

## LIGHTING FOR SANITATION FACILITIES

This Technical Brief looks at the planning and design options for lighting in and around toilets, both during the day and after dark

### THE NEED FOR LIGHTING IN AND AROUND TOILETS

Sanitation facilities are only effective if they are used and they will only be used if the experience of using them is acceptable. This means users must feel safe and be able to see what they are doing inside the toilet. Whilst lighting may initially be viewed as a costly extra, especially in addition to the cost of a basic superstructure, its benefits justify the investment. Planning lighting in advance helps ensure that it is both efficient, effective and contributes towards greater safety, especially for women and children.

Low-cost toilets can be dirty and potentially dangerous for a variety of reasons. The state of shared toilets is not known until the user goes inside and if visibility is poor, then that uncertainty increases. Being able to see in and around the toilet is a basic requirement for the user. Furthermore, improving the interior of a latrine can encourage better sanitary behaviour.

The ability to see when inside the superstructure is a basic need for both social and safety reasons. Although this issue requires a technical response, often this is not as essential seen by designers or builders. Construction happens during the day, so the situation after dark is not always obvious to those providing the facility. Lighting is mainly needed at night, however many toilets lack windows due to poor design and materials, time constraints, or concerns over privacy. Their design and construction should take both daytime and after dark lighting into consideration and check visibility over a 24-hour period.

### USER NEEDS

Many people fear the dark, especially children. However, being able to see when inside the toilet is important for several other reasons. Practical issues include the need to avoid slips and trips, to see the position of footrests, defecation holes and anal cleansing materials, and to avoid stepping into excrement. Missing the drop-hole in a slab causes the area to be soiled, embarrassing the user, making the toilet unsightly and disgusting, causes smells, attracts flies and spreads disease. A dark interior in turn makes cleaning difficult, as it is hard to see any mess. People also like to check for spiders, scorpions or snakes; the dark can encourage vermin to hide out of sight, until disturbed by a user.

Adequate light is needed to be able to adjust clothing, and for women to change menstrual hygiene materials and check for staining. Anyone who is helping someone to go to the toilet, including children and those who are infirm or have a disability, need to be able to see what is happening.

### SANITATION FOR ALL, ALL OF THE TIME

Extending the useable period of latrines can benefit different groups in society. Those who are ill with diarrhoea or suffering with incontinence have less control of when they need the toilet, so 24-hour access is important. Women who are pregnant, menstruating, or are mothers of infants are also likely to require access to sanitation facilities after dark. Where there are cultural or safety restrictions on women's movements during the day, improving access to sanitation at dawn and dusk is beneficial. There is also a need for sanitation after dark for those working a long day or night shifts.

**Improving coverage.** Where there is limited sanitation, queues are likely to form at sanitation facilities. By providing lighting, latrines can be used for a longer period, extending access into the evening, and maximising the use of limited facilities during waking hours.

**After dark.** Light may be needed intermittently throughout the whole period of darkness. If public lighting is limited to certain hours, lights triggered by movement can operate on demand. If this is not available, additional sources of light are necessary.

### SAFETY AND SECURITY

While all users worry about rats or snakes hiding in a toilet, women and girls in particular may be frightened of being harassed or attacked, especially in insecure environments. This can range from people looking into the toilet through gaps or tears in the infrastructure, offensive comments and verbal harassment, unwanted physical contact, robbery, actual harm or sexual assault, abduction and other violent attacks. Even if these incidences are rare, fear of them can lead to avoidance of using toilets, especially after dark.

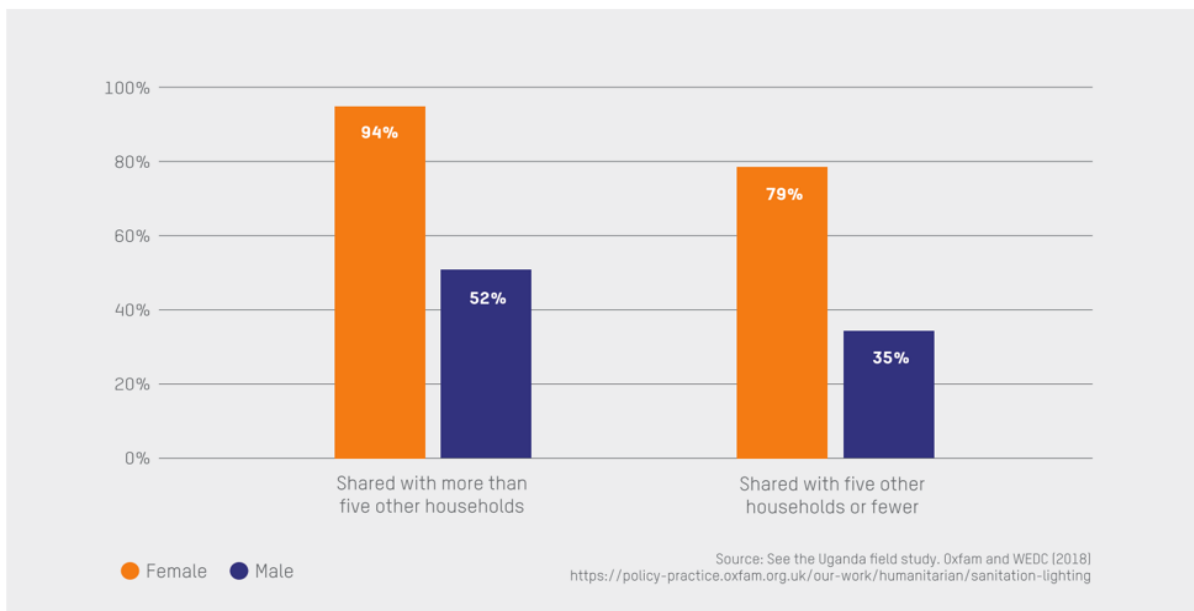
**Crime and the fear of crime.** Research is inconclusive about the impact of public lighting on crime. Crime may even increase if it is displaced to unlit areas. Whilst lighting may not reduce crime directly, it generally reduces the *fear* of crime. By reducing fear, people are more likely to go out at night and use sanitation facilities. More people outside at night can act as a deterrent, as criminals are more likely to be seen.

**Gender-based violence (GBV)** can be targeted at both men and women but is much more likely to affect women and girls. It is underreported and often not visible to humanitarian workers. Protecting and supporting people affected by GBV is a specialist skill, so working with professionals in this area is essential to ensure that the provision of toilets will not increase risks to vulnerable people. Although GBV is not just limited to sanitation facilities, going to the toilet is one of the few reasons many women and girls have to leave their homes or shelters after dark .

Safety issues arise not only when using the toilet but also going to and from it. Toilets are often screened or hidden to provide privacy or are located away from homes and this seclusion can increase vulnerability. A location that is private and not offensive to neighbouring households can mean it is too risky to use. Locating the toilet away from other areas of activity means that it becomes obvious where a user is going when walking in that direction.

Lighting and location are not the only security issues that a WASH professional needs to consider; a robust physical construction, adequate privacy within the toilet, and doors that can be latched shut are also all basic requirements. Research has also shown that fear of GBV is highest when camps or settlements are being set up and people don't know each other or have a sense of community, and it increases when more than five households share a latrine.

**FIGURE 1: FEAR OF GBV BY NUMBER OF HOUSEHOLDS SHARING A LATRINE**



## GENERAL SUGGESTED STANDARDS FOR SANITATION LIGHTING

- I. **Consultation** - Consult representative stakeholders about the lighting of toilets. In particular:
  - logistics, shelter, WASH, GBV, protection and security professionals;
  - representatives of the affected population; and
  - an adequate sample of people specifically at risk, including women, adolescent girls, disabled and elderly people, and sexual minorities.
- II. **Lighting – (Ref- Sani Tweaks)**- Systematically assess the most appropriate lighting options to ensure people feel safe when going to/from the latrine, and when inside. Check if it can be positioned overhead lighting in a way that avoids casting dark shadows and does not illuminate the silhouette of the user. Be prepared to combine several lighting options to ensure effective coverage, such as individual torches, fixed lights on facilities and public lampposts
- III. **Focus on the most at-risk: plan for the most vulnerable users from the start and the design should work for everyone**
- IV. **Neighbourhood lighting** - Where it is only possible to install limited lighting, work with those most at risk in the community to prioritise areas to be lit.
- V. **Communal sanitation lighting**- Permanent communal and institutional toilets with large numbers of users at night should have external and internal lighting.
- VI. **Household sanitation**- Household level sanitation should be prioritised to provide convenient facilities.

**Consult – Modify – Consult**

## PRIORITISING A MINIMUM LEVEL OF PUBLIC LIGHTING-WHENEVER POSSIBLE

At the start of an emergency, people are very vulnerable and displaced people in a new location may not know their neighbours which heightens risks. Paths will be indistinct and problems with vermin probably at their greatest. **Some level of lighting needs to be provided at this early stage.**

In some insecure areas such as conflict zones, fixed lighting may not be appropriate or allowed as it provides a target for armed groups. A black-out may be required. Torches may reveal people walking alone at night, putting them at risk. Consider safer sanitation options, such as household toilets or container-based solutions.

Consulting users can help to identify the riskiest areas, but other indicators can also be used to build up a more comprehensive picture of the situation:

- GBV, protection and gender specialists will already be talking to the community about their safety and social and cultural factors affecting women's movements after dark
- Security staff may have reports of incidents,
- Health staff, women's groups and teachers may have information about incidents in and around toilets,
- Observing queues or unused toilets can indicate usage (or lack of it),
- Inspecting toilets at night if safe to do so,
- Signs of use of candles or burning grass in the toilets,
- Observations or reports of people going to the toilet in pairs or groups,
- Signs or reports of informal container-based sanitation, and
- Signs or reports of open defecation.

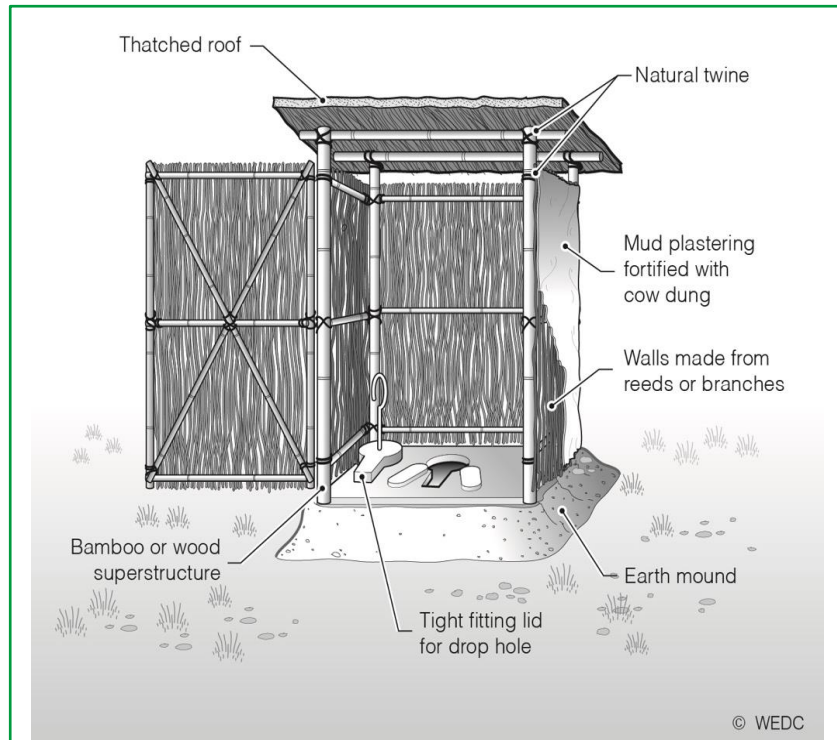


Figure 2. A low-cost toilet with a gap between the walls and roof

## NATURAL LIGHT INSIDE THE TOILET

There are various methods of improving the visibility inside a toilet. These apply during both **day and after dark.**

### WALLS

One of the reasons for a toilet building is to provide privacy, however, preventing people looking in can also stop light getting in. Plastic sheeting is often used as a temporary screen for toilets in an emergency, but this can be easily damaged or deliberately slashed so it is no longer private. Thin sheeting lets light through in the daytime but if the toilet is lit at night or if the sun is behind the toilet, the silhouette of the person inside can be visible. A double thickness of plastic can reduce this effect, but the use of **light-proof plastic** is preferable. Sheeting can only be a temporary measure, so solid walls should be provided, which also provide some noise insulation in public toilets and better thermal insulation. Solid walls give a greater sense of security but make the inside of the superstructure darker unless some provision is made.

### Colour

Simple actions can enhance visibility within a latrine. Dirt and vermin are easier to spot if the floor is not a dark colour. Painting a light colour on doors, walls, and floors will reflect the available light.

### WINDOWS

During the day, windows can provide light to illuminate inside a toilet. Even at night they can help, as external light from lamp posts can enter, if the siting of the lights and toilets are planned at the same time. However, people want privacy as well as light. This can be ensured in various ways:

- Putting the windows high up prevents people seeing in, provided the ground does not slope up around the toilet.
- Frosted glass or fine mesh can obscure the view but let light in.

- Lots of holes high up in the door and/or wall can provide ventilation as well as some light. Pierced brickwork can look decorative as well as providing light and air.
- Ventilation gaps above the door or between the roof and walls also allow light in.

### Roof lights

One way to ensure privacy is to have a window in the roof. Clear plastic sheets can allow light in but still protect the user from adverse weather. The light from even a small hole can be maximised using a “deck prism”. This is a block of glass that scatters the light in many directions, illuminating the interior. A low-cost option, called a “liter of light” can be made with a plastic bottle filled with water (and some bleach) fitted into a roof, ensuring the gap between the bottle and roof is well sealed to prevent rain getting in (see [www.literoflight.org](http://www.literoflight.org)).

## ARTIFICIAL LIGHTING INSIDE THE TOILET

Windows cannot provide light during the hours of darkness. Some toilets may even need artificial lighting during the day and various options are available for this.

### TORCHES AND LAMPS

A portable light is a flexible solution for interior lighting of toilets. This could be:

- a mobile phone (if it can be charged),
- a battery, wind-up or solar torch,

Trying to balance a portable light whilst using a latrine is not easy, especially if assisting children or people with mobility problems. **Providing a shelf, hook**, or other method of supporting the portable light so that it illuminates the interior (and does not fall down the latrine hole) makes this easier. All the aids to vision mentioned earlier also apply, for example, a mirror on a shelf or wall will increase the illumination from a torch in a toilet cubicle. Oil lamps, candles and open flames create a fire risk and their use should be discouraged in favour of safer and cheaper options such as solar.

Torches and other hand-held lights can be part of a comprehensive lighting strategy. Battery, wind up or solar powered torches and lanterns provide personal, flexible lighting. They produce a horizontal beam of light, suitable for illuminating rough ground, checking for vermin, and identifying faces. They are needed in those areas that cannot be lit by public lighting, however, they only

#### Designing for people with visual impairments

The advice for toilets for use by those with visual impairments can be helpful for everybody if light levels are low. Colour schemes should have contrasts rather than being all the same colour. Pedestal toilets should be a different colour to the walls and floor. Bright lights (even from windows) can cause glare, making unlit areas harder to see. Even shiny surfaces (like polished floors) can cause confusion. Other features are making sure there are no steps or other hazards.

**Night-flying insects.** Lights at night can attract various insects, such as moths. These can be annoying for users of the toilet and in turn, may attract animals such as frogs to prey on them, which also may disturb users. Having the light outside the toilet, shining in through a window, may reduce the problem.

provide limited illumination, with a narrow beam. People can move about without being seen unless a torch is shone on them, however, those carrying a torch are visible to others.

**Providing torches.** Supplying only a single torch to a household creates a problem when one person needs to leave the shelter, to socialise, to cook, to collect water or to go to the toilet. This leaves the rest of the family in the dark and draws attention to why the person is leaving the shelter. Oxfam’s research shows that when a single lighting device is given to a household, women and girls have less access to it than male family members, Some uses of torches, such as studying or charging phones, may be a higher priority than lighting the way to the toilet.

The cost, availability and specifications of torches vary. Good quality solar and wind-up torches are safest and most cost-effective for the user. At one end, a high specification can provide multiple functions such as general lighting or a narrow beam of light, different levels of brightness, energy-saving settings, and USB connections that could be used for charging mobile phones. Solar powered torches may be cheaper to operate but must be exposed to sunlight and are vulnerable to theft if left charging outside

during the day. Smaller lights can be carried or worn around the neck while recharging. At the other end of the scale, cheap battery torches will provide a basic service, although there is recurring expenditure on batteries, which need to be disposed of eventually. A market-based approach may be a suitable solution, with the provision of cash or vouchers allowing people to choose from a range of options.

**Recent technological advances** have made the provision of lighting much more feasible and cost-effective. **Solar power** has enabled lights to be “off-grid” and positioned where they are needed, rather than where the power supply is. Better **batteries** can store the energy collected during daylight so it can be used for a whole night, coupled with **LED** lighting, which has reduced the power requirement. **Mobile phones** often have an integral

## FIXED LIGHTING

A permanent light inside a toilet is convenient for users. It needs a power source (from an electricity supply, solar panel, battery, or gravity or pulley system) that will last all night. A switch or movement sensor can help reduce power consumption when it is not needed. As a toilet does not need to be brightly lit (unlike for reading or working), a dim light can be used, which will also conserve power and make it less prone to theft as it will be of limited use. Women have also reported a preference for dim lights as it makes them less visible.

### Structural considerations

Temporary toilets are likely to only have a temporary screen around them.

If lights are going to be attached to the superstructure, the frame should be robust enough to support them. Solar lamps with heavy batteries need strong posts and foundations.

## LIGHTING THE WAY

Going to a toilet outside the home after dark requires lighting for the journey there and back, as well as inside the toilet. Many of the same issues apply to the path as to the inside of the toilet. A clear, smooth path with no obstacles is easier to walk along. If the path (or its edge) is marked with light coloured stones, it is easier to follow. Different paths to separated men’s and women’s toilets increase privacy and safety, especially where cultural factors bar women from even incidental contact with unrelated men.

Overhanging vegetation should be cut back regularly, making it easier to see and reducing places for people and animals to hide. However, this makes it easier to see when people are going to the toilet. At night, the sight of mobile phone or torch light signals someone’s presence, which may attract unwanted attention or even robbery and violence. Going to the toilet under the cover of darkness may be preferred by some people. Public lighting can improve visibility at night, but intermittent lamp posts or shadows cast by trees and buildings can create dark areas that cause fear.

## LIGHTING OPTIONS

Whilst WASH organisations are responsible for sanitation, they still need to coordinate actions with other sectors. If lights at toilets are the only lights in the area, people may congregate at them after dark. Lighting the toilet will only provide illumination there, rather than the route to the facility. If people are afraid to go out at night, then a well-lit toilet will not solve this challenge by itself. Lights consist of:

- the **lantern** (the light fitting and bulb),
- a power source – either a **solar panel** (and necessary electrical components) or an **electricity grid**,
- a **battery** (to store energy from the day for night-time use), and
- a support (either a **post** or a building).

**Lanterns.** Whilst ideally the lights should illuminate a wide area, often the most readily available option will be streetlights designed for roads. These provide illumination in one direction (onto the road), preventing light pollution to the buildings either side of the street. This direction may not be easy to adjust without moving the whole installation, so ensuring the correct area is lit from the start is an important design factor. The lantern should reflect light downwards over a wide area without shining into homes as this can disrupt sleep.

Street lighting design standards require a close spacing of bright lights directed vertically onto the road surface. This level of illumination is neither appropriate nor affordable for mainly pedestrian areas. Pedestrian lighting can be less bright, should not dazzle people, and should illuminate a wider area. To illuminate uneven ground and people on the street, the light needs to shine partially horizontally.

**Solar panels** can be placed above the lantern, avoiding the shade of trees or tall buildings. These should slope down in the direction of the equator (e.g. facing south in the Northern hemisphere), ideally at the angle of the location’s latitude. A minimum slope of about 10° is needed to shed rain and wash off dust, although panels may need to be washed occasionally. An **electricity grid** may be more cost effective for closely spaced lights, powered by solar energy, a mains supply or a generator, but and if the power fails,



all the lights fail. Illegal connections need to be prevented. The location of the lamps is limited by the grid, which may focus lighting on roads as they are convenient locations to put the cables. Gravity, fuel cells and batteries have also been used as power sources. A **battery** is needed to store energy throughout the day to the night-time. These are heavy and need replacing after a while, so

**Principles of lighting.** The *luminous flux* [ $\Phi$ ] represents the quantity of radiation which comes from a lamp, measured in units of **lumens (lm)**. This goes out in all directions from a light source. As the light spreads out from the lantern, the intensity of the beam of light will stay the same, but the area lit by the beam will get bigger, so that intensity is spread out over a larger and larger area. *Illuminance* [E] relates to the light falling on a surface measured in units of **lux (lx)** (which equal lumens per square metre). Thus, illuminance equals the intensity of light emitted divided by the square of the distance from the source to the point considered.

Illuminance can vary from 400 lx at sunrise up to 100 000 lx in direct sunlight. People need about 1 lx to notice obstacles, but up to 5 lx to recognise faces and 500 lx to read by. Roads need about 10 lx, but higher levels are required at junctions. Streetlights are spaced to avoid too much variation between the bright area under the lantern and the darkest area between neighbouring streetlights.

It is not just about the illuminance but also the direction. Street lighting is directed vertically down to the road, rather than shining into surrounding houses. Pedestrians need the light to be more horizontal to light steps and other people's faces. Lanterns for pedestrians need to illuminate a wide area and so have different reflectors to direct the light. Light shining directly into your eyes creates "glare". The contrast between the bright light and the darker surroundings means you cannot see clearly.

access is needed. They are also vulnerable to theft, so security needs to be considered. Placing them in a locked box located high up the pole can make them harder to steal, but also makes maintenance harder and increases the load on the support.

### Supports

Pedestrian lights can be at a low level to provide horizontal illumination, but this only shines on a limited area. A lamp post raises the lantern up, so it can shine on a larger area. The higher the post, the larger the area lit, but at a lower brightness.

Lights attached to buildings (shops, bars or market stalls) can provide quick and robust public lighting. Using a building to support the light and solar panels saves on the cost of a lamp post. Batteries can be located inside the structure, reducing the risk of theft. The roof can provide a support for several solar panels, enough for external and internal lighting.

### Lamp posts.

Where a building is not available or not strong enough to support a solar light, a lamp post can be used. These need to have a strong enough pole to support the light, battery and panel, especially in high winds. The pole can be bolted to the foundation, allowing it to be moved to another place later if necessary. **Foundations** for lamp posts should be able to resist forces due to strong winds on the panel, as well as any vandalism or misuse. Erosion around the foundation can be a problem in areas with poor surface water management. This document uses the term "lamp posts" to distinguish public lighting for people from street lighting for vehicles.

### Other factors

Public lights will not illuminate everywhere, so crime can simply be displaced elsewhere. The layout of buildings needs clear sightlines. Light pollution can be a problem, shining into buildings at night and disrupting sleep, especially for people living in temporary accommodation such as tents. Lighting may be perceived as a security measure to control rather than protect displaced people. If public lights are turned off in the middle of the night, personal lights may still be needed.

## OPERATION AND MAINTENANCE

The development of LEDs and low-cost solar panels has made the provision and operation of lighting affordable and practical. These do not need much daily maintenance and indeed, very little maintenance can be carried out by non-technical staff beyond reporting damage or failure of the light. In very dusty environments, periodic wiping of the panel can improve performance, but this is a challenge if the lamp post is high. The lanterns and batteries on lamp posts will need replacing, although this might be after many months.

## INSTITUTIONAL FACILITIES

Where a clinic or hospital operates on a 24-hour basis or is open after dark, then patients and staff require it to be continuously lit. Other non-residential places used after dark include police stations,

**Security.** Lights can be stolen or vandalised. The batteries need to be in a locked box to reduce theft but still allow for replacement. Other measures include:

- use a tall pole with the battery located high up,
- encourage local ownership (linking to a water or lighting committee for example)
- site the lamp post where it can be seen.

community centres, markets, eating places and places of worship (especially during Ramadan when meals are taken at night). Shared facilities that are not used at night (such as schools or workplaces) may not be such high priority.

## SHARED TOILETS

The priority for lighting is greatest at communal facilities. Research has shown that fear of GBV is higher for shared sanitation services. Communal or public toilets are shared rather than private spaces and are likely to be further from home than household toilets. Other users are likely to be strangers (rather than known neighbours) and the state of shared toilets may not be known. As they are used by more people, lighting is cost effective. Usage is reduced at night, so only a proportion of men and women's cubicles need to be lit.

## ACUTE PHASE OF EMERGENCIES

Lighting is a basic security feature not a “nice to have” option. The most unstable period is at the start of any emergency, when often traumatised and anxious people are still unfamiliar with their surroundings, the sanitation facilities and the people around them. Trench latrines are extremely unpleasant, so being able to see clearly is important – balanced with as much privacy as possible.

## PEOPLE WITH SPECIAL NEEDS

Where people require assistance to go to the toilet, lighting will make this easier and a more dignified experience. Toilets that are accessible to people with mobility or visibility problems should include plans for lighting at the design stage. The particular needs of female users should be prioritised in the design from the outset.

## INSECURE LOCATIONS

Areas that may feel less secure can be those located near the edge of a camp, on hilly sites or places with lots of trees, in congested areas and close to bends in roads, or near a barracks or a bar. If the source of the problem cannot be solved or the layout of the site improved, then lighting may help reduce the level of fear.

However, lighting can also increase problems. If public lighting is limited, it will attract more than just insects at night. Children doing homework or men meeting to chat and drink may gather beneath it. If the only light is near a toilet, users are very visible and this may discourage their use. Too much lighting may make going to the toilet obvious to those who would prefer the cover of darkness. Consultation with a variety of users and ongoing monitoring is the only way to fully understand what is working and what needs further adaptation.

## COORDINATION

Whilst sanitation (and lighting toilets) is a WASH responsibility, the technical area leading on lighting can vary in different responses. The most effective lighting interventions have involved representatives from different technical areas including camp management, WASH, health, logistics, protection and gender working together in a coordinated manner.

## THE ROLE OF WASH

Whilst it is not strictly the WASH sector's responsibility to light public areas, there are ways to improve the user's journey to the toilet:

- **Providing household or neighbourhood toilets at an early stage.** Locating the toilet close to where people live reduces the distance they must travel. Sharing the facility with people they know makes it obvious if there are strangers around.
- **Separating male and female communal or public toilets.** The path to the toilets should also be separate rather than shared, again signalling that men should not be near the women's facilities.
- **Combining bathing and toilet facilities.** It may be less embarrassing to be seen going to wash than to the toilet, especially for women and girls. Combining washing and toilet facilities is also useful for menstruating women and those with diarrhoea.
- **Selecting suitable locations.** Isolation and privacy need to be balanced. A toilet far from the nearest building makes it obvious where someone walking in that direction is going but hiding the toilet so it cannot be seen also leaves people feeling isolated.

## COMMUNITY ENGAGEMENT

Working with a community can help ensure the facility is protected both from theft and vandalism, such as children throwing stones at the light. There may need to be agreement on how and when the light is used, to allow children to study and other

people to socialise or work in the evenings. The process for fault reporting and minor maintenance (e.g. cleaning) needs to be clear. Linking community management of lighting with other infrastructure (e.g. water points) may aid sustainability.

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As with the provision of sanitation and water facilities lighting needs the same approach of consultations before and after installation as there are always unforeseen consequences which were not anticipated. The approach is summed up as Consult – Modify – Consult (please see the Sani Tweaks documents - <https://www.oxfamwash.org/sanitweaks>)

**Container-based sanitation.** If the perceived risks of going outside to the toilet at night are high, even with lighting, it may be worth considering container-based sanitation. This is useful for children using potties, but in insecure areas adults may also want to use a sanitary pot for defecation.

A specific bucket or pot kept just for this purpose should be used, with a lid to reduce smells and keep the faeces out of sight. A sanitary disposal point is needed, such as a toilet, with the means to clean out the pot in the morning when it is emptied.