are mechanically ventilated (using an electric fan), the rule of thumb is that air should be exchanged 15 times per hour, which means that one user per four minutes will be taken care of. But a conventional water-flush toilets do not prevent the smell from dropping faeces and released gases, and the odour will stay on for four minutes, even when the toilet cubicle is well ventilated. A dry toilet, on the other hand, is constructed so that a downward draft into the collection chamber will prevent the smell from spreading in the cubicle! (See slide 2.7-5).

Unisex and baby-friendly facilities

5.2 - 14



Women and men have quite different dimensions and 'reach' in terms of length of arms and legs (Goldsmith, 2000)



Baby friendly unit

*Courtesy of Clara Greed
from Hanson et al. 2007*

People are shaped differently and their different requirements need to be considered in the design of toilets and urinals. In private modern homes, this is taken care of by having rather large toilet rooms which cater for most human sizes. The same should apply to public toilets. With an aging population and obesity increasing worldwide, we anticipate a trend towards larger cubicles for all. But it is a fact that most cubicles built in poor areas are very small. If public toilets are to become popular they have to have rather spacious cubicles making the visit comfortable.

Women are likely to be accompanied by babies and small children and they may have to bring in pushchairs and baby-changing bags when they go into public toilets. Ideally, disabled provisions should not be mixed with baby-changing facilities, and they should be separated out particularly in areas of heavy demand to avoid conflict and resentment between disabled users and young parents with babies. With rising expectations that men take more responsibility for children they will also require more space. In fact, new Swedish public toilets often have space for changing nappies in the male section as well as the female section.

Unisex toilets are often suggested as a means of reducing queues and creating greater flexibility. However, they do not increase overall capacity and if they reduce the queues, this could be because women are reluctant to use them. Unisex facilities can be unattractive to women because men are more likely to 'spray the seat' and have less hygienic toilet manners.

In some communities, people may feel awkward and out of place when they have entered the wrong toilet section. In other communities, sharing toilets with complete strangers of the opposite sex may result in the loss of a woman's 'reputation' and have serious religious and moral implications. In locations where demand is heavy, unisex toilets are unlikely to reduce queuing and may lead to more frustration, particularly from men who are not used to queuing. They are simply not a practical solution for high-use locations. There are many sexual and social problems associated with situations where toilet cubicles and internal washing, drying and queuing space is shared by the sexes.

Another argument for introducing unisex public toilets is to keep the investment costs down. There is a trend towards toilets in workplaces becoming unisex, and this may eventually spread to general public toilets. Individual unisex toilet cubicles do have a place, for example in a local area where there is a low-level, but essential demand for toilet facilities (such as a workplace). But acceptance depends on how the toilets are designed. Because of privacy problems employees prefer to have self-contained separate compartments with integral washing facilities that open separately onto a corridor rather than a conventional set of toilets made 'unisex'. In particular, women feel very uneasy if there are gaps above and below the cubicle walls and doors, and they experience embarrassment about toilet noises and smells and shared washing facilities.

However, unisex toilets which also include disabled facilities and baby-changing provisions are popular and appropriate in small coffee shops and other 'off-street' locations in small businesses. In the case of toilets for disabled people it is important to have unisex facilities in between the Ladies and Gents sections so that, for example, an elderly man can go into the toilet with his disabled wife to help her on the toilet. In contrast Automatic Public Toilets are a less popular form of unisex toilet, and only meet a limited level of on-street public toilet demand. They should not be seen as a substitute for traditional male and female public toilets in areas of high demand for reasons explained earlier. Therefore it is always important to consider the likely type of users and their needs before deciding if a unisex solution is appropriate.

Urinals

5.2 - 15



There are urinals for both men and women. Many attempts have been made to develop a suitable urinal for females (top and bottom left). The top one is a squatting type where the user faces the wall and keeps her feet on the blue-tile foot rests. The urine runs down the slanting groove to a collection tank. The bottom one is used for urinating standing up. The difference between the sexes is that men can direct the urine manually, while women cannot. Women need to be able to either sit or squat in a manner in which they can relax in order to completely empty their bladders. Whether men sit or not seems to be guided by tradition as evidenced by Muslim men using the squatting position while urinating

‘Hovering’ over the toilet seat, or ‘flexing’ over a female urinal causes muscular tension, and indeed it is only a viable option for those who are fit and healthy. Additionally, women’s urinals have proved impractical in dealing with menstruation and also women need to decide whether they need the toilet for urination or defecation before choosing a urinal (which they are not accustomed to doing at present). Cultural traditions and biological facts make the design work more difficult.

It is well known that visitors to bars and pubs drink so much that they have a greater need to urinate in the evening and night hours. If no urinal is available they will probably relieve themselves indiscriminately. This is particularly the case with young men. As a result male street urinals have been introduced in many cities (top right and [5.2-11](#)), some of which retract back into the ground during the day time. There is rarely similar provision for women, and nowadays some young women will squat in alleyways out of desperation. This is still socially unacceptable, and it is dangerous in terms of personal safety and sexual harassment for them to urinate in public. Therefore a better solution is better provision for all.

In the daytime urinals are still the main kind of public toilet. They are not necessarily well-designed or environmentally sustainable. Two particular problems with water-flush urinals are the wastage of water and below zero temperatures. Previously, urinals with a constant flow of flushing water routinely used several cubic meters of water per day. Nowadays, urinals are fitted with devices to flush only after use. A general experience, though, is that they often leak. Even a small flow, slightly more than dropping, will waste hundreds of litres per day. The problem of

water freezing requires some kind of heating – adding to investment as well as running costs – or a waterless urinal.

A waterless urinal with a smooth surface (porcelain, steel, or good paint) and sufficient slope for the drainage pipe is odour-free (bottom right). These are the two reasons why the authorities in the water-stressed Karnataka State in India made waterless urinals mandatory in five-star hotels and office buildings in Bangalore. Vacuum urinals are also odourless since the urine is not mixed with water and the drainage pipe is closed after use. However, their operation is more demanding and therefore less appropriate in many situations.

Differently abled persons

5.2 - 16



Photo Courtesy of M. Subburaman, Scope, India

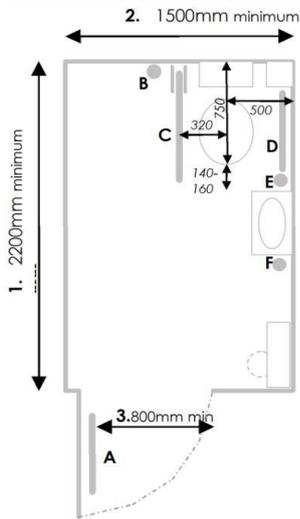
People are living longer, which increases the demand for facilities for disabled persons. There is also a greater emphasis on people with disabilities getting out and about, rather than being confined to care institutions or their homes. Society has moved from a medical view of disability, in which it is seen as the disabled individual's 'fault' that they cannot get around because of their disability, to an architectural view of disability in which it is seen as the fault of society that people cannot get around. Particular blame for the inaccessible nature of the built environment is put on the urban designers, town planners and architects. Therefore the emphasis nowadays in urban policy is upon creating accessible, equitable and comfortable cities and environments for everyone – and public toilets are seen as a key component in this process.

For quite some time, disabled persons have been catered for in town planning and toilet design. Now there is a trend to make provisions for less able persons, that is the dis-enabled (those who are restricted by limitations in the design of cities and buildings) both at the entrance and in the cubicle. The picture shows an affordable entrance with a ramp and railing facilitating access to the toilet. As we grow older the problem of sitting and rising increases, and the same goes for overweight persons. Some companies produce special gears such as handles, lifting devices and railing, to make it possible for disabled persons to perform inside the cubicle on their own ([see 5.2- 7](#)).

The VivaCity report, *The Accessible Toilet Resource Manual* ([Hanson et al, 2007](#)) contains useful information about technical standards and survey results ([see 5.2- 4](#)). The authors developed a toilet audit tool for technical standards for toilets (see below). Such a manual should be used when assessing drawings and designs of new toilets before they are built, in order to reduce mistakes.

The Accessible Toilet Resource Manual

Place: _____
Date: _____
Auditor name: _____



Dimensions:

- 1. **Depth** 2200mm min y/n? _____
- 2. **Width** 1500mm min y/n? _____
- 3. **Door** 800mm min y/n? _____
- 4. **Grab rail heights:**
 - A (horiz. Door) 680mm y/n? _____
 - B (vertical) 800mm y/n? _____
 - C (drop down) 680mm y/n? _____
 - D (horizontal) 680mm y/n? _____
 - E (vertical) 800mm y/n? _____
 - F (vertical) 800mm y/n? _____
- 5. **Grab rail lengths:**
 - A,B,D,E & F 600mm long y/n? _____
- 6. **WC pan height** (top of seat) 480mm y/n? _____
- 7. **Basin height:** 720 –740mm y/n? _____
- 8. **WC pan from side wall?** 500mm y/n? _____
- 9. **WC pan from back wall?** 750mm y/n? _____
- 10. **Drop down to WC pan?** 320mm y/n? _____
- 11. **WC pan - basin** 140-160mm y/n? _____
- 12. **Height of basin mirror** 1600mm min (to top) y/n? _____
- 13. **Height of wall mirror** 600mm – 1600mm y/n? _____

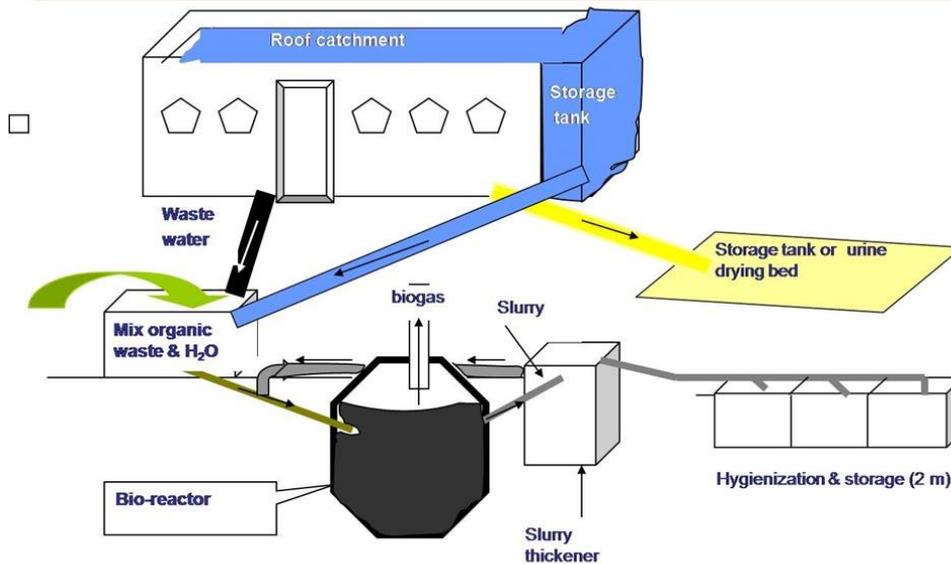
- 14. Suitable access route to WC? Y/N
- 15. Suitable signage to WC? Y/N
- 16. Is WC near to male and female WCs? Y/N
- 17. Doors on route easy to open? Y/N
- 18. WC door easy to open? Y/N
- 19. Outward opening door? Y/N
- 20. Lever type door lock? Y/N
- 21. Is there a colostomy shelf? Y/N
- 22. Is there a General use shelf? Y/N
- 23. Backrest/cistern to lean on? Y/N
- 24. Toilet paper single sheet dispenser? Y/N
- 25. Lever tap to basin? Y/N Automatic tap Y/N
- 26. Soap facilities within reach? Y/N
- 27. Paper towels within reach? Y/N
- 28. Grab rails appear grippable & sturdy? Y/N
- 29. Drop-down rail easy to use and sturdy Y/N
- 30. Alarm system? Y/N
 - Cord to floor? Y/N
 - Reset button within reach of WC? Y/N

Observations:

- 31. Flush lever on the transfer side? Y/N
- 32. Is the transfer space clear of obstructions? Y/N
- 33. Left or right hand transfer? L /R /neither
- 34. Is there a waste bin? Y/N
- 35. Is there a sanitary disposal bin? Y/N
- 36. Is there an incontinence pad disposal bin or nappy bin? Y/N
- 37. Is there a coat hook at suitable height? Y/N
- 38. If there is a sanitary dispenser, easy to use and at good height? Y/N
- 39. If there is a hot air dryer, is it at good height and useable? Y/N
- 40. Is there a standing height basin to supplement hand-rinse basin? Y/N
- 41. Have Baby changing facilities been included in the WC? Y/N
- 42. Lighting good? Y/N
- 43. Good contrast in internal decoration? Y/N
- 44. In your opinion, is this an accessible toilet? Y/N
- 45. **Further comments:**

Where does urine and faecal matter end up?

5.2 - 17



J-O Drangert, Linköping university, Sweden

Users rarely ask about where excreta end up – once defecation is done, they go back to other business. However, the toilet and urinal will not be sustainable unless the collected matter is disposed of in a safe and productive way. The amount of urine is huge, and faecal matter, if flushed away, is an even more voluminous discharge.

Instead of being utilised, excreta from toilets usually end up in overflowing septic tanks or in sewers which take it to a treatment plant. Designs need to view urine and faeces as resources rather than as waste. An NGO in Trichy in India (www.scope.org) has built public toilet blocks with dry urine-diverting toilets which use the urine as a fertiliser and the composted faeces as a soil conditioner. The Borda group (www.borda-sa.org) has done interesting work in Asia on a combination of biogas production and some treatment of the effluent, so that it can be safely disposed into drainage ditches or preferably agricultural fields. They also make use of all organic waste in the area to feed the biogas digester. We provide details about such toilet complexes in the biogas chapter (Chapter 5) and the greywater chapter (Chapter 4).

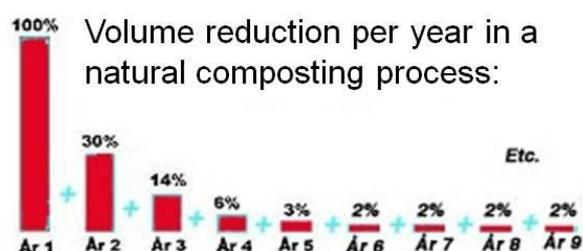
The picture above shows a self-sustained sanitation block where rainwater is collected for hand washing and ablution. If rainfall is low, well water may be a supplementary water source. The design of this toilet block allows for recirculation of valuable nutrients. Urine from the urine-diverting toilets and waterless urinals is collected and delivered as fertiliser to neighbouring farms. In this example wash water, ablution water and blackwater (if dry toilets are not being used) go into a biodigester together with organic waste. The treated slurry is also a good fertiliser (See Ch 5. on biogas). The toilet block is independent of piped water supply and sewerage, and can therefore be used in a variety of locations. It is self-contained, and requires minimal expenditure on infrastructure. Also, in some places there is a market for selling the urine.

To make toilet blocks more environmentally sustainable it is important to reduce electricity usage whilst balancing this with the provision of adequate lighting and ideally hot water for washing. Solar- and wind-powered electricity systems have been used in Australia and other countries.

The operation of such a toilet block requires trained staff, but we should not overstate this aspect since the technology is quite adaptable to changing conditions. Millions of Chinese farmers run such small biogas plants successfully.

Public toilets in remote locations

5.2 - 18



Courtesy of Compostera AB, Sweden

Public toilets in areas with no water supply or sewer connections represent a special case. No regular supervision is possible for toilets on walking trails, at roadside rest areas, and on small beaches (top-right). Such conditions require waterless toilets that seldom need to be emptied. These toilets have to be self-contained, odourless, and able to withstand some abuse.

The CompostEra company (www.compostera.se) has simplified the Clivus Multrum idea and developed a dry toilet with the following characteristics: the toilet room (top left) is tiled and easy to keep clean, the robust pedestal of wood with a plastic ring can resist some misuse, and the paper roll is difficult for visitors to take away.

Under the toilet room is a collection tank (bottom right). Prior to being used, the tank is half-filled with organic matter (filter bed) to facilitate vermi-composting of the faeces and paper. The urine drains off the faecal pile and into the starter/filter bed. As it very slowly seeps through the filterbed, urine is nitrified – that is, oxidised to nitrite (by *Nitrosomonas*) and nitrate (by *Nitrobacter*). These **salts** help kill the pathogens picked up from contact with faecal matter. The collected liquid ends up with a bacteria count defined as swimmable water. Within the first year, phosphorus and potassium have saturated the organic bed, and in the following years they remain in the liquid. Given that the pile receives some water from toilet cleaning and is moist, little nitrogen is lost as ammonia gas, while there is more loss from a dry faecal **pile??**. The liquid that accumulates is easy to empty. Odourless and virtually free of pathogens, it is a perfect fertiliser for gardens as it contains a broad spectrum of plant nutrients including micronutrients not found in chemical fertilisers.

The decomposition of the faeces and other organic material is slow but thorough – after six years the volume is only 2% of the original (bottom left). As new excreta are added, the total build-up is only 2–3% per year so it takes three to four decades for the tank to fill. Interestingly, medical residues (oestrogen, pharmaceuticals etc.) decompose during this prolonged 30–40 year storage/processing. By that time most of the accumulated material is mineralised. However, it also contains fresh waste so should be sanitised using a professional animal waste treatment process. Descriptions of *Nitrosomonas* and *Nitrobacter* can be found at <http://en.wikipedia.org/wiki/Nitrosomonas> and <http://en.wikipedia.org/wiki/Nitrobacter>

Summary of design and reuse options

5.2 - 19

| Output | Option 1 | Option 2 |
|-------------------------------------|---------------------------|----------|
| Water from hand washing | Soil bed | Sewer |
| Urine from urinal | Undiluted | Flushed |
| Faecal matter from diverting toilet | Mixed with ash or sawdust | Flushed |
| Excreta from toilet | Undiluted | Flushed |
| Ablution water | Soil bed | Sewer |

J-O Drangert, Linköping university

‘Nature’s call’ creates a demand for a physical toilet or urinal. Users’ perceptions and societal values create demand for cleanliness, security, privacy, and comfort. If such demands are not met, the responses range from indiscriminate urination and vandalism to bladder strain and confinement to the home area.

A range of actors can provide public toilets: the municipality, shopping malls, pubs, restaurants and contractors/franchisees. There are also collaborations where the parties divide the tasks between them in various ways.

The required investment can be provided by councils, banks, or user groups. Running costs and maintenance are dominated by salaries, electric bills, water bills, and repairs. In the end the users will foot these costs through fees, municipal taxes or slightly increased prices for consumer goods and restaurant bills.

The greatest challenge for public toilets is their management. The solution is to create a locally functioning system in which the facility owner, franchisee, and janitors/attendants perform the required services to the satisfaction of the users.

The trend towards aiming at ecological sustainability means that authorities want to minimise resource inputs and maximise the re-circulating of outputs from toilet blocks. The selection of a sustainable public toilet design starts with establishing whether the water supply is reliable and whether the owner has the capacity to take good care of the wastewater. If there is little water available, or if the supply is irregular, water should firstly be reserved for hand washing. The disposal of the used water is then not a problem, as it can be infiltrated in the soil or discharged to a sewer. Cultural practices should be taken into account, but experience also tells us that customs may change when people move to town or migrate to new countries or for other reasons. Culture is being challenged and often revised!

The table above focuses on outputs from any toilet block, and these can be combined in whatever way the designer chooses. For instance, in the operation of conventional public flush toilet excreta and tap water from the hand-washing basin are flushed away in a sewer and discharged somewhere (as shown by the **blue boxes** in the table). It is difficult to safely reuse this output since the volume is large, and therefore expensive to treat. Sludge from a treatment plant for mixed waste streams commonly contains toxic ingredients and is not readily available for farm land.

The inputs and outputs from urine-diverting toilets are shown by the **green boxes**. Tap water from the hand-washing basin is discharged into a soil bed. Urine is collected and brought to a farm and used as fertiliser. The faecal matter can be hygienised by simple storage (WHO, 2006) or collected and co-composted with other organic material, and eventually used as a soil conditioner.

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