Exploring the Issues around Rural On-Site School Sanitation in South Africa

A preliminary report to the Water Research Commission on Project K5/2381:
Evaluating the design of existing rural school sanitation infrastructure and developing a model and guidelines for optimal design

by

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WRC Report No. 2381/P/15
ISBN 978-1-4312-0682-7

July 2015

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EXECUTIVE SUMMARY

Six year old Michael Komape drowned in excrement in a pit latrine at his school in Limpopo in January 2014, just a week after he had started his school career. This unspeakable tragedy reveals how vital it is that our education system ensures that schools have safe and decent sanitation. Reports from educators, families, rights groups and the media indicate that school toilets that are overcrowded, blocked, broken, filthy or have no hand washing facilities are not exceptional.

The schools where safety and dignity are at risk still typically reflect the demographic inequalities of apartheid. In its 2014 report, the South African Human Rights Commission stated that:

> "Those areas which lack water and sanitation mirror apartheid spatial geography. Former homelands, townships and informal settlements are the areas in which communities and schools, which are black and poor, predominantly do not enjoy these rights and many others. The lack of access to sanitation has an impact on other rights including rights to dignity, education, health, safety and the environment" (HRC, 2014).

While the finger is often pointed at service delivery, the visible failure of many of the toilets that have been delivered – both old and new – in terms of the threat they represent to health, safety and dignity points to a range of issues both "hard" and "soft", both technical and human: infrastructure design that considers the needs of both users and management, the choice of appropriate technologies and the appropriate use of these technologies and the need for proactive management with a sound knowledge of and commitment to health and safety. The fact that 20 years into our new democracy some of South Africa's school children are still not guaranteed a safe or healthy place to perform the most basic of bodily functions demonstrates that achieving adequate sanitation for schools is not just a logistical challenge but also a matter of management at all levels: understanding and committing to the integral role of sanitation in education and in upholding human wellbeing and dignity.

This document represents a preliminary exploration of school sanitation in South Africa as part of the study titled *Evaluating the design of existing rural school sanitation infrastructure and developing a model and guidelines for optimal design* which is being conducted by Partners in Development on behalf of the Water Research Commission**.** This document explores the background and status of school sanitation in South Africa and its legal environment and looks at best practice for the design of facilities and choice of systems and technologies. What this exploration revealed was the fact that the failure or success of infrastructure is fundamentally linked to the needs, resources, attitudes and beliefs of management and the users of school sanitation, and that any attempt to improve the status quo must come from a perspective of a "total solution" which addresses all of these elements coherently. While this document touches on how infrastructure interfaces with user needs and the implications for management, a careful review of models for management and user education is planned as the study progresses. It is clear that addressing these three elements – infrastructure, management and education – together is vital in order to expect that any intervention might succeed.

An assessment of sanitation at 100 rural schools in KwaZulu-Natal, Limpopo and the Eastern Cape is underway (December 2014) as part of this study. The assessment involves an inventory of sanitation stock and its condition, interviews with the principal and cleaner (where there is one) and a focus

group with learners allowing some triangulation of viewpoints between different stakeholders. The assessment tools can be found in Annexure A at the end of this document and can be used by anyone wishing to better understand the issues around sanitation at a given school. In addition, we will facilitate a discussion of these issues at national level during 2015 and the insights gleaned from this process and from the assessments will be published by the Water Research Commission in early 2016. It is our hope that this study contributes to the wellbeing of South Africa's children during the hours in which they are at school.

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1. INTRODUCTION

1.1 The importance of adequate sanitation

Risks posed to children by contact with faeces

Faecal sludge can contain a range of bacteria, viruses, protozoa and helminths depending on the health of the household and community which has produced the sludge. In the South African context, where rates of infection with HIV and TB are high, the consequences of diarrhoeal diseases from bacteria or viruses or loss of nutrients to parasites can be dire.

Worldwide about 1.8 million people die every year from diarrhoeal diseases which are almost always transmitted as a result of improper sanitation and hygiene; 90% of these are children under 5, and most are in developing countries (World Bank Group, 2014). It is estimated that 88% of diarrhoeal deaths worldwide are attributable to contact with faecal matter as a result of drinking unsafe water, inadequate sanitation and poor hygiene (UNICEF/WHO 2009). In South Africa, diarrhoeal diseases are the eighth largest cause of death nationally, accounting for 3% of total deaths, and the third largest cause of death among children under 5, responsible for 11% of deaths in this age group (Lewin, 2007). Persistent diarrhoea is associated with an 11-fold increase in mortality for children with HIV compared to uninfected children (UNICEF/WHO, 2009).

Children are particularly vulnerable to the potential effects of helminth (worm) infections, such as nutritional deficiencies and impaired physical and mental development (WHO, 2005). Some of the impacts of this are a 23% drop in school attendance and 40% lower future earnings as adults for children with helminthic infections (CWW, 2011). Sub-Saharan Africa is the area of the world most affected by soil transmitted helminths (GAHI, 2013). While estimates of numbers of helminthic infections in South Africa are not available, studies indicate that the estimated 57% of South Africans who live in poverty carry the highest burden of both HIV and helminthic infections (Mkhize-Kwitshana et al., 2011). In South Africa, the highest prevalence of soil transmitted helminths is in the KwaZulu-Natal coastal area which includes eThekwini Metro (Appleton et al., 2009). A study conducted in 1998 with 1017 school children in northern KwaZulu-Natal found 90% of the pupils infected with either *Ascaris lumbricoides (roundworm)*, *Trichuris trichiura* (whipworm) or hookworm and 31% infected with all three (Saathoff et al., 2004). In a slum in eThekwini, 89.2% of children were found to be infected with *A. lumbricoides* and 71.6% with *T. trichiura* (Appleton et al., 2008). A higher burden of disease resulting from *Taenia solium* (tapeworm) has been documented in the Eastern Cape (Mafojane et al., 2003). A study in 1984 found 51% of the patients at Groote Schuur hospital with cerebral cystercercosis caused by *T. solium* to be children (ibid). In studies conducted in the informal settlement of Kayalitsha in the Western Cape, helminthic infection rates at 12 schools were found to be over 90% (Mkhize-Kwitshana, 2012).

Benefits achieved by sanitation

The purpose of sanitation is to provide a 'primary barrier' to isolate faecal matter from the general environment (World Bank Group, 2014). If faecal matter contaminates the environment however, it can easily be spread by dermal contact. 'Hardware' alone (toilets and taps), therefore, will have

limited impact on health if it is not accompanied by good hygiene practices, particularly hand washing with soap, which can break the transmission of disease. In addition, the provision of sanitation impacts the well-being of users in other ways that may be highly personal. Surveys conducted by the World Bank Group (2014) found that the provision of sanitation was associated with increased dignity and privacy, cleanliness, convenience and comfort, safety and social status.

1.2 The development of school sanitation

There is little record of the beginnings of school sanitation since formal schooling in dedicated structures came into existence. However, sanitation at even the household level was still a critical problem in Britain even in the 19th century. The Report of the Committee of Health for Dornoch, Scotland on 10 December 1831 provides a glimpse into just how dire the situation was:

> The Committee has witnessed much wretchedness and distress and even an extreme of poverty and helplessness amounting to an inability in some instances on the part of the people themselves, speedily to remove their accumulated heaps of manure from their dwellings. [1]

Sixty years later, in 1890, the Medical Officer's Report made to Dornoch Town Council on the Sanitary Condition of the Burgh stated:

> "There is no system of drainage by means of Sewers in the Town. The excreta from houses are allowed to soak into the ground near the houses, or in some places are supposed to find their way to cesspool by rough built drains. From a few houses there are pipe drains carrying sewage to the Dornoch Burn at various points, thus polluting a slowly moving stream … at present there is no proper means of removing excreta. [2]

The following year, cases of typhoid were traced to the school toilets in Dornoch; outbreaks of cholera had occurred as well because of the appalling conditions.

Dry toilets were reported at schools across Ireland during the 19th century and early 20th century[3]. A former student of one of these schools described the toilets as having a wooden board with two holes cut in it so that two children could go together in case they were scared. Users sprinkled ash into the pit after using it and earth was thrown into the pit by whoever cleaned at the end of the day. Older schoolgirls cut squares of newspaper which were put on a string for use as toilet paper. At that particular school, the sea would come up and wash the contents away. Water would be pumped out by a pump into a bowl for hand washing and hands dried on a rag. In Ireland, a dividing wall often separated the girls and boys play areas, with girls' toilets on the one side and boys on the other.

[1] (www. Historylinks.org.uk, Accessed 3 June 2014).
[2] (www. Historylinks.org.uk, Accessed 3 June 2014).
[3] (www.Askaboutireland.ie, Accessed 3 June 2014).

Figure 1 School toilets in Ireland in the 19th Century. (Askaboutireland.ie, Accessed 3 June 2014)

In England, the 1870 Elementary Education Act, following by other legislation over the following two decades, made schooling compulsory for children between the ages of 5-10 (including children with disabilities), curtailing child labour and sparking a massive endeavour to build schools.[4] In 1871, Edward Robson was appointed chief architect for the new London School Board and was tasked with the job of providing schools for the nearly 40% of London's 455,000 children who did not go to school. He prepared for the immense task at hand by travelling through both Europe and America visiting schools and gathering detailed notes and ideas. His definitive work, *School Architecture* (1874), describes in detail various aspects of school infrastructure. He describes a school in Germany which accommodated 1,100 children and had latrines and drinking fountains on each floor, though he noted that hand washing basins were not provided for learners at even the best schools in Germany (Robson, 1874). From this extensive research Robson developed his own models for school infrastructure which William Whyte described as "strikingly new" for its time and Sir Arthur Conan Doyle as "Lighthouses! Beacons of the future!"

1.3 Sanitation as a global concern

As the impact sanitation has on reducing disease and death has become clearer – at the same time that increasing population density has caused the risks associated with inadequate sanitation to increase – improved sanitation has become a major global concern and many international organisations have begun to champion the cause.

In 2000 the United Nations adopted the United Nations Millennium Declaration and subsequently member nations – as well as many international organisations – committed to achieving eight international development goals by 2015. Millennium Development Goal 7c is to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation.[5] The United Nations declared 2008 the International Year of Sanitation[6]. However, while over a quarter of the world's population has gained access to improved sanitation since 1990, a

[4] http://www.victorianweb.org, Accessed 4 June 2014.
[5] www.un.org
[6] http://www.who.int/water_sanitation_health/hygiene/iys/about/en/index1.html, Accessed 24 July 2014.

WHO/UNICEF study predicted that 2.4 billion people will still lack access to improved sanitation facilities in 2015.[7]

In 2001, the Water Supply and Sanitation Collaborative Council (WSSCC) launched the Water Sanitation and Hygiene (WASH) Campaign at the International Conference on Freshwater in Bonn, Germany in order to raise the level of advocacy and mobilisation around water, sanitation and hygiene issues (Water Aid/WSSCC 2003). The campaign advocates and mobilises for policy change and increased commitment of political and social leaders with regard to WASH issues and promotes behaviour change through hygiene promotion in schools, training and building local capacity in communications and improving networking and research. School WASH has become an increasing focus with the aim to improve health, boost educational achievement, promote gender equality and use children as agents of change in their communities (UNICEF, 2011). UNICEF has produced a range of publications and tools to aid WASH programmes in schools which recognise the need to involve stakeholders in WASH initiatives in schools (UNICEF, 2012).

Figure 2 Pillars for WASH programmes (UNICEF)

The World Health Organisation (WHO) and UNICEF established the Joint Monitoring Programme for Water Supply and Sanitation, with the vision of accelerating "progress towards universal sustainable access to safe water and basic sanitation by 2025, including the achievement of the MDG target by 2015 as a key milestone." [8] UNICEF adopted a WASH Strategy Paper in 2006. In addition to meeting the MDG 2015 goal the organisation aims to "ensure that all schools have adequate child-friendly water and sanitation facilities, and hygiene education programmes[9]."

The Water and Sanitation Program (WSP), a trust fund administered by the World Bank, was set up with the goal of improving access to water and sanitation for poor people through projects aimed at regulatory change, technical assistance, building partnerships, capacity building and behaviour change (such as hand washing)[10]. The WHO has introduced Participatory Hygiene and Sanitation Transformation (PHAST), a participatory learning methodology aimed at improvement of hygiene behaviours, reduction of diarrhoeal disease and encouraging effective community management of water and sanitation services (Lienert, 2014).

[7] http://www.who.int/topics/millennium_development_goals/mdg7/en/, Accessed 24 July 2014.
[8] http://www.wssinfo.org/about-the-jmp/mission-objectives/, Accessed 24 July 2014.
[9] http://www.unicef.org/wash/index_43084.html, Accessed 24 July 2014.
[10] http://en.wikipedia.org/wiki/Water_and_sanitation_program, Accessed 24 July 2014.

The Bill & Melinda Gates Foundation has also established a Water, Sanitation & Hygiene programme which focuses on developing innovative approaches and technologies that can lead to radical and sustainable improvements in sanitation in the developing world[11].

[11] http://www.gatesfoundation.org/What-We-Do/Global-Development/Water-Sanitation-and-Hygiene, Accessed 24 July 2014.

2. SCHOOL SANITATION IN SOUTH AFRICA

2.1 The history of school sanitation in South Africa

The story of school sanitation in South Africa is deeply intertwined with the history of European colonization, dispossession of native Africans and the forced racial segregation of South Africa's inhabitants. The Department of Basic Education, in its Action Plan to 2014, describes how the process of land dispossession and resettlement initiated through the 1913 Land Act impacted the location of schools: today, slightly less than half of South Africa's school children are enrolled in schools in areas formerly designated 'homelands' (DBE, 2011). The Bantu Education Act of 1953 increased the segregation of schools by race.

While under apartheid education was compulsory for all racial groups, learner spending by the state was highly unequal by race and ethnicity and black schools in particular lacked basic services such as water and sanitation (Twenty Year Review South Africa, 2014). Inequalities in the physical learning environment were stark. Overcrowding also impacted the quality of the education which learners received which in turn impacted the dropout rate, contributing over the years to a dire skills shortage, high unemployment and poverty (Twenty Year Review South Africa, 2014). Schools particularly in rural area and townships were also poorly maintained compared to schools in the mainly white urban areas. (Department of Education, 2009). Schools in the townships and in some rural areas suffered damage as a result of the unrest following the protests of 16 June 1976. Vandals and arsonists damaged and destroyed many schools buildings as well as school property. Sporadic unrest during the 1980s and early 1990s affected many schools during this time and initiatives by the government to improve school infrastructure were curtailed.

By the end of formal apartheid in 1994 some inequalities had been reduced but spending on every white learner was still about 4,5 times higher than that for every black learner (DBE, 2011). By 2000 the new government had brought spending nearly into line for all schools, although the fact that public schools serving middle class families are permitted to levy fees has resulted in de facto spending patterns continuing, although less extreme than they were under apartheid (ibid). In addition, the unequal capital expenditure on infrastructure which occurred under apartheid has carried the legacy of inequality physically into the present. A large number of schools across all provinces were not provided with water, sanitation and electricity by the apartheid government while a number of mud schools were built by local communities in the effort to provide their children with an education despite neglect on the part of the government[12]. The bulk of these mud structures are in the Eastern Cape. In addition, Wall et al. (2013) comment that despite initiatives to address school sanitation, infrastructure has generally been left in the shadow of initiatives to improve teaching. In particular there has been little focus on sustainability and long-term service provision, consequently much sanitation infrastructure is either dysfunctional or serviceable but in some state of disrepair (ibid).

[12] http://www.education.gov.za/Programmes/ASIDI/tabid/841/Default.aspx, Accessed 24 July 2014.

2.2 Status of school sanitation in South Africa today

School enrolment in South Africa is high: amongst children of school-going age (7-17 years) 97% attended some form of educational facility in 2012 (Hall & De Lannoy, 2014). In 2013 there were 12,489,648 learners enrolled at a total of 25,720 ordinary schools – with roughly 12 million at public and 0.5 million at independent schools – served by 425,023 educators (DBE, 2013). While there were a 1.6% increase in the number of learners and 1% increase in the number of educators from 2011 to 2013, the number of schools decreased by 0.5% during this period. KwaZulu-Natal had the largest number of schools, representing 23.9% of the national total, followed by Eastern Cape (22.3%) and Limpopo (15.8%) (ibid). The three provinces together represented 15,423 public schools, or 64% of all schools nationally.

Table 1 Numbers and percentages of learners, educators and schools in the ordinary school sector for each province for 2013 (DBE, 2013)

Province	Public and Independent					
	Learners	As % of National Total	Educators	As % of National Total	Schools	As % of National Total
Eastern Cape	1 938 078	15.5	66 007	15.5	5 733	22.3
Free State	664 508	5.3	24 475	5.8	1 396	5.4
Gauteng	2 129 526	17.1	74 823	17.6	2 649	10.3
KwaZulu-Natal	2 866 570	23.0	96 057	22.6	6 156	23.9
Limpopo	1 714 832	13.7	57 108	13.4	4 067	15.8
Mpumalanga	1 052 807	8.4	34 936	8.2	1 885	7.3
Northern Cape	282 631	2.3	8 972	2.1	573	2.2
North West	788 261	6.3	26 194	6.2	1 606	6.2
Western Cape	1 052 435	8.4	36 451	8.6	1 655	6.4
South Africa	12 489 648	100.0	425 023	100.0	25 720	100.0

In 2011, half of South Africa's ordinary schools were found to have inadequate or non-existent sanitation facilities.

DBE data from the 2011 National Education Infrastructure Management System (NEIMS) report presented in Table 2 documents 29,198 sanitation installations at 24,793 education sites (indicating more than one type of sanitation installation at some sites). A total of 913 sites were found to have no sanitation facility at all and a further 11,450 had unimproved pit latrines while 155 had chemical toilets, indicating that 50,5% of sites had at least some sanitation facilities which were inadequate. Of the 67.3% (16,680) of schools which had at least some acceptable sanitation (in some cases co-existing with inadequate sanitation), about half (35%) had onsite sanitation in the form of VIPs (20%), septic tank systems (10%) or Enviro loos (5%) while the remainder had waterborne sanitation with municipal sewer connections (32%). In addition, while 90% of schools had a water supply, 2,402 education sites had no water supply at all and 2,611 had an unreliable water supply (DBE, 2011).

Table 2 Summary of types of sanitation facilities at education sites for each province (DBE, 2011).

Department of Basic Education

Ablution Summary - Number of Education Sites

Site Type Ordinary School

Date 20/05/2011
Table 5
Page 1 of 1
Sites : Open

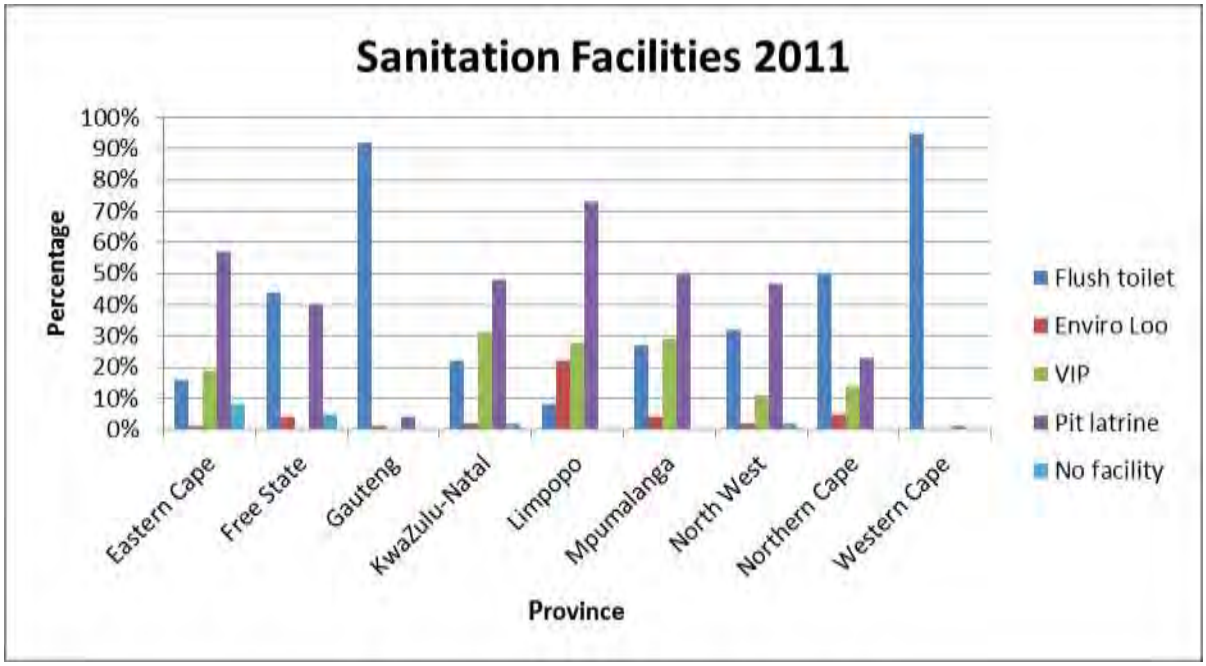
Province	No of Sites	Municipal Flush	Septic Flush	Enviro Loo	VIP	Pitlatrine	Chemical	No Facility
Eastern Cape	5,676	951	169	49	1,071	3,160	40	351
Free State	1,615	716	135	63	102	643	6	60
Gauteng	2,031	1,679	96	22	10	75	5	6
KwaZulu Natal	5,930	1,294	369	147	1,657	2,634	57	160
Limpopo	3,924	322	493	870	1,122	2,657	5	36
Mpumalanga	1,866	505	472	62	590	942	2	35
North West	1,674	539	360	31	166	762	6	37
Northern Cape	611	307	129	26	64	142	7	3
Western Cape	1,464	1,381	229	2	4	15	22	5
Total	**24,793**	**7,996**	**2,492**	**1,294**	**4,988**	**11,450**	**155**	**913**

Site can have combination of different types of ablution

Table 3 provides a visual representation of the prevalence of types of sanitation per province. The more rural provinces of Limpopo, KZN and Eastern Cape have the lowest percentages of flush toilets

while Gauteng and Western Cape had the highest proportions of schools using flush toilets at 92% and 95% respectively. Unimproved pit latrines were most common in the more rural provinces of Limpopo (73%), Kwazulu-Natal (48%), Mpumalanga (50%) and Eastern Cape (57%).

Table 3 Types of school sanitation by province (%) (DBE, 2011)



In 2011 the DBE conducted a School Monitoring Survey to assess compliance of schools with standards. The findings of study were as follows (DBE, 2011):

- Three-quarters of schools had separate flush toilets, VIP or Enviro loo toilets for boys, girls and teachers, with Limpopo and the Eastern Cape below this proportion (64% and 66%, respectively) and Gauteng and the Western Cape well above this figure (95%).
- A total of 5,436 schools did not have these sanitation facilities; most of these schools were in the Eastern Cape (1,692 schools), Limpopo (1,358 schools) and KwaZulu-Natal (1,334).
- Nearly a third (32 percent) of Quintile 1 schools did not have suitable sanitation, followed by 27 percent of Quintile 2 schools and 23 percent of Quintile 3 schools, whereas this applied to only 7 to 8 percent of Quintile 4 and 5 schools.[13]
- The NEIMS figures (DBE, 2011) are very different to these findings – according to NEIMS, only 3.7 percent of schools countrywide did not have sanitation facilities. This discrepancy in findings is due to the fact that NEIMS looked at general availability of ablution facilities, whereas the School Monitoring Survey asked more specific questions about the availability of separate toilets for boys, girls and teachers.
- Only 3,548 schools (20 percent) had toilets that have been adapted for use by disabled people, ranging from 9% of schools in Limpopo to 29%in the Northern Cape. KwaZulu-Natal had the highest number of such schools (1,061), followed by the Eastern Cape (823 schools).

[13] The five socio-economic quintiles were developed to target resources and support for the schools that are most in need. In broad terms, the quintiles capture historical inequalities. Quintile 1 represents school communities at the poorest end of the scale (DBE, 2011).

Quintile 1 schools most often had adapted toilets – 18%, compared with 14-16% of schools in the other quintiles.

It should be noted that in these studies sanitation was deemed adequate solely on the basis of the existence of infrastructure and not on whether the infrastructure was fit for use in terms of operations and maintenance. A survey conducted in 2013 by the rights organisation *Section 27* on the condition of school toilets found that the toilets at many schools were old and the buildings were dilapidated (Section 27, 2013). Most toilets did not have toilet seats and many did not have doors, depriving users of privacy. Most sanitation facilities had not been provided with hand-washing facilities. In many cases there were insufficient toilets for the number of learners, with the result that learners were forced to miss class or stand in queues for long periods in order to use the toilets. They found many instances of unhygienic toilets, where floors and the surrounding areas were soiled and waste was not disposed of efficiently. In cases where the pits were full learners could not use the toilets at all and were forced to relieve themselves in the bush or to walk home during the school day to relieve themselves. In rural areas, however, operations and maintenance are often negatively impacted by a lack of locally based service providers and the logistical difficulties relating to the large distance between schools and the poor transport and communication infrastructure. There are also issues with accountability (especially in relation to the safe disposal of sludge) – and capacity, with school staff not always able to ensure that the necessary work is done (Wall and Ive, 2010).

In addition to the issues raised above, there are problems such as the lack of provision of soap and bins in order to prevent toilets from becoming a place where disease transmission increases. In addition, user behaviour can render school toilets unusable or unsafe.

An aspect that is received increasing attention is the impact of school sanitation facilities on girls' attendance of school due to their needs during menstruation. There is evidence that the pattern of girls' staying home from school during menstruation is a widespread problem across Africa (Think Africa Press, 2011). The lack of affordable sanitary products and facilities for girls to change or dispose of pads safely and privately at school are key factors. UNICEF (2011) estimates that 10% of girls in Africa who have reached puberty miss classes or drop out completely during their period, with the numbers as high as 20% in countries where menstrual hygiene is taboo. The problem may be more severe in rural areas: in a study conducted in Ghana 95% of girls from rural areas reported missing school during menstruation, while in peri-urban areas only 20% reported missing school (Scott et al., 2009). In February of 2011, President Jacob Zuma acknowledged the need for pads in schools with a proposal that free sanitary towels should be provided to schoolgirls, although the details of this plan remain unclear (Think Africa Press 2011). At Mary Waters, a school in Joza, a teacher has tried to combat the problem by providing a stockpile of pads at the school that she funds herself (ibid).

2.2.1 Eastern Cape

In the Eastern Cape 1,938,078 learners were enrolled during 2013 in the ordinary school sector, 1,881,605 of whom attended public schools; 5,562 public schools were documented in the province. While 15.5% of the country's learners and educators were found to be in the Eastern Cape, the

province has 22.3% of the schools in the country (DBE, 2013). The Eastern Cape was the only province to experience a decrease in the number of learners and educators between 2011 and 2013 (DBE, 2013). Data from 2011 documented 41 special needs schools in Eastern Cape (DBE, 2011).

Table 4 Numbers and percentages of national total of learners, educators and schools in the public school sector in Eastern Cape (DBE, 2013)

	Learners	Educators	Schools
Public	1 881 605	63 137	5 562
Independent	56 473	2 870	171
Combined % of national total	15.5%	15.5%	22.3%

In 2011 Eastern Cape was found to have the following sanitation infrastructure (DBE, 2011):

Table 5 Numbers and percentages for types of sanitation found at education sites in Eastern Cape (DBE, 2011)

Type	Number	%
Municipal flush	951	17%
Septic flush	189	3%
Enviro loo	49	1%
VIP	1,071	19%
Unimproved pit latrine	3,160	56%
Chemical toilet	40	0.7%
No facility	551	10%
TOTAL	5,930	N/A*

*Some sites have more than one type of sanitation.

Sixty-seven percent of education sites in the Eastern Cape were found to have inadequate sanitation (unimproved pit latrines, chemical toilets or no facilities). Acceptable on-site sanitation was found at 23% of sites and waterborne sewerage at 17%. The VIP represented 48% of the acceptable sanitation found and 83% of acceptable on-site sanitation found.

A study conducted in the Eastern Cape in 2007 found the majority of schools sanitation facilitates to be inadequately maintained (Wall and Ive, 2010). The main reasons for this were found to be the logistical difficulties relating to the large distance between schools, a lack of locally based service providers and poor transport and communication infrastructure. Figure 1 shows the breakdown of the various sanitation systems used in the Eastern Cape and some of the key issues. The analysis of the management capacity of the provincial Department of Education and the schools found that the schools not meeting minimum standards were unable to refurbish, upgrade or carry out the basic maintenance necessary (Wall and Ive, 2010).

Sanitation system	Schools No.	Comments
Waterborne / flush	1108	Many toilets are blocked and leaking
Flush to septic tank	62	
Flush to pond/plant	134	
Ventilated Improved Pit	1619	High percentage of pit latrines are full
Pit latrines	2511	55% of schools do not meet basic standards
Bucket	27	
Other	69	
None	887	
Total schools in Province	6417	

Figure 3 Sanitation systems in the Eastern Cape documented by Wall and Ive (2010)

Wall et al. (2012) note the following issues facing school sanitation in the Eastern Cape:

- Whilst there is a good strategic framework in place with high-level goals, planning at the local level is insufficient and often unrealistic.
- Whilst the public authorities may apparently have full staff complements, many of the incumbents lack the necessary level of skills required for their positions.
- Grant funding for infrastructure capital works is available; however the stringent processes required for planning and procurement are a barrier to implementation.
- Where the public authority has entered into supply contracts with small businesses, the inability of the authority to effect proper contract administration and regular and timeous payment frequently causes these businesses to fail – or to abandon the contract because they are unable to operate in this difficult environment.
- There is not sufficient incentive for officials to proactively drive the processes forward, and many appear to prefer to accept the bureaucratic log-jams rather than to work pro-actively to find ways to solve these administrative delays and problems. This negative situation is reinforced by the fear of the officials that they may be held liable for wrongdoing if they make decisions that may be judged as un-procedural.
- The Eastern Cape has a long history of education crises. The Eastern Cape DoE was during 2011 (not for the first time during the last decade) placed under the administratorship of the national government Department of Basic Education.

2.2.2 KwaZulu-Natal

Approximately 24% of South Africa's schools, 23% of its learners and 23% of its teachers are from KwaZulu-Natal. In 2013, 6,241 schools were documented in the province: 5,939 of which were public and 228 of which were independent. Data from 2011 documented 63 special needs schools in KwaZulu-Natal (DBE, 2011). In 2013, 2,866,570 learners were documented in the ordinary school sector, 2,798,975 of whom attended public schools. Twenty-three percent of learners, 22.6% of educators and 23.9% of schools in South Africa fell in KwaZulu-Natal.

Table 6 Numbers and percentages of national total of learners, educators and schools in the public school sector in KwaZulu-Natal (DBE, 2013)

	Learners	Educators	Schools
Public	2 798 975	91 285	5939
Independent	67 595	4 772	228
Combined % of national total	23%	22.6%	23.9%

KwaZulu-Natal has 12 educational districts that coincide with municipal district boundaries with the exception of the eThekwini Metro Municipality, which is divided into the two education districts of Pinetown and Umlazi.

Table 7 Education districts of KZN (DOE KZN, 2014)

DISTRICT	Public Ordinary Schools			Independent Ordinary Schools		
	Learners[1]	Educators[2]	Schools	Learners[1]	Educators[2]	Schools
AMAJUBA	127 526	4384	242	1 180	111	8
ILEMBE	161 635	5471	428	1 253	86	3
PINETOWN	323 494	11020	499	12 833	993	41
SISONKE	139 395	5225	445	1 441	102	9
UGU	197 649	6814	490	4 404	312	16
UMGUNGUNDLOVU	213 952	7413	496	14 128	1026	50
UMKHANYAKUDE	220 622	7678	537	1 577	100	7
UMLAZI	310 505	11396	463	15 353	1121	49
UMZINYATHI	180 664	6026	496	1 061	116	6
UTHUKELA	191 811	6644	445	1 849	148	12
UTHUNGULU	274 870	9545	659	3 736	299	16
ZULULAND	267 433	9091	739	2 485	111	11
PROVINCE	2 609 556	90707	5 939	61 300	4525	228

The KwaZulu-Natal Department of Education has a total budget of approximately R37 million (DOE KZN, 2014). An estimated sum of R40 billion is needed just to eliminate the infrastructure backlog, however (ibid).

In 2011 the following sanitation infrastructure was documented at schools in KwaZulu-Natal (DBE, 2011):

Table 8 Numbers and percentages for types of sanitation found at education sites in KwaZulu-Natal (DBE, 2011)

Type	Number	%
Municipal flush	1,294	22%
Septic flush	369	6%
Enviro loo	147	2%
VIP	1,857	31%

Type	Number	%
Unimproved pit latrine	2,834	48%
Chemical toilet	57	1%
No facility	160	3%
TOTAL	5,930	N/A*

*Some sites have more than one type of sanitation.

Fifty-two percent of education sites were found to have inadequate sanitation (unimproved pit latrines, chemical toilets or no facilities). Acceptable on-site sanitation was found at 39% of sites and waterborne sewerage at 22%. The VIP represented 51% of the acceptable sanitation found and 79% of acceptable on-site sanitation found. The KZN Department of Education reported, however, that unlined VIPs collapse when desludged (DOE KZN, 2014)

In its April 2014 Non-financial Performance Report, the KZN Department of Education indicated that it had built toilets at 417 schools through its Water and Sanitation Programme during the 2013/2014 financial year and expected that by the end of the 2014/2015 financial year all schools in the province would have toilets, although the inadequate numbers and unacceptable condition of toilets at some schools would require ongoing rollout of new toilets (ibid). The report indicates that the Department is piloting the use of on-site sanitation options other than VIP toilets.

2.2.3 Limpopo

In Limpopo, 1,714,832 learners were documented in 2013 in the ordinary school sector, 1,662,106 of whom attended public schools; 3,924 public schools were documented in the province. While 13.7% of learners and 13.4% of educators were found in Limpopo, 15.8% of the country's schools fell in this province (DBE, 2013).

Table 9 Numbers and percentages of national total of learners, educators and schools in the public school sector in Limpopo (DBE, 2013)

	Learners	Educators	Schools
Public	1 662 106	54 708	3 924
Independent	52 726	2 400	143
Combined % of national total	13.7%	13.4%	15.8%

Data from 2011 documented 18 special needs schools in Limpopo (DBE, 2011).

In 2011 Limpopo was found to have the following sanitation infrastructure (DBE, 2011):

Table 10 Numbers and percentages for types of sanitation found at education sites in Limpopo (DBE, 2011)

Type	Number	%
Municipal flush	322	8%
Septic flush	493	13%
Enviro loo	870	22%
VIP	1,122	29%
Unimproved pit latrine	2,857	73%
Chemical toilet	5	0.1%
No facility	36	1%
TOTAL	3,924	N/A*

*Some sites have more than one type of sanitation.

Seventy-four percent of education sites were found to have inadequate sanitation (unimproved pit latrines, chemical toilets or no facilities). Acceptable on-site sanitation was found at 64% of sites and waterborne sewerage at 8%. The VIP represented 40% of the acceptable sanitation found and 45% of acceptable on-site sanitation found.

2.3 Case studies

The following section provides examples of the issues described in school sanitation in the three target provinces.

2.3.1 Eastern Cape

Impilo Yabantu Services, a sanitation services company operating in the Eastern Cape, has serviced the sanitation blocks of 1,106 schools across four educational districts. Assessments found 96% of schools visited in need of some level of repair, ranging from replacing a toilet seat to installing emergency toilets as the school has none. Some of the schools which do not require maintenance are in the process of having new facilities constructed under the Accelerated Schools Infrastructure Development Imitative (ASIDI) developed by the DoE.

Jadezweni Junior Secondary School (Dutywa Educational District)
This school has 6 toilets for 96 girls (1:16), 5 toilets for 106 boys (1:21) and 2 toilets for 6 educators. All the toilets are pit toilets. The toilets have a zinc top structure with precast concrete pedestals. The school has no hand washing facilities.


Figure 4 Jadezweni Junior Secondary School

Masakane Senior Primary School (Cofimvaba Educational District)

This school had 3 pit toilets for 31 girls (1:10), 3 pit toilets for 46 boys (1:15) and 2 pit toilets for 5 educators. They were block construction and in very good condition. While no one was tasked with cleaning the toilets the leaners were sometimes given the job as punishment.


Figure 5 Toilet blocks and pedestals in good repair at Masakane Senior Primary School

Lower Qutsa Primary School (Cofimvaba Educational District)

This school has 8 toilets for 46 girls (1:7), 5 toilets for 34 boys (1:7) and 6 toilets for 5 educators; all are pit toilets. The educators' facilities are made of brick but were damaged by strong winds and the roof was blown off. The rest of the structure has consequently become unstable and when the seasonal winds reoccur will most likely be damaged further. The girls' toilets have a zinc superstructure that has also been damaged in the winds; it no longer has doors. The boys' toilets have no super structure and are just a series of pedestals on a concrete slab over the pit. The pictures below demonstrate the condition of the toilets. A number

Figure 6 Roofless teachers' toilets at Lower Qutsa

of other schools serviced by Impilo Yabantu have toilets damaged due to strong winds.

Figure 7 Girls' toilets damaged by winds (left) and boys' toilets without a superstructure at Lower Qutsa

S W Mbanga Junior Secondary School (Butterworth Educational District)

This school had waterborne toilets. There were 15 for 227 girls (1:15), 10 toilets and 2 urinals for 282 boys (1:24) and 6 toilets and a urinal for 13 educators. Toilet blocks doubled as a general storage area for rubbish and broken equipment. While the majority of the toilets worked there were toilet seats and doors missing and there was a lack of hand washing facilities.

Figure 8 Debris and broken equipment stored in the toilet blocks at S W Mbanga Junior Secondary School

Figure 9 Broken doors and missing taps at S W Mbanga Junior Secondary School

Hlobo Junior Secondary School (Butterworth Educational District)

At this school no specific person was tasked with cleaning the toilets. It needed a full clean but no repairs. There are 10 pit toilets for 59 girls (1:6), 9 pit toilets and a urinal for 88 boys (1:10) and 2 pit toilets for 10 educators. The toilets are built of face brick.

Figure 10 Toilet blocks and pedestals at Hlobo Junior Secondary School

Tshianane Secondary School

Tshianane Secondary School had a total of 417 learners and a toilet:learner ratio of 1:70. For the 219

Figure 11 Toilets without doors, vents pipes without covers and inadequate pedestals at Tshianane

girls there was a block of 4 pit latrines (1:55); the block had 5 ventilation pipes but none were functional. Each of the 4 stalls had a window and a door; one toilet was missing a toilet seat. For the 198 boys, there were two corrugated iron toilets with toilet seats and a third pedestal made of a corrugated iron sheet with no toilet seat (1:99 toilet:learner ratio). There were no windows for the toilets and only one had a door. The two ventilation pipes were not functional. The pits for both boys' and girls' toilets were not yet full. There was no hand washing facility for boys or girls.

2.3.2 KwaZulu-Natal

In 2013 Partners in Development visited schools in uMsunduzi Municipality to see what issues existed with infrastructure. While the survey did not include schools in deep rural areas, some of the schools in peri-urban areas which have similar situations are discussed below. In addition, PID monitored toilet blocks built in 2013 at two rural schools in eThekwini Municipality where pour flush toilets were tested .

Mpumalelo Primary School

Mpumalelo had a capacity of 1600 learners with an enrolment of 1475. The school had pit latrines located in 3 toilet blocks for each sex. Girls' toilet blocks had 5 toilets and boys' had 3 with a 3 person urinal, with a ratio of 1:45 toilets to learners – slightly lower than the 1:48 design due to low enrolment. Toilets for the 51 person staff, 12 of which are men, were located in the administration block, with 3 toilets for women (1:12) and 4 toilets (including 2 urinals) for men (1:3). There was one additional toilet for teachers on an upper level which was kept locked. While all of the pit toilets were functional, three blocks of learners' toilets appeared as though they had never been cleaned, although the caretaker said they were cleaned twice a week. The floors and walls were filthy. Puddles of urine were observed in all of the toilet blocks; in one faeces was found in the corner.

Figure 12 Learner pit latrine facilities, showing pools of urine (bottom left) and faeces (bottom right) on the floor at Mpumalelo Primary School

Nyonithwele High School

Nyonithwele High School was built in 1999. There were two main blocks of classrooms, with toilet blocks for boys (each containing 3 toilets and a slab urinal for 3 users) and girls (containing 5 toilets) upstairs and downstairs in each building. The upper set of toilets in each building was not in use; it was explained that these are kept in reserve in case the lower set become blocked. As a result, only half of the toilet facilities of the school were in daily use, increasing the ratio of toilets to learners from 1:25 (built infrastructure) to 1:49 (infrastructure in use). There were 9 men in the staff body of 35. There were 2 toilets and 2 urinals in the male staff bathroom (1:2). For women, there were 3 toilets in the administration block and a single toilet for the cooking staff at the kitchen (1:7). The toilets were reported to be cleaned once a week but were very dirty.

Figure 13 A toilet for learners at Nyonithwele

Mumzo High School

Mumzo High School had been functioning in temporary facilities since 2005, when the residential area in which it was located (known as “France”) was built. Construction of a permanent facility was supposed to begin in 2010 but had not yet commenced. The school served 850 learners. Two blocks of pit latrines had become full and could not be used. The municipality could not access these toilets with a vacuum tanker to empty the pits because of the temporary buildings blocking the way. Consequently, the municipality had provided the school with 9 bucket toilets which are emptied twice every week. In addition there were 2 single pit latrines which are in use. With a ratio of 1 toilet per 94 learners, staff reported that learners often waited in a queue for the toilet for the entire break time and still did not have an opportunity to use the toilet. The staff of 28 had no dedicated toilets; staff of both sexes must leave the school and walk to a nearby church to use the toilet facilities there.

Figure 14 Full pit latrines (left) and bucket toilets (right) at Mumzo High School. The two beige structures (centre right) cover functioning pit latrines.

Georgetown High School

Georgetown High School was built in 1970. It had a capacity for 900 learners but enrolment was at 832 at the time of the visit. One block of classrooms, along with toilets, was no longer in use. In the two other blocks girls' and boys' toilets were located both upstairs and downstairs; the downstairs toilets in the second block were not in use because of leaks. Each toilet block contained 5 toilets, and 3 toilets and a 3 person slab urinal for boys, with a ratio of 1:25 toilets in use to learners, while the facility was designed for a ratio of 1:20. There were 13 men among the staff of 35. There were 3 toilets for female staff (1:7) and 2 toilets and 2 urinals for male staff (1:3). The toilets were reported to be cleaned twice per day.

Figure 15 Male staff toilets (left) and sinks and toilets for learners (centre and right) at Georgetown High School

Sizmesele Primary and Thandaza High School in eThekwini

New toilet blocks were built in February 2013 at Sizmesele Primary and Thandaza High School, both located in deep rural areas of eThekwini Municipality. Regular flush toilets leading to a septic tank were installed along with 3 pour flush toilets at each school for research purposes. Deterioration of the facilities over the first 18 months appeared to be due to a combination of design issues and damage caused intentionally by users. Paint on the cement floors began to wear off quickly and the plaster between the wooden door frames of the stalls and the adjacent cement blocks began to fall out, possibly both due to a poor choice of design and materials. Security gates which had alternate bars going only halfway up allowed vandals easy access to the toilet blocks until the maintenance staff added more bars. Pour flush pedestals which did not have separate toilet seats fared better than the standard toilets, many of which had the seats broken off. Different cleaning practices in the two schools were apparent.

Figure 16 A damaged door frame, inadequate security gate and punctured Jojo tank

Figure 17 Differences in cleaning practices between the two schools were obvious

2.3.3 Limpopo

In 2013 Section 27 collected data from 10 schools in Limpopo as part of its campaign for norms and standards. The conditions of the sanitation blocks at a few of these schools are described below.

Lutandale Primary School

Lutandale had a block of 5 pit latrines for girls. Each stall had a hole in the wall for a window. None of the stalls had doors or seats and there were no ventilation pipes. For boys there were 3 corrugated iron pit latrines. Each had a door but not a seat and the stalls had no windows. There were no ventilation pipes. There were no hand washing facilities for boys or girls.

Figure 18 Toilets at Lutandale Primary School

Jaji Secondary School

Jaji had 312 learners. There was a block with 2 pit latrines for the 123 girls and another for the 189 boys. Toilet:learner ratios were 1:62 for girls, 1: 95 for boys and 1:78 for all learners. There were windows, doors and toilet seats for each toilet. The two vent pipes for each toilet were not functional. There was a tap each for boys and girls to wash hands but the water supply was not reliable.

Figure 19 Vent pipes and full toilets at Jaji Secondary School

Pholoahlaba Primary School

Pholoahlaba had 520 learners and a ratio of 1 toilet to 130 learners. There were 2 pit latrines each for the 233 girls (1:117 toilet:learner ratio) and 287 boys (1:144 toilet:learner ratio). The toilet blocks had small holes in the walls for windows in each stall. None of the stalls had doors; the toilets do have seats. There was a ventilation pipe for each toilet block but neither was functional. There were no hand washing facilities for boys or girls. All of the pits were full and maggots could be seen on the surface of the sludge in the pedestal.

Figure 20 Full pit latrines at Pholoahlaba

Humbelani Secondary School

Humbelani had 586 learners, with a toilet:learner ratio of 1:28. There were 2 toilet blocks containing 10 pit latrines for the 316 girls (1:32 toilet:learner ratio); half of the stalls had doors and 8 had a small "hole" for a window; the other 2 had no kind of window. Only 2 of the 10 toilets had seats. The 2 ventilation pipes were not functional. For the 270 boys, there were another 2 blocks with 10 toilets and also a urinal (1:23 toilet:learner ratio). Six of the toilets had doors and 6 had seats. Nine had a small hole in the stall for a window while 1 did not have any sort of a window. The two ventilation pipes were not functional. Two of the pits at this school were completely full and another 8 were almost full. There was no hand washing facility for boys or girls.

Figure 21 Toilets with broken or missing seats at Humbelani

2.3.4 Summary of issues

The condition of toilets in many of the schools visited represents an affront to human dignity and a serious impediment to learning. Where toilets are structurally unsound or do not afford privacy they cannot (or should not) be used as they are unsafe and violate the dignity of users. In addition, filthy conditions can render toilet blocks a threat to health. From these examples a number of issues can be identified which should be considered in the design of both infrastructure and management systems for school sanitation:

- **Design capacity:** Toilet:learner ratios ranged widely from 1:7 to 1:208, with some schools (particularly in Limpopo) operating significantly over design capacity while others (particularly in Eastern Cape) were operating significantly under capacity. Over use of facilities could accelerate wear and tear on infrastructure as well as make it difficult to keep toilets adequately clean during high use periods while under use may make maintenance too top heavy to be sustainable. For management, if a larger number of toilets cannot be sustained in terms of cleaning, repairs and safety, some toilets may need to be closed. Trends of population migrating out of the area or population growth should be considered in planning.

- **Number of toilets per sex:** In a number of cases boys' toilet facilities included fewer pedestals than those for girls but when urinal capacity was included more facilities were provided for boys than girls. It could be argued that more toilets should be provided to girls than boys as they require more time for urination and menstrual management. While roughly equal numbers of toilets may be provided to each sex for staff, at some schools (particularly primary schools) there were significantly more female staff than males, resulting in a far higher toilet:user ratio for women than for men. Staffing patterns in terms of sex should be considered during planning.

- **Location:** Proximity of toilets to users is important. In some cases staff noted that toilets were located too far away from where they were needed. Teachers should not have to walk far from classrooms to use the toilets and junior primary learners should have toilets sized for small children in their classroom area. Proximity and number of toilets for sports or evening events must also be taken into consideration.

- **Choice of technologies and components:** Some facilities demonstrated disregard for human dignity and health in their very design. Square cement holes serving as pedestals are degrading in nature. Many facilities were designed without hand washing facilities. In terms of breakages and vandalism, the fewer removable or breakable parts the less there will be to maintain, but this may be at the expense of comfort and user acceptance.

- **Safety and privacy:** School sanitation must provide an environment that meets the needs of users of each age and sex appropriately. For young learners, this could mean open plan toilets near the classroom to meet needs for safety, while for adolescent girls toilets with lockable doors out of view of the main circulation area may be required to meet needs for privacy.

- **User behaviour:** User behaviour has an enormous impact on the wear and tear of facilities and their cleanliness. Deliberate acts such as vandalising infrastructure or fittings or urinating and defecating on the floor was observed was a recurring problem. The cleanliness of staff toilets was typically acceptable.

- **Provision of hygiene supplies:** Provision of toilet paper ranged from no provision of toilet paper (learners are expected to carry their own with them from home), to a requirement that parents provide toilet paper to the school, to provision of toilet paper by the school. Soap and paper towel for washing and drying hands was not found in learner toilet blocks at any of the schools, although they were usually found in staff toilets. Bins for menstrual hygiene or rubbish were usually absent. Some staff reported that they did not provide hygiene supplies because they are stolen by learners.

- **Cleaning:** Cleaning reported at the schools visited ranged from having no plan in place at all to a cleaning regimen of 2 times per day. The toilets which did not appear dirty were those which were cleaned at least 2 times per day, after each break time. In visits to schools in the Pietermaritzburg area the most recently built facility appeared visually to be the dirtiest. In addition to filthy floors and pedestals, it appeared that walls were never cleaned.

- **Repairs:** In addition to the inadequacy of the infrastructure provided at these schools, the lack of maintenance in terms of both repairs and cleaning has rendered many toilets practically unusable. It was typical in all schools to find some broken toilet seats or pedestals without seats in learner toilet blocks. Missing doors and seats rob learners of privacy, safety and reasonable comfort while relieving themselves. Faecal matter, urine, and other filth which appears to have accumulated over time without cleaning present a threat of disease, exacerbated by the facts that the schools do not provide toilet paper or soap and few provide even water for washing hands.

- **Emptying:** In a number of schools emptying of full pits posed a serious problem, in some cases reducing the number of toilets available or rendering the school without sanitation at all.

2.4 Legislation and guidelines

The Bill of Rights provided in the South African Constitution (1996) provides for everyone's rights to an environment that is not harmful to their health and well-being which is protected from pollution and ecological degradation.

The Sanitation Policy Whitepaper (DWAF, 1996) defines ***sanitation*** as "principles and practices relating to the collection, removal or disposal of human excreta, refuse and waste water, as they impact upon users, operators and the environment". It goes on to define ***adequate sanitation*** as "the provision and ongoing operation and maintenance of system of disposing of human excreta, waste water and household refuse, which is acceptable and affordable to the users". Furthermore,

the Sanitation Policy Whitepaper emphasizes the importance of effective hygienic practices as well as an acceptable impact on the environment as key to the definition of sanitation.

The Strategic Framework for Water Services (DWAF, 2003) defines a ***basic sanitation facility*** as the infrastructure necessary to provide a sanitation facility which is safe, reliable, private and protected from the weather. It should be ventilated, keep smells to the minimum, be easy to keep clean, minimise the risk of the spread of sanitation-related diseases by facilitating appropriate control of disease carrying flies and animals and enable safe and appropriate treatment and / or removal of waste and wastewater in an environmentally sound manner.

In 2007 Parliament amended the South African Schools Act (Act no. 84 of 1996). Section 5A provides for the Minister of Basic Education to make regulations prescribing minimum uniform norms and standards for public school infrastructure and specifies what the regulations must contain. Section 58C requires Heads of Department (HODs) to identify resources in order to comply, identify risk areas for compliance, develop a compliance plan for the province, develop protocols with the schools on how to comply with norms and standards and manage risk areas and report to the MEC on the state of compliance and requires MECs to report annually to the Minister on provincial progress to ensure that the norms are complied with (South Africa, 2007).

After several years of lobbying by rights groups such as Equal Education, Minister of Basic Education Angie Motshekga published the *Regulations relating to minimum uniform norms and standards for public school infrastructure* under the South African Schools Act – the first legally binding norms and standards for school infrastructure – on 29 November 2013. The norms and standards, which apply to all public schools in South Africa, stipulate that a member of the provincial Executive Council must provide the Minister with detailed plans as to how the norms and standards will be implemented within 12 months of the publication of the regulations (i.e. by 29 November 2014) and annually thereafter (South Africa, 2013). These plans must address the following:

- Backlogs at a district level in each province
- Provide short, medium and long-term plans with targets and costings
- Address the planning and maintenance of new schools and the upgrade and maintenance of existing schools
- Include proposals for procurement implementation and monitoring

A member of the Executive Council must report annually to the Minister on the implementation of these plans. Schools without access to sanitation or a water supply and schools built from mud or other inappropriate materials (asbestos, metal or wood) must comply with the norms and standards within 3 years. The new minimum standards for water and sanitation at schools are presented in Table 10.

Table 11 Norms and standards for water and sanitation provision

NORMS AND STANDARDS FOR SCHOOL SANITATION INFRASTRUCTURE		
	Requirement	**Acceptable options**
Water supply	Schools must have sufficient water of good quality which complies with drinking water standards for drinking, personal hygiene and food preparation. Water must be available at all times with convenient access	Municipal reticulation network Rainwater harvesting Mobile tankers Boreholes Local reservoirs and dams
Sanitation facility	All school must have sufficient number of sanitation facilities. They must be: Easily accessible Provide privacy and security Promote health and hygiene Comply with all relevant laws Be maintained in good working order Provide separate facilities for teachers, girls and boys	Water borne sanitation Small bore sewer reticulation Septic or conservancy tank systems Ventilated Improved Pit latrines (VIPs) composting toilets ***NB: Unimproved pit latrines and bucket latrines are not acceptable***

The choice of an appropriate sanitation technology is to be determined through an assessment of the particular school. The number of toilets, urinals and wash basins are determined on the basis of the size of the school and whether it is a primary or secondary school. The capacities per number of users are presented in Section 3.8. For the planning and assessment of infrastructure, the norms and regulations classify public schools as follows:

- Primary schools (Grades R to 7):
  - Micro primary – capacity of < 135 learners
  - Small primary – capacity of >135 but < 310 learners
  - Medium primary – capacity of >310 but < 620 learners
  - Large primary – capacity of > 620 but < 930 learners
  - Mega primary – capacity of >930 learners

- Secondary schools (Grades 8 to 12):
  - Small secondary – capacity of > 200 learners
  - Medium secondary – capacity of >400 learners
  - Large secondary – capacity of > 600 learners
  - Mega secondary – capacity of >1 000 learners

In terms of other classification systems that are useful, the DBE grades the functionality of a school environment according to the following four factors (DBE, 2012):

- ***Basic safety***: No factors present which may cause harm to learners and educators and hamper carrying out the core functions of a school (these measures must comply with standards set by the Department of Health and the Department of Labour). A school with inadequate sanitation facilities or no access to potable drinking water does not meet basic safety requirements.
- ***Minimum functionality***: The school has the resources and basic facilities to enable it to perform the core functions of a school at the minimum acceptable level
- ***Optimum functionality***: The school has the resources and facilities to function beyond the levels of basic safety and minimum functionality
- ***Enrichment***: Functionality is already optimal but the school requires additional resources for a specific objective

In order to assist provincial education departments with targeting resources and support for the schools that are most in need, a system of five socio-economic quintiles was developed, with Quintile 1 representing school communities at the poorest end of the scale (DBE, 2011). In broad terms, the quintiles capture historical inequalities: 93% of schools located in the former 'homelands' are allocated to Quintiles 1 to 3 while 70% of historically white schools fall into Quintile 5 and 16% into Quintile 4 (DBE, 2011). A 2009 UNICEF review of school funding and management, however, found that the quintile system did not always provide an adequate degree of accuracy (DBE, 2011).

Table 12 Number of schools per quintile in 2009 (Action Plan, 2014)

	Q1	Q2	Q3	Q4	Q5	Total
EC	1 974	1 759	1 150	445	341	5 669
FS	953	200	200	78	100	1 531
GP	214	215	616	517	408	1 970
KZN	2 032	1 389	1 396	632	479	5 928
LP	2 151	687	934	150	66	3 988
MP	486	529	396	255	178	1 844
NC	251	149	89	48	63	600
NW	617	335	691	35	38	1 716
WC	282	123	251	339	458	1 453
Total schools	8 960	5 386	5 723	2 499	2 131	24 699
% of learners	27	19	26	15	13	100

Table 11 indicates that Eastern Cape, KwaZulu-Natal and Limpopo have the highest numbers of schools in Quintile 1, the poorest quintiles, ranging around 2000 schools in this quintile in each of these provinces while all of the other provinces have less than 1000 schools in Quintile 1.

Umgeni Water (2004) used the following categories to classify schools for a sanitation intervention programme:

- Primary or lower secondary schools
- Schools with no facilities
- Schools with infrastructure in total disrepair
- Schools with toilets but no water
- Schools with water but no toilets
- Schools with a water source that is polluted

For a survey of sanitation at schools in Uganda, the Ugandan Ministry of Education and Sports in Uganda classified schools according to the following categories (Uganda, 2006):

- Location (rural/urban)
- Ownership (government/private)
- School level (primary/secondary)
- Enrolment of pupils (school size categories from <500 to >2000 in steps of 500)
- Number of teaching staff
- Teacher/pupil ratio
- Number of children with disabilities

2.5 Institutional structures and responsibilities

In South Africa, the provision of school sanitation facilities is the responsibility of the Department of Basic Education. However, the Department of Water Affairs and Forestry (DWAF), now reformed as the Department of Water and Sanitation (DWS), is the custodian of the nation's water and was the lead department in the sanitation sector until the sanitation function was moved to the Department of Human Settlements in 2009. Following the presidential elections in 2014 a new Department of Water and Sanitation was established on 8 July 2014 and the sanitation function is expected to be fully transferred to this department by 26 September 2014 (Sithole, 2014). In its 2002 publication *Sanitation for a healthy nation* DWAF outlines the roles of various institution and the tasks they perform to help achieve and maintain adequate water supply, sanitation and hygiene in schools as follows (DWAF, 2002):

- **Department of Basic Education (DBE):** The national Department of Basic Education is responsible for curricula while the provincial Departments of Education are responsible for infrastructure, including sanitation infrastructure, at schools. The national DBE works together with the Department of Health to develop curricula, guidelines and resources addressing health, hygiene and sanitation.
- **Department of Health (DoH):** The DoH is required to support schools as follows with regard to health, hygiene and sanitation:
    - Provide guidance on the environmental health aspects of school design, construction and maintenance
    - Monitor environmental health conditions and child health
    - Provide training and advice for teachers, schoolchildren and parents on water, sanitation and hygiene
    - Provide selected health services (e.g. deworming treatment, hygiene promotion).

- **Department of Public Works:** Acts as the implementing agent when schools are constructed and have a responsibility to ensure that adequate sanitation is installed in schools.
- **Department of Environmental Affairs:** This department is responsible for developing standards that are aimed at protecting the environment. It can also educate learners about the benefits of a clean environment and the health risks associated with a polluted environment.

The provincial Departments of Education are responsible for maintaining sanitation infrastructure. Education districts are the administrative sub-division of the provincial DoE comprising a number of education circuits. The districts are primarily responsible for managing curriculum support and promoting professional development of educators, with responsibility for school infrastructure, particularly in terms of services such as water, sanitation and electricity, is still retained to a large degree at the provincial level. The core functions of the education districts do however including assisting schools to compile school improvement or development plans and providing oversight and accountability to principals for the performance of their schools; sanitation could receive a greater focus in terms of these activities.

While the national Departments of Education are responsible for the maintenance of sanitation facilities as they own the infrastructure, the municipality owns the infrastructure supplying water to the schools. (Wall and Ive, 2010).

The level of management given to a school in relation to their budgets is based on their assessed capacity to manage the funds as determined by the South African Schools Act (Section 21 of Act 84 1996). Based on assessments of the capacity of the school and the School Governing Body (SGB) the Act determines if a school is capable of managing their own finances. Any school falling under Section 21 of the Act receives a maintenance budget which is intended to cover the classrooms, school grounds and sanitation facilities for day-to-day maintenance and major emergencies (Wall and Ive, 2010). These schools also receive budgets to pay municipal bills. Section 21 schools may deal directly with suppliers and contractors for the relevant budgeted areas, while complying with standard operating procedures and with the audit procedures of the DoE. Non-Section 21 schools are not responsible for their own budgets so do not have the authority to engage service providers directly to carry out maintenance. These schools must procure services with the assistance of DoE officials from a budget allocation held by the DoE (Wall and Ive, 2010).

The South African School Act Section 20 (1996) states that School Governing Bodies are responsible for ensuring that the school runs effectively and efficiently as well as maintaining and improving school buildings, properties and facilities.

Non-governmental organisations can also play an important role in school sanitation, helping with hygiene awareness programmes, facilitating community participation, developing community based construction teams and implementing and monitor projects (DWAF, 2002). Communities can also play a role, lobbying their children's schools for better sanitation facilities, raising funds and encourage local political representatives to support sanitation initiatives (WHO,2004). While much of the international literature calls for investment from the community either in the form of financial support, community mobilisation or labour (Chatterly et al., 2014; Snel et al., 2002), because in South African communities are aware that DoE is responsible for maintaining sanitation

infrastructure there is very little community involvement in the operation and maintenance of school sanitation facilities.
Table 12 below identifies key stakeholders in the provision of sanitation at schools and their roles and responsibilities.

Table 13 Stakeholder roles and responsibilities (adapted by Wall and Ive, 2010)

Stakeholder	Role and responsibility
Water Services Provider (i.e. municipality or other external WSP)	Provision of municipal water and sanitation services to DoE, i.e. the boundaries of school properties
Provincial Department of Education	Employer – appoints Provincial Sanitation Manager who is the employer's representative. District inspectors of the DoE have an ongoing responsibility for school inspection.
DWS and National Department of Environmental Affairs (DEAT)	Regulation Water resource management Environmental authorisation and monitoring
School (Headmaster and SGB)	Acts as local client on behalf of DoE for matters relating directly to the individual requirements for each school
Contractor/service provider	Provider of sanitation services to schools
Parent Teacher Association	Dissemination of Health and Hygiene (H&H) information Special fundraising activities for facility improvement, etc.
Pupils	Users of toilet facilities Beneficiaries of the health and hygiene awareness activities
Other funders	Funding from corporate clients that could assist the sponsoring of schools as part of their social programmes, or, various bilateral funding could be channelled as part of overseas development assistance programmes

2.6 Initiatives to improve school sanitation

This section reviews some of the initiatives by the South African government and organisations to improve school sanitation. Many initiatives to address sustainable service delivery focus on short term outcomes and do not fully address the long term issues of operations and maintenance.

2.6.1 Initiatives by the governmental sector

The following plans drive the initiatives of the Department of Basic Education (DBE, 2014b):

- Action Plan to 2014: Towards the Realisation of Schooling 2025 (2010)
- Basic Education Delivery Agreement for Outcome 1: Improved quality of basic education
- Strategic Plan 2011-2014
- National Development Plan 2030 (2012)
- Annual Performance Plan 2014-2015 (2014)

Goal 24 of Action Plan to 2014: "Ensure that the physical infrastructure and environment of every school inspire learners to come to school and learn, and teachers to teach." (DBE, 2011).

The National Development Plan 2030 (South Africa, 2012) outlines the prevalence of infrastructure shortages in poor communities and emphasizes the need to equip rural, no-fee schools with quality

infrastructure to address their historical disadvantage. The plan presents the following goals and actions to improve school infrastructure:

Goals

- Eradicate infrastructure backlogs.
- Ensure that all schools meet the minimum standards by 2016.
- Undertake an infrastructure audit to enable proper planning.
- By 2030, all schools should have high quality infrastructure.

Actions

- Investigate the escalating costs of building schools.
- Develop measures to build schools at a reasonable cost without compromising quality.
- Expand infrastructure delivery capacity.
- To avoid construction delays clarify and streamline the responsibilities of different institutions including the Departments of Basic Education and Public Works, the Independent Development Trust, provincial departments of education, and local authorities.
- Reverse the decision to centralise the delivery of school infrastructure and develop capacity at the appropriate levels. Procurement decision making should remain decentralised but maintain a central role in providing enabling structures (in this case guidelines on price, materials and construction firms) as well as differentiated oversight.
- Plan new schools according to population trends and settlement patterns to avoid constructing schools where demand is declining. This will require closer coordination with local authorities.

The Annual Performance Plan 2014-2015 (2014) does not provide performance indicators and targets for sanitation but links to the longer term Accelerated Schools Infrastructure Delivery Initiative (ASIDI). ASIDI is the DBE's current initiative to accelerate the delivery of school infrastructure (Dept. of Basic Education, 2014). The ASIDI programme utilises several delivery structures including the DBSA, IDT, CDC and Department of Public Works. ASIDI is funded through the Schools Infrastructure Backlog Grant (SIBG). The programme is implemented through a four-pronged strategy which involves engagement with provincial DoEs to explore how targets might be reprioritised to more effectively address the 3,627 schools that need to be brought to basic safety functionality levels as well as the replacement of all inappropriate school structures, particularly mud schools situated in the Eastern Cape (which is aided by an additional conditional grant). Specifically, the programme aims to achieve the following:

- 510 schools that were built with inappropriate structures will be replaced with brand new schools that meet the department's standards of basic functionality
- 939 schools that previously did not have any access to sanitation will be supplied with a basic level of sanitation
- 932 schools will get electricity for the first time
- 1145 will be provided with basic water supplies for the first time

The needs of schools are assessed and the extent of infrastructure provision established. The DBE appoints implementing agents who implement and manage batches of projects on its behalf, procuring and appointing professional service providers and contractors to execute the work.

Progress towards the targets set by the DBE in its Accelerated Schools Infrastructure Delivery Initiative (ASIDI) in 2011 was reported as follows in March 2014:

- 266 of 939 schools that previously did not have access to sanitation were supplied with a basic level of sanitation
- 224 of 1145 schools have been provided with basic water supplies for the first time (DBE 2014).

In 2000 the Department of Basic Education established the School Register of Needs, a database included every school in the country, including their geographical location, the condition of building and facilities available. This has developed into the National Education Infrastructure Management System (NEIMS), which collates information on size, capacity, type of building, electricity source, and water source and sanitation facilities. This information can be used by decision makers during infrastructure planning and programme.

The DBE has indicated that it is working with the Department of Science and Technology on a programme to improve school infrastructure in the Cofimvaba district of the Eastern Cape (Mafoko, DBE, Pers. comm., 14 Aug 2014). The DBE is also involved with an installation of 51 Enviro loos in Limpopo (ibid).

In KwaZulu-Natal the DoE Strategic Plan for 2010/2011-2014/2015 states in Strategic Objective 1.2 that 450 schools in rural districts must be provided with clean water and 400 schools must be provided with adequate sanitation. It sets out milestones of providing adequate sanitation to 50 public ordinary schools per year over the five year period covered in the plan (DoE-KZN, 2010).

2.6.2 Examples of initiatives by the non-governmental sector

Umgeni Water integrated programme

In 2004 Umgeni Water proposed an integrated schools water, sanitation and food security programme in collaboration with the Department of Education, to be launched in the Sisonke, Ugu and Umgungundlovu District Municipalities in KwaZulu-Natal (Umgeni Water 2004). The programme incorporated involvement of the KwaZulu-Natal Department of Education and Culture, Umgeni Water, the Department of Agriculture, and Department of Health, and a number of private organisations and worked actively with School Governing Bodies. In terms of sanitation, the programme aimed to build appropriate water and sanitation infrastructure and formalise the inclusion of health and hygiene into the school curriculum.

Mvula Trust's rural schools sanitation project

Mvula Trust implemented a rural schools sanitation project in three provinces: Northern Province (now Limpopo), Mpumalanga and KwaZulu-Natal. The programme involved the funding of more than 200 schools to erect good basic sanitation facilities in the form of VIP latrines. A cluster approach was adopted whereby up to 5 schools formed a cluster through which the projects were implemented. Each school was required to raise 10% of the costs. An evaluation by DRA and Condene (1999) found the following:

- There were several advantages to the cluster approach including economy of scale; improved project learning at the local level; networking between schools; and improved momentum. However this approach also caused some tension between schools, less transparency in terms of finances, and resulted in some schools being inappropriately linked to the project (had different needs).
- The three main management agents were the schools themselves (either through the principal or the SGB), a project steering committee (PSC) involving community representatives and the project agent. It was found that where the PSC was strong the school's role diminished and where the PSC was weak the school's role was increased. The ideal situation was for an equitable sharing of roles and responsibilities. The transparency of financial allocations and use was generally a key concern expressed by the PSCs and school management teams.
- The 10% contribution required from the communities proved to be a success in that communities felt far more involved and committed to the projects.
- From a design aspect, the schools were satisfied that an appropriate number of toilets were provided. However aspects that did not receive sufficient attention were that the hand washing facilities were not adequate (in some cases no hand washing facilities were provided), toilet seats were too big and pedestals too high for the pre-schools and doors were often not sufficiently robust (or screen walls were built instead of doors, which reduced privacy).
- The health and hygiene education programme was generally a success. However it was done as a once-off intervention by the project agent. It would have been improved if the teachers were trained and given the materials to teach the children.
- Handing over of the toilet facilities provided an additional opportunity to instil a sense of ownership and pride in the achievements, supporting ongoing care and maintenance of the facilities.

Schools Infrastructure Support Programme (SISP)

From 2006 to 2008 the European Union funded the Schools Infrastructure Support Programme (SISP) in three provinces (Limpopo, KwaZulu-Natal and Eastern Cape). Twenty-seven schools were supported (9 in each province) in which facilities, including sanitation facilities, were improved. The programme also focussed on building capacity at national, provincial and school level to plan, implement and maintain the facilities. The specifications for sanitation facilities were:

- At least one toilet block made up of 15 seats: 12 for learners (6 each for girls and boys), 1 for disabled users and 2 for teachers.
- Waterborne, VIP or urine diversion technologies were used.
- Toilet blocks were built with face brick, had a steel float finished concrete floor, a window and door for each cubicle, and an IBR roof with "Sisalation" to provide thermal insulation.
- Hand washing basins were installed outside the entrance to each block.

3. INFRASTRUCTURE: CONSIDERATIONS FOR DESIGN

3.1 Determining design needs

The design challenges we face today were already apparent in the early days of school sanitation in 19th century Europe. Robson, in his volume on school infrastructure (1874) grappled with such issues as privacy, lighting, ventilation, hardware, proximity to classrooms, toilet:user ratio, management and maintenance. The following guidance which he developed provides a good introduction:

> The latrines should be so located as not to be too far from the school, and yet sufficiently far off to prevent any possible smell reaching the windows. But for the fact that due attention is not always paid to the proper condition of closets by school teachers and managers, it would not be necessary to point out this. The approaches and doors from the schools should, of course, always be separate for the sexes, and the former should – imperatively in the case of infants – have covered ways, so as to obviate any danger of damp feet… Without shutting any door, the whole should be perfectly enclosed from observation. Each closet should be separated by a partition, and each should have a separate door, with proper light and ventilation. As to fittings, iron troughs have been found in practice to be the most economical, and the least open to tampering liability to get out of order. They should invariably be thoroughly flushed out once every day, in summer twice a day. Neglect of this precaution frequently produces a nuisance…The number should be, three to the first hundred, and one in addition for every succeeding fifty. The teachers and caretaker require also separate provision. The caretaker's should adjoin that for the children, to ensure the necessary attention to the latter (Robson, 1874).

In addition to the needs of users, design should consider environmental needs and management needs, such as monitoring, maintenance, cleaning and emptying on-site collection chambers.

Today, a number of guidelines exist which address the design of school toilets. The IRC's manual *Child-friendly hygiene and sanitation facilities in schools* identifies 10 characteristics which sanitation facilities should possess in order to be "child friendly" (Zomerplaag & Mooijman, 2005):

1 They should be 'interactive' spaces that stimulate children's learning and development.
2 They should be designed with the involvement of children, teachers, parents and communities.
3 They should provide the lowest-cost solutions available without compromising on quality.
4 They should have operation and maintenance plans in place.
5 Their dimensions and features should be appropriate to children.
6 They should address gender-related needs and roles.
7 They should not harm the environment.
8 They should encourage hygienic behaviour.
9 They should offer adequate capacity so as to ensure minimal waiting time.
10 Their location should be carefully chosen.

In the UK, the national charity ERIC launched the Bog Standards Campaign in 2003 to work for better sanitation facilities in schools (Welsh Government, 2012). The Bog Standards' Suggestions for good toilet design and the IRC (Zomerplaag & Mooijman, 2005) identify the following criteria for toilet facilities for school children and staff:

- Adequacy: The number of toilets must be adequate for the number of users
- Access: Toilets must not be located more than 30 metres from all users
- Privacy
- Security
- Child-friendly
- Appropriate to local cultural and social conditions
- Appropriate to local environmental conditions
- Hygienic in design
- Easy to clean
- Adequately lit
- Hand washing facilities must be conveniently provided
- Clean and functioning: A cleaning and maintenance routine must be in operation that ensures toilets are cleaned at least twice a day in good condition at all times
- Sanitary fittings and fixtures need to be of good quality and of robust design
- Maintenance and replacement costs need to be considered.

Burton (2013) notes the following issues with school toilets that were identified during surveys with users:

- restricted access or time (break times only, access controlled by adults)
- missing, unreachable or dirty soap
- lack of toilet paper or bins
- doors that don't lock
- toilets that smell
- fear of bullying
- embarrassment at having to ask to use the toilet, or for allocated paper
- missing/broken toilet seats
- toilets blocked/won't flush
- dislike of urinals

3.1.1 Menstrual management

International studies have found that the absence of toilets or the absence of separate private facilities in schools for girls is a major reason parents keep their daughters from attending during menstruation in some communities (Mengistu, 2012). In a study undertaken by the University of Oxford on the impact of providing sanitary pads to poor girls in Ghana (Scott et al., 2009), the impact of school attendance during menstruation was found to be very high, particularly in rural areas: 95% of girls in a rural village interviewed reported missing school during menstruation, while in peri-urban villages 20% reported missing school. Similarly, a 2011 study at secondary schools in Malawi found that poor sanitation facilities for girls contributed significantly to absenteeism (Pillitteri, 2011). Ninety-five percent of girls reported using reusable menstrual cloths made from old clothes; problems with cloths smelling or falling out at school were reported. Some (11%) reported leaving class to change their menstrual cloths and then going home rather than returning to class, while 7% said they didn't come to school at all during their menstruation period (ibid).

3.1.2 Special physical needs

Zomerplaag & Mooijman (2005) report that as many as one in five of the world's poorest individuals have a disability and experience a daily struggle accessing basic services such as sanitation, with the result that opportunities such as education, as well as health, are compromised.

Zomerplaag & Mooijman (2005) point out that many different standards and criteria are in use for defining and measuring disability, resulting in widely varying estimates of the number of number of children with disabilities and children with special access needs which don't fall within a particular set of criteria not getting the services they need. The fact that schools often do not make the adaptations necessary for learners with disabilities to access facilities results in children with disabilities being excluded from schools (ibid). Where children with disabilities attend schools that do not provide toilets which they can access, they may avoid relieving themselves for the entire school day, as well as avoiding drinking fluids, with potentially serious consequences to their health (ibid). The South African standards for school sanitation require that all schools comply with the principles of universal design which require facilities to be inherently accessible to users irrespective of age or ability (South Africa, 2013)

> "All latrines should be able to accommodate the "un-average" person". (DWAF, no date)

Zomerplaag & Mooijman (2005) identify three main types of disability which require adapted facilities:

- Blindness or limited vision: special grips, guiding systems and proper lighting may be required
- Ambulatory limitations: elimination of steps, wider doors, special grips or foldable seats may be needed to accommodate wheelchairs or crutches.
- Missing/paralysed arms: lids, taps and knobs must be able to be opened with one hand or operated with the feet.

In South Africa, the 2001 census found that around 5% of South Africans have a serious disability which prevents full participation in life activities (DWAF, no date). Half of these have physical disabilities related to limbs or sight. This means that up to one million South Africans – at least one in every 20 households – require special adaptations for people with disabilities (ibid). In addition, people who are temporary disabled following injury or surgery may require adaptations. For this reason, the term "special access toilet" used by Deverill and Still (1998) may be best suited for these facilities.

> "The truth is that there is no clearly defined separation between the well and the infirm and that many of those considered well will suffer some infirmity. The old idea that barrier-free architecture is catering to a minority is no longer valid"
> James F. Hillary, American Institute of Architects (DWAF, no date)

Common problems in existing toilets are doorways that are too narrow or open inward, inadequate floor space in the cubicle, different floor levels when accessing the toilet, large opening in the toilet seat, a lack of grab bars for support, taps that are difficult to operate, and dark conditions inside stalls.

In addition to provision of infrastructure for learners needing special access at South Africa's 25,720 ordinary schools, there are over 359 special needs schools operating across the country (DBE, 2011).

3.1.3 Psychological needs

In her review of literature on school toilets, Burton (2013) highlights the role of toilet facilities in meeting the social and psychological needs of users. Toilets provide privacy to users not only for performing their bodily functions but also in terms of personal space. On the other hand, users can look to the toilet facilities for a place to "hang out" with some privacy from the wider school body. Burton cites a study conducted by Lundblad in 2009 which found that the toilet "had several uses and purposes. It could be used as a place of refuge to give or receive consolation, a place to drink water, to check on appearance and as a pretext to take a break". ERIC (no date) points out that bright, colourful toilets boost morale.

Users need to feel safe from the fear of being raped, mugged, bullied or pressured to smoke or take drugs when they visit the toilet. In the South African context, there is also anecdotal evidence that in some communities users may fear that their excreta could be used in black magic to harm them.

3.1.4 Sustainability: operations and maintenance

Operations and maintenance should also be considered during the planning phase. The ASIDI programme provides an opportunity to address the early planning and implementation of an O and M plan. Brikke and Bredero (2003) detail the operations and maintenance requirements of different sanitation technologies in order to enable planners and project staff to make informed choices. They address not only parts and materials but also the skills required for the building, maintaining and operating of different technologies.

Table 13 details the factors identified by UNESCO that influence the selection of community sanitation technology and how they relate to O and M considerations (adapted from UNESCO, 2003).

Table 14 Factors that Influence the Selection of Community Sanitation Technology (adapted from UNESCO, 2003)

Factors of general relevance	Factors specifically relevant to O&M
Technical factors	
• Design preference (substructure, floor slab, squatting or raised seat, superstructure); • Technical standards and expected lifetime of the technology; • Availability of construction materials; • Cost of construction.	• O&M requirements; • Ease of access; • Use of decomposed waste; • Pit-emptying technique.
Environmental factors	
• Soil texture, stability, permeability; • Groundwater level; • Control of environmental pollution; • Availability of water; • Possibility of flooding.	• O&M implications for environmental protection; • Protection against groundwater contamination; • Protection from flooding.
Institutional factors	
• Existing national/local strategies; • Roles and responsibilities of actors implied; • Training capacity; • Availability of subsidies and loans; • Availability of masons, carpenters, plumbers, sanitary workers, pit-emptiers and pit-diggers.	• Pit-emptying services (municipal/private); • Sewerage maintenance capacity; • Potential involvement of the private sector; • National budget allocations for sanitation; • Monitoring.
Community factors	
• Sociocultural aspects – taboos, traditional habits, religious rules and regulations, cleansing material, preferred posture, attitude to human faeces, gender-specific requirements; • Motivational aspects – convenience, comfort, accessibility, privacy, status and cleanliness, ownership; • Discouraging factors – darkness, fear of falling in the hole, or of the pit collapsing, or of being seen from outside, smells, insect nuisance; • Social organization factors – role of traditional leadership, religious leaders, school teachers, community-based health workers; • Other factors – population densities, limited space for latrines, presence of communal latrines.	• O&M costs; • O&M training and awareness for sanitation; • Health awareness and perception of benefits; • Presence of environmental sanitation committee; • Women's groups; • Social mobilization on hygiene and sanitation behaviour.

3.2 Design process

The IRC (2005) stresses that while the use of standardized designs can be attractive in order to reduce costs and control quality, users should be actively involved with all phases of the design process. If effectively engaged, learners and teachers are able to assess their existing practices and find solutions for their needs, which can both avoid the use of inappropriate solutions or the neglect

of specific local conditions and needs, as well as increase acceptance of the solutions that are implemented. Women's and girls' needs, knowledge and opinions have sometimes been ignored where they were not involved in decision-making; a gender-biased division of responsibilities during design, construction, operation and maintenance should be avoided (IRC, 2005). IRC (2005) provides a useful checklist which can assist with the design process.

IRC (2005) argues that children are typically curious and interested in the world around them and can be good at finding solutions to the problems that affect them. In addition, learners are much more likely to adopt appropriate hygiene practices when they understand the importance of sanitation improvements and are involved in finding their own solutions. It offers the following guidance on utilizing a participatory design process:

- It is important to assess the readiness of the stakeholders. Do they see their sanitations conditions as problematic and do they want to change them? An awareness raising process may need to be facilitated.
- Hygiene and sanitation can be a sensitive subject and discussions should be facilitated by a neutral adult in an informal environment where a safe space can be established for talking openly about issues such as urinating, defecating and menstruation, probably with participants separated by sex and without authority figures (teachers, etc.) present. Facilitators should speak the local language; have in-depth knowledge of local customs and habits related to hygiene, water and sanitation; and ideally be of the same sex, social class and ethnic group as the participants. Engage users about the reasons for current problematic behaviour without assuming that it represents "misbehaviour".
- As it is impossible for the entire community to participate directly in the design process, a committee should be elected which is balanced in terms sex, ethnic group and social class. This committee should report back on their findings at the end of each design phase.
- Innovations should be piloted with a full scale model or at a temporary testing facility so that users can experiment with it.

Burton (2013) notes that while consultation with children and parents is key, this may not result in consensus. She describes the redesign of toilets as one high school where a survey conducted with adults and children identified shared objectives: "no urinals, no smells, privacy, cleanliness and no opportunities for bullying" but learners favoured an open plan toilet design while adults did not.

As part of the implementation of England's *Aiming High for Young People* strategy, the Sorrell Foundation's programme ***Joinedupdesign for myplace*** engages children in the design of the spaces they use. The Foundation asked their bid teams to create client teams from the target group of youth and match these with creative teams comprising architects, branding experts and creative advisers. The professionals work with the children to develop concepts in response to their design briefs.

"This kind of engagement benefits the participants enormously. It expands their agenda, raises their expectations, exposes them to new aspects of life, and having their views taken seriously is hugely beneficial." Keith Priest, Fletcher Priest Architects on the Sorrrel Foundation programme

The Sorrell Foundation makes the following compelling arguments for involving children in the design of the spaces that they use:

- They are the consumers.
- Facilities for children are built for and used by young people. They are the real experts in what works for them and their peers.
- They become informed, inspired clients, adding real value to the process.
- Young people contribute energy and a creative spark to the design process, bringing fresh thinking to the table in the conversation with their designers. If time is taken to inspire and inform them about the design process, they can add value at every stage, from being involved in the selection of the architect through to the completion of the project.
- It can help deliver design that is more than fit for purpose.
- Young people want the best from their creative teams. While being pragmatic and aware of the limitations of a project, they always strive for the best possible design.
- It raises everyone's game.
- In recruiting an enthusiastic, passionate team of young people, who will be directly affected by the outcome of the finished building, there is more at stake. This motivates everyone involved in the design process.

The Sorrell Foundation lists the following benefits which youth in its programme have experienced with are salient to learners in South Africa:

- Learners develop the ability to work together to achieve a common goal.
- Through meetings with their team and with stakeholders, learners develop communication, negotiation and presentation skills.
- Working with professionals and authority figures helps learners develop insight into the working world and the real life power structures in their school and community, developing their abilities to negotiate these spaces.
- Learners have to work with practicality and functionality as well as creativity in the design process, grappling with engineering challenges and budget constraints and making difficult choices which they know they have to stand by.

In its guidance on the design of school facilities, the Department for Education and Skills in the United Kingdom (no date) states that:

> "Involving pupils in the design process has been found to increase their sense of pride and ownership of their school buildings, helping to reduce vandalism and bad behaviour. Pupils should be involved in aspects of the design – such as choosing colours and finishes for the toilet facilities – wherever possible. Another option is to incorporate pupil artwork into the laminate finish of the cubicles and associated panels."

In his report *Lifting the lid on the nation's school toilets*, the Children's Commissioner for Wales (2004) describes a school at which pupils and staff worked together to design new school toilets:

"The caretaker and volunteers transformed the former 1950s style toilets into bright, modern coloured suites in lime green, bright pink and lavender. The pupils then chose names for each block – Groovy Chick, Hunny Bunny and Winnie the Pooh! Mirrors have been provided in all suites as well as soap dispensers and sanitary provision. The Deputy Head teacher, Cath Rogerson said the response from the pupils has been fantastic."

Figure 22 Expanding the aesthetic boundaries of school toilets: Thirslington stall doors in "juicy pink"

In the UK, the company Thrislington Cubicles has taken on the challenge of transforming the aesthetics of school toilets to create a more positive environment for users (Thrislington Cubicles, no date).

While budgets for cosmetic aspects of school sanitation may seem like a luxury that is out of reach for poor schools in the developing world, Trevor Mulaudzi, founder of the South African Water and Sanitation Academy (SAWASA) has enjoyed success with a model of raising funds from businesses to renovate school toilets to a high standard. He believes that the more dramatic the visual improvement of the schools the more powerful the impact on user behaviour (Trevor Mulaudzi, pers. comm.).

Figure 23 SAWASA doing a "deep clean" of a school toilet; (Source: Trevor Mulaudzi)

Figure 24 School toilets renovated by SAWASA (Source: Trevor Mulaudzi)

Zomerplaag and Mooijman (2005) encountered architects who felt that investing in toilet facilities was a waste of money as learners would vandalise them. They felt that construction and fittings should be done as cheaply as possible to minimise replacement costs. Zomerplaag and Mooijman (2005), however, advocate that while some users may damage facilities "*we should design for the majority of pupils who deserve decent toilets, not the minority.*"

"Active involvement of the users is essential in all phases of the design process. In general, when properly coached and guided, potential users are perfectly able to assess their existing practices and find solutions for their own needs." IRC, 2005.

IRC's (Zomerplaag and Mooijman, 2005) manual on child friendly design of sanitation facilities provides guidelines for ensuring that sanitation is appropriately designed for each age group in terms of the knowledge and attitudes that are prevalent in the age group, the level of participation leaners can have in the process and the implications of these for design. A sample of these guidelines for the age group 5-7 (early primary) is provided in Table 13 below.

Table 15 Sample guideline for design of appropriate sanitation for age group 5-7 (Zomerplaag and Mooijman, 2005)

Knowledge & Attitude	Implications for the design of hygiene and sanitation facilities	Children's participation
Children in this age group experience the positive effects of personal care on their appearance (washing themselves, combing their hair and brushing their teeth). They tend to value things in a simple way: looking and smelling good means feeling good…	Facilities should reflect the sensation of being clean: light colours, sufficient natural light and ventilation. Themes used in hygiene promotion materials can be used for decoration to strengthen the link between education and practice. Facilities should be designed in such a way that a teacher or older student can stand next to the child to teach it how to use the toilet properly. However, most children can complete simple actions or tasks on their own or with minor assistance. There is no direct need for privacy; children like to observe others and imitate their behaviours.	In this age group children could become actively involved in design, planning, maintenance and operation of facilities. However, they cannot be held fully responsible and require close guidance of adults or older children.

3.3 Location and layout

Deverill and Still (1998) identify the follow aspects which should be considered when determining the location and layout of toilet and hand washing facilities:

Social (user) considerations	Management considerations	Technical considerations
Segregation Convenience (access) Privacy Security Limiting social space Needs of users with disabilities Needs of preschoolers	Care of toilets Expansion Emptying Use of space	Ease of excavation Wind direction (doors, odours) Water table (drainage, flooding) Contamination

The IRC (2005) notes that monitoring and supervision is another management concern. WHO (2009) notes that priorities for location and layout will differ for different age groups: toilets for young children who need assistance when going to the toilet should be designed for easy supervision by teachers, while entrances for toilets for older children should be positioned for maximum privacy.

Hand washing facilities can be built inside the toilet block and/or located at convenient locations around the school (Still and Deverill, 1998). Locations depend on access to water, however. Placing hand washing facilities in the open may increase passive surveillance by staff reducing vandalism and theft of soap and fittings as well as increasing safety but compromise privacy, especially for girls who may need access to taps to manage their periods. Taps should therefore be provided inside the toilets, if elsewhere as well. Placing taps near the play area may encourage hand washing before and after eating and contact with soil as well.

3.3.1 Access

India (no date) notes that it must be possible to reach facilities at all times and in all weather conditions including during heavy rains. Access routes must be open and clear, without long grass and bushes where snakes, dogs, or other threats could be lurking (ibid). In addition, India (no date) points out that facilities should not be located on the fringes with other 'unwanted' activities, such as waste collection which causes nuisance, such as bad smell, flies and other pests. This will demotivate people to use the facilities.

> "Even a well-designed facility faces the risk of not being used if it has a poorly considered location."
> - IRC, 2005

The WHO (2009) advises that toilets should be located within 30 m of users.

Facilities should be located near classrooms so that learners who need to relieve themselves during class can do so without teachers fearing that they will be away from the classroom for a long time (ERIC, no date) and so that learners with special toileting needs or other special needs can access the toilet quickly and without difficulty. A solution for this is to attach a toilet to each classroom or cluster of classrooms are a particularly good solution (ibid). These allow pupils easier access to toilets during lessons and enable teachers to keep a closer eye on pupils (ibid). Toilets must also be provided which can be accessed during break time/sport or assembly and exams, however (ibid).

A Special Access Toilet for disabled and elderly users should be provided in a position which allows both sexes, parents and staff to make use of it (Deverill and Still, 1998). As the Special Access Toilet may be used by both boys and girls it may be necessary to site it away from both the girls' and boys' toilets; however it could be constructed adjacent to the teachers' toilet facilities (ibid).

The UK DfES (2007) advises that wheelchair accessible toilets should be distributed across the whole school for use by staff and visitors as well as by disabled pupils and that there should be a small number of additional staff and visitor toilets near the administration facility and staff room.

If access is to be given to nearby households to use the facilities, this should be considered during the planning and design phase (India, no date).

3.3.2 Safety

The facilities should not be located in an isolated place due to the risk of rape or harassment (IRC, 2005). Facilities should not be built right next to a fence adjacent to a public footpath or other area where users may fear intimidation or abuse (Deverill and Still, 1998). The facilities must also be at hearing distance and/or have visual contact with the school so that users can alert staff if assistance is needed (IRC, 2005).

Deverill and Still (1998) state that toilets and hand washing facilities for boys and girls should be fully segregated, preferably in different parts of the grounds, to increase safety for girls. The Welsh Government (2012) requires that toilet areas for male and female learners over the age of eight to be separate. The UK MfES (2007), however, states that hand washing areas can be integrated into the outside area and may be unisex, as this has been found to reduce the opportunity for anti-social behaviour.

The IRC (2005) points out that that harassment and molestation does not only occur between the sexes. Older or stronger children can tease, bully or molest younger or weaker children, or one group of children might harass or harm members of another group of the same age. It is important, therefore, to not design only for separation of boys and girls but to design to minimise the potential for some children to control the spaces inside toilets, depriving others of the comfort and safety to attend to their physical needs. If practical, toilets for specific year groups could be provided to reduce the opportunity for bullying (ERIC, no date). Alternatively, a group of single pit latrines can be provided instead of a block of latrines, so that there is no internal space where learners can loiter, unsupervised (Deverill and Still, 1998). This layout option may not necessarily cost more, but it will use significantly more space.

If a toilet block is used, the layout inside the toilet blocks should avoid hidden corners or spaces that cannot be easily monitored by staff (ERIC, no date). The UK DfES (2007) recommends that toilets be positioned so that the communal areas can be seen from outside without jeopardising privacy, with cubicle doors at 90 degrees or greater from the circulation route.

Thrislington (no date) advices that spaces should be kept small within the toilet facility to discourage the use of toilets as hangout places where harassment or other behaviours that violate school rules can be engaged in (UK DfES, 2007).

Pre-primary children are best catered for with open plan shared cubicles where the teacher can supervise and train all the children together (Deverill and Still, 1998).

UK DfES (2007) advises that toilets should be arranged in small blocks, not in a large central block, stating that small blocks are preferable for the following reasons:

- they increase the opportunity for passive supervision, thus discouraging anti-social behaviour
- they reduce disruption caused by cleaning and maintenance
- they cut down curriculum time lost through pupils visiting toilets during lessons.

Plumbing or collection of sludge must also be considered in the location and layout of toilet blocks and hand washing facilities.

3.3.3 Privacy

India (no date) notes that facilities and their access routes should be located away from busy public places and roads adjacent to the school grounds for privacy.

In addition, IRC (2005) points out that in some cultures it is important not to be seen entering or leaving the toilet facility, and so the location and orientation of facilities should be chosen in consultation with stakeholders.

ERIC (no date) proposes the following design considerations to ensure privacy:

- Cubicles must have walls and doors that cannot be peered over or under wherever possible.
- There shouldn't be gaps between hinges.

- Urinals should be positioned so they can't be seen from outside the toilets when the door is open.
- Urinals should be individually screened.
- Mirrors should be positioned so they don't enable people to see urinals or cubicles from the outer door.
- People at washbasins should not be facing those at urinals, or facing a mirror which shows urinals.
- All windows should have frosted glass if urinals or the inside of a cubicle can be seen through them. If windows need to be opened, they should not be placed in view of urinals or the inside of a cubicle.

UK DfES (2007) recommends that toilet blocks be designed with no views directly into cubicles; instead, doors to cubicle must be positioned at 90 degrees to the circulation route, allowing common areas can be viewed without privacy being jeopardised.

In contrast to the recommendations to prevent social gatherings in the toilets, Burton (2013) suggests that toilets are important places of social activity or personal retreat, and should be designed to be comfortable and pleasant "hang out" places to accommodate this.

3.3.4 Monitoring and supervision

Location should be chosen to facilitate monitoring of users both in terms of assisting children when needed and in terms of preventing antisocial behaviour (bullying, smoking, etc.) (India, no date). For younger children, locating a hand washing facility near the door of the classroom rather than near the toilet may better facilitate teachers helping leaners to develop the habit of washing their hands (ibid), while locating hand washing facilities near classrooms or offices may help to curb vandalism of taps or theft of soap or hand drying towels.

Deverill and Still (1998) note that facilities should not be located on the edge of the property where learners may find it easy to leave school on the pretext of going to the toilet. As it is important for learners to be able to use the toilet during class when needed, a clear view of the path from the admin building or classrooms (or toilets accessed from inside the classroom) will enable staff to monitor loitering after learners have used the toilet. Thrislington (no date) suggests that toilets be positioned opposite offices, staff work rooms or preparation rooms so that passive supervision can be ongoing throughout the school day.

In addition, ideally the location of the facility should enable a security person to monitor the facilities to prevent unauthorised use by the community or vandalism outside of school hours (India, no date).

3.3.5 Environmental and management considerations

Facilities should be located at a safe distance from water sources and located below wells (India, no date). Adams et al. (2009) recommend that all latrines and infiltration systems be located at least 30 m from any groundwater source, and at least 1.5 m above the groundwater table.

Where pits are required, toilets should not be built in depressions that can be flooded, where draining excess water from the tap stands will be difficult, or where there is a risk that a high water

table will flood the pit (Deverill and Still, 1998). Areas where pit excavation will be difficult should be avoided; this can be tested by drilling holes with an auger or digging a trial pit (ibid).

Areas should be earmarked for future expansion for school sanitation pit (ibid). For toilets that will be emptied, good access to the chamber should be provided, with consideration for whether a vacuum tanker will need to access the pit. If sludge is to be buried on-site, this site should be designated as well (ibid).

Toilets with doors leading directly outside should be orientated with consideration for the direction of the prevailing winds to prevent damage to the doors from winds pit. The doors of VIPs should face the prevailing wind direction and not into the sun to aid ventilation and should not be built upwind of the school pit (ibid).

3.3.6 Model arrangements

IRC (2005) proposes that a good tool for site selection is the creation of maps together with the school community and, if relevant, the families living in the immediate surroundings. These maps can include practical considerations (prevailing wind direction, location of wells, existing pathways), as well as cultural and psychosocial (privacy, safety) considerations. Mapping will also help to develop different options for locations and make it easier to compare them.

Deverill and Still (1998) propose that regardless of the configuration that is selected, at least one unisex special access toilet should be provided for the use of disabled students, parents and teachers, with at least one such toilet per 300 students.

The KwaZulu-Natal Department of Education has adapted the design of one long row of VIPs to rather have two rows with a passage between. Because of pits being directly below pedestals on both sides, however, this necessitated a redesigning of the pits to avoid having a narrow strip of earth between two large pits, which could be unstable (Pers. comm., H. Bulcock. 4 July 2014).

The Indian Ministry of Urban Affairs and WSP/UNDP (1995) recommends that an adequate “circulating area” which is 2 to 3 m wide be provided inside the block which is adequately lighted and ventilated.

Figure 25 shows a model arrangement for toilet, urinal and washbasin facilities proposed by Deverill and Stil (1998).

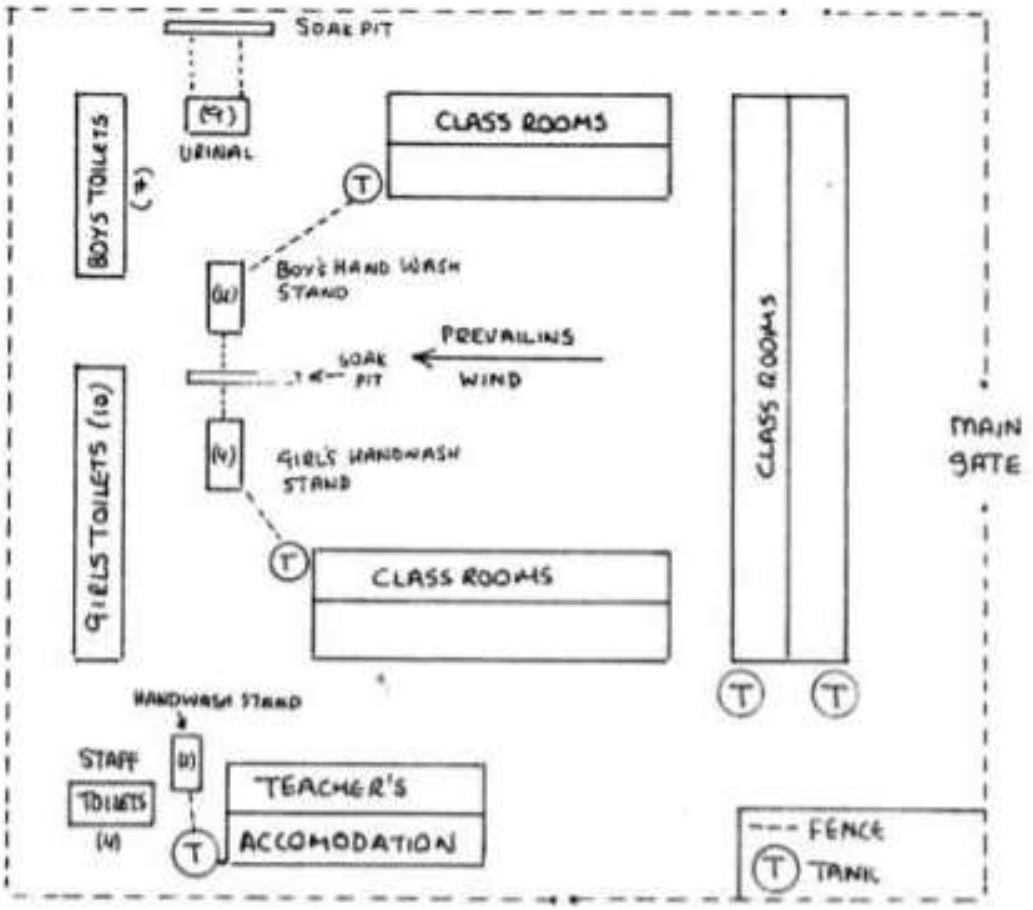


Figure 25 Model arrangement for school sanitation (Deverill & Still, 1998)

3.3.7 Lessons

Social, management and technical issues must be considered when siting the toilets and hand washing facilities. Segregating toilets for boys and girls (with the exception of preschool) is important to prevent harassment of girls by boys. However, harassment of younger or weaker children by older or stronger children within single sex toilets can still be a problem. This can be addressed by having different blocks for different age groups (e.g. junior primary and senior primary toilets) which can also allow for scaling for different ages. One way to address this is to have single units which are unisex, either incorporated into each classroom or in a row with doors leading directly outside. This could raise problems in terms of weathering and damage to doors and interiors if the doors are left open. While many sources recommend segregated hand washing for boys and girls (which offers a limited degree of privacy to girls washing up during menstruation) others have found that a shared hand washing facility reduces the antisocial behaviour found in single sex toilets. The needs, issues and cultural norms of the particular users should be evaluated with their participation to determine the optimal arrangement in terms of block/individual toilets, provision or limitation of “hang out” space (to either limit antisocial behaviour or to provide places of retreat, segregation on the basis of gender or age and location within the school grounds. Design within the block must carefully balance the needs for safety, privacy and ease of cleaning.

3.4 Capacity

Recommendations for the number of children to be served per toilet typically range from 1:20 to 1:50. The World Health Organisation, in its *Water, sanitation and hygiene standards for schools in low-cost settings* (2009) provides ratios of 1:25 toilets for girls and 1 toilet plus 1 urinal (or 50 cm of urinal wall) to 50 boys, with a minimum of one toilet for female staff and one for male. Similarly, in South Africa the Department of Water Affairs and Forestry recommended a ratio of 1:25 in its *Minimum Requirements for Ensuring Basic Water Supply and Sanitation in Schools* (2008).

The new norms and standards for public school infrastructure put into effect in South Africa in 2013 (South African School Act 84 0f 1996 Notice 932 of 2013) require that toilets, urinals and hand washing facilities be provided as follows:

Table 16 South African standards for number of toilets and basins per users for primary schools (South Africa, 2013)

Enrolment	Enrolment per gender	girls toilets	girls basins	boys toilets	boy's urinals	boy's basins	unisex* grade R toilets	grade R basins	disabled toilets & basins	female staff toilets	female staff basins	male staff toilets	male staff urinals	male staff basins	total toilets
0-25	0-13	2	1	1	1	1	0	0	1	0	0	1	0	0	6
26-65	13-33	2	1	1	1	1	0	0	1	0	0	1	0	0	6
66-134	33-67	3	2	1	2	1	2	1	1	1	1	1	0	1	11
135-310	68-155	6	4	2	4	2	3	2	1	2	1	1	1	1	20
311-620	156-310	8	6	4	4	2	4	3	1	2	1	1	1	1	25
621-930	311-465	10	6	4	6	3	5	3	2	3	2	1	2	2	33
931-1240	466-620	12	8	6	6	4	5	3	2	3	2	1	2	2	37

NB: for Grade R enrolment is assumed to be ⅛th of total enrolment

Table 17 South African standards for number of toilets and basins per users for high schools (South Africa, 2013)

Enrolment	enrolment per gender	girls toilets	girls basins	boys toilets	boy's urinals	Boy's basins	unisex disabled toilets & basins	female staff toilets	female staff basins	male staff toilets	male staff urinals	male staff basins	total toilets
0-100	0-50	2	1	1	1	1	1	0	0	1	0	0	6
101-200	51-100	4	2	2	2	2	1	1	1	1	0	1	11
201-400	101-200	6	4	2	4	2	1	2	1	1	1	1	17
401-600	201-300	8	6	4	4	3	1	2	1	1	1	1	21
601-800	301-400	10	6	4	6	3	1	2	1	1	1	1	25
800-1000	401-500	12	8	4	6	3	2	3	2	1	2	2	30
1001-1200	501-600	14	8	6	6	4	2	3	2	1	2	2	34

South Africa School Act, 84 1996 Notice 932 of September 2013

A primary school with 500 learners would require a total number of 25 toilets as follows:

- For 219 girls: 8 toilets (1:28) and 6 basins (1:37)
- For 219 boys: 4 toilets (1:55), 4 urinals (1:55) and 2 basins (1:110)
- For disabled users: 1 toilet and 1 basin
- For 62 Grade R users: 4 toilets (1:16) and 3 basins (1:21)
- For female staff: 2 toilets and 1 basin
- For male staff: 1 toilet, 1 urinal and 1 basin

A high school with 500 learners, on the other hand, would require a total number of 21 toilets as follows:

- For 250 girls: 8 toilets (1:31) and 6 basins (1:37)
- For 250 boys: 4 toilets (1:63), 4 urinals (1:63) and 3 basins (1:83)
- For disabled users: 1 toilet and 1 basin
- For female staff: 2 toilets and 1 basin
- For male staff: 1 toilet, 1 urinal and 1 basin

The South African standards compare with the WHO standards (1 toilet per 25 girls and 1 toilet and 1 urinal or 50 cm urinal wall per 50 boys) for toilets per number of learners as follows:

Table 18 Comparison of DBE norms with WHO standard for number of toilets

	DBE Norms				WHO Norms			
Enrolment	**Girls toilets**	**Boys toilets**	**Boy's urinals**	**TOTAL (DBE)**	**Girls toilets**	**Boy's toilets**	**Boy' urinals**	**TOTAL (WHO)**
0-100	2	1	1	4	1-2	1	1	3-4
101-200	4	2	2	8	3-4	2	2	7-8
201-400	6	2	4	12	5-8	3-4	3-4	11-16
401-600	8	4	4	16	9-12	5-6	5-6	19-24
601-800	10	4	6	20	13-16	7-8	7-8	27-32
801-1000	12	4	6	22	17-20	9-10	9-10	35-40
1001-1200	14	6	6	26	21-24	11-12	11-12	43-48

The IRC (Zomerplaag & Mooijman, 2005) notes the following variables should also be considered in order to determine the capacity required for sanitation facilities at individual schools.

- Appropriateness of urinals as a means to reduce the number of seats (for both boys and girls)
- Times toilets are used. If only during breaks, capacity must be increased.
- How many breaks are there (fewer breaks means more capacity needed)
- Start/end times for class/school. Different break and ending times require fewer facilities.
- Determine the 'highest peak' for usage.
- Projected future number of users and projected proportion between males and females
- Known disabilities to accommodate as well as general provision of special access toilets
- Is segregation of teachers (and or older/younger children) necessary?

The water capacity required will depend on whether toilets flush and, if so, how much. The Ministry of Urban Affairs (India) and WSP/UNDP (1995) recommends that a reliable water supply should be able to provide 7 litres per use for flushing toilets (including hand washing) and 0.2 litres per use for dry systems and urinals. Pour flush or low flush systems require approximately 2 litres per use for flushing. The feasibility of supplementing the municipal water supply using rainwater harvesting should be assessed, but design should be based on access to water during the driest months.

3.5 Components

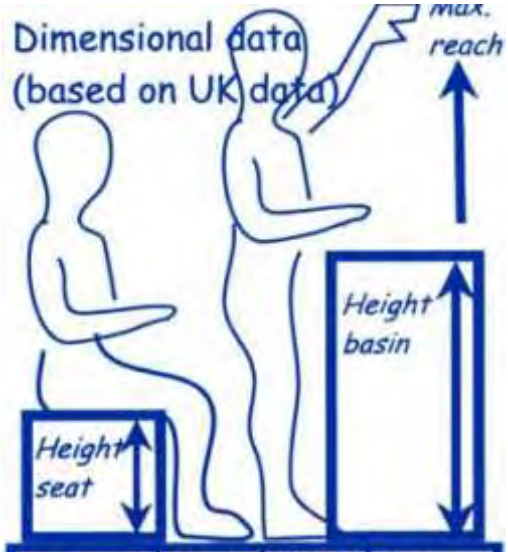
The IRC (Zomerplaag & Mooijman, 2005) states that while there is a wide range of materials of varying costs that can be used for hygiene and sanitation facilities, good quality facilities demand the highest possible standards and raises the following points:

- Materials should be durable and must be able to withstand frequent use and cleaning.
- Surfaces that will come into contact with faeces or urine must be impermeable and easy to
- clean, especially where soap and simple cleaning supplies are not readily available.
- Moulds can be used to make smooth-shaped surfaces and corners (the moulds can be used for serial production of slabs, seats, etc.).
- To facilitate cleaning of slabs, provisions can be made in the slabs to drain water used for cleaning.

The WHO (2009) notes that younger children and older children may require toilets and other components to be scaled differently. In particular, care must be taken to ensure that there is no risk of small children falling into pits through a pedestal or squat hole.

IRC (2005) comments that 'adult-size' designs are all too often used for schools with minimal adaptation, which results in facilities being uncomfortable for children and sometimes presenting unforeseen obstacles which in turn may lead to children using them in the wrong way or refusing to use them at all.

The height of seats, urinals and hand washing facilities should be determined, as well as the placement of soap, drying towels, etc. (ibid). In addition children of different ages have different levels of physical strength and motor skills, which may require different solutions. The height of doorknobs, locks, steps and handrails, diameter of toilet seat, weight of doors and toilet seats and strength needed to open taps, flush or carry water should be measured for and designed with care. The diameter of the hole in the pedestal or squat plate should be determined with consideration not only for actual safety of smaller children but to address the psychological need of feeling safe (India, no date). In larger schools serving a wide range separate facilities for younger and older learners might be best; where this is not practical accommodations can be made for younger children with a step placed in front of the washbasin or toilet or a seat insert with a smaller hole placed over the toilet seat (IRC, 2005). Innovations should be considered for their impact on the ease of cleaning and should be tested to determine any unforeseen effects (ibid).



Age group	Height seat	Height basin	Max. reach
3-5 year	26 cm	58 cm	105 cm
5-9 year	30 cm	70 cm	120 cm
9-11 year	34 cm	76 cm	140 cm
11-13 year	38 cm	76 cm	156 cm
13-16 year	42 cm	82 cm	167 cm

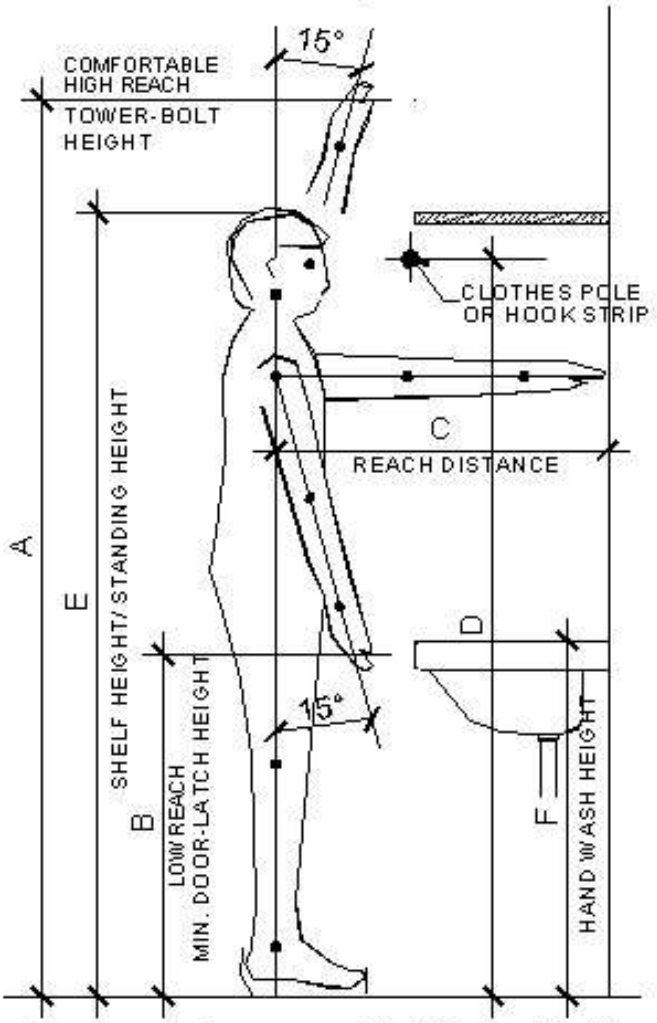
Figure 26 Dimensions based on data collected in the UK Zomerplaag & Mooijman, 2005)

As children vary so greatly from one place to another in terms of their size and strength, it is impossible to set international standards for dimensions for hygiene and sanitation facilities in schools. Because of this IRC (2005) recommends that children of different ages be measured at the school itself, suggesting that a maths lesson could be made of this exercise.

India (no date) provides the following anthropometric data based on Indian children; measurements could be taken to obtain the same data in South Africa.

ANTHROPOMETRIC DATA FOR CHILDREN (Both Sexes)

Source : Architectural Graphic Standards



Ages	Tower Bolt Height A		Door Latch Height B		Reach Distance C		Hook Strip or Clothes Pole D		Shelf/ Standing Height E		Hand Wash Height F	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
15	1915	75.5	730	28.5	685	27.0	1575	62.0	1675	66.0	760	30.0
12	1705	67.0	630	24.5	620	24.5	1385	54.5	1485	58.5	685	27.0
9	1510	59.5	555	22.0	550	21.5	1220	48.0	1320	52.0	635	25.0
7	1370	54.0	510	20.0	495	19.5	1120	44.0	1220	48.0	585	23.0
5	1210	47.5	465	18.5	435	17.0	990	39.0	1090	43.0	485	19.0

Figure 27 Anthropometric data obtained for children in India (India, no date)

3.5.1 Fixtures

Thrislington (no date) notes that fixtures should be fixed back-to-back or use a through fixing for added strength; a screw fixing is not recommended because of the possibility of vandalism. ERIC (no date) points out that toilet paper dispensers should be sturdy. Jointing strips, extrusions and visible fixings should be avoided as they provide places for dirt and germs to accumulate and hinder cleaning UK DfES (2007). UK DfES (2007) highlights that locking devices on cubicle doors should be selected which operate with a simple single action for use by users with poor manual dexterity. Pupils should not be able to easily unlock doors from the outside (ERIC, no date). Locks should also

be designed so that they are the weaker element and if force is applied to the lock the lock, rather than the door or frame, will break, as a lock is cheaper to replace than a door or frame (UK DfES, 2007).

3.5.2 Pedestals

As pedestals represent the interface between the user and the urine/faeces collection or transport system, their design is integrally linked to the design of the system. Design of a pedestal, should, however, be made with consideration for both cultural norms and anatomy, in terms of the sex, size and any physical limitations which the user might have.

UK DfES (2007) recommends that while it is a more expensive option, it is preferable for the toilet to be wall hung to avoid dirt and germ build-up around the floor junction and facilitate effective cleaning.

Deverill and Still (1998) stress the importance of ensuring that the design of the pedestal is appropriate. They note that moulded plastic pedestals, if kept clean, are attractive and easy to install; benches fitted with plastic seats and liners are, however, more robust and easier to clean. If a liner is used it should be larger at the bottom than at the top to reduce soiling on the inner surfaces[14].

Deverill and Still (1998) recommend a height of 400 mm for the pedestal for high school users and 300 mm for preschool and primary school users.

Deverill and Still (1998) recommend that a bench be constructed of precast ferrocement panels 40 mm thick and painted with a washable acrylic paint as galvanised steel, wood and other materials may deteriorate. The drop hole cast in the bench panel should either be circular with a diameter of 220-250 mm, or an oval shape 220 by 270 mm (and suit any plastic seat used). Larger drop holes may discourage younger learners from using the toilet for fear of falling in.

The distance from the front of the bench to the front of the hole should be no more *than 75 mm* or the hole will be set too far back for user comfort and soiling of the bench may increase. A standard toilet seat can be cemented into place for comfort and to facilitate cleaning.

Seats and lids

The value of a lid for the toilet is a topic of debate. As seats and lids increase the surface area that requires cleaning, and hinges are difficult to clean, they can be eliminated from a toilet design if users will accept this. In standard flush toilets, aerosols may be produced in substantial quantities during flushing which can carry infectious microorganisms (Johnson et al., 2013) and so closing the toilet with a lid before flushing could reduce the aerosol plume significantly. For a VIP, a toilet seat lid would need to ensure a minimum air gap of 15 mm to provide adequate ventilation (Deverill and Still, 1998). However, closing the toilet seat requires that users touch the lid and toilet seat which are likely to be contaminated from other users' hands.

[14] This is not true for toilets for disabled users, however, as a wider base could prevent a wheelchair from being positioned as close to the pedestal as is necessary.

The flush handle poses the same problem. In South Africa, users and cleaning staff may have little consciousness of the fact that flushers or door handles quickly becomes contaminated by a user who has not yet washed his/her hands and contamination can then be passed to the next user. In the United States, where consciousness of contamination is relatively higher, the Bradley Corporation in their 2013 survey found that 64% of respondents reported that they used their foot to flush the toilet to avoid touching the flusher with their hand. For flush toilets, a footflushing mechanism would increase hygiene (and possibly require less strength from young or disabled users) but make cleaning more difficult. US company Sloan Valve manufactures a foot flush pedal.[15]Thetford manufactures a pedestal with a footflush incorporated into the front [16].

Figure 28 Foot flush pedals made by Sloan Value (left) and Thetford (right) in the USA

[15] http://www.sloanvalve.com/Specifications/Royal_310.pdf Accessed 3 July 2014

[16] http://www.thetford.com/HOME/Products/PermanentToilets/AquaMagicVFootPedalFlushwandwoWaterSa/tabid/106/Default.aspx Accessed 3 July 2014

3.5.3 Urinals

Urinals installed in addition to pedestals have a number of advantages:

- Reduces time taken by user, reducing waiting times and congestion in the toilets
- Eliminates contact by users with soiled toilet seats
- Allows toilets to be reserved for defecation, reducing the number required
- Separating urine reduces sludge volume and moisture content, aiding sludge management
- Urine can be collected for agricultural use
- Prevents the accidental fouling of the toilets, which is in many cases the prime cause of unpleasant odours (Deverill and Still, 1998)

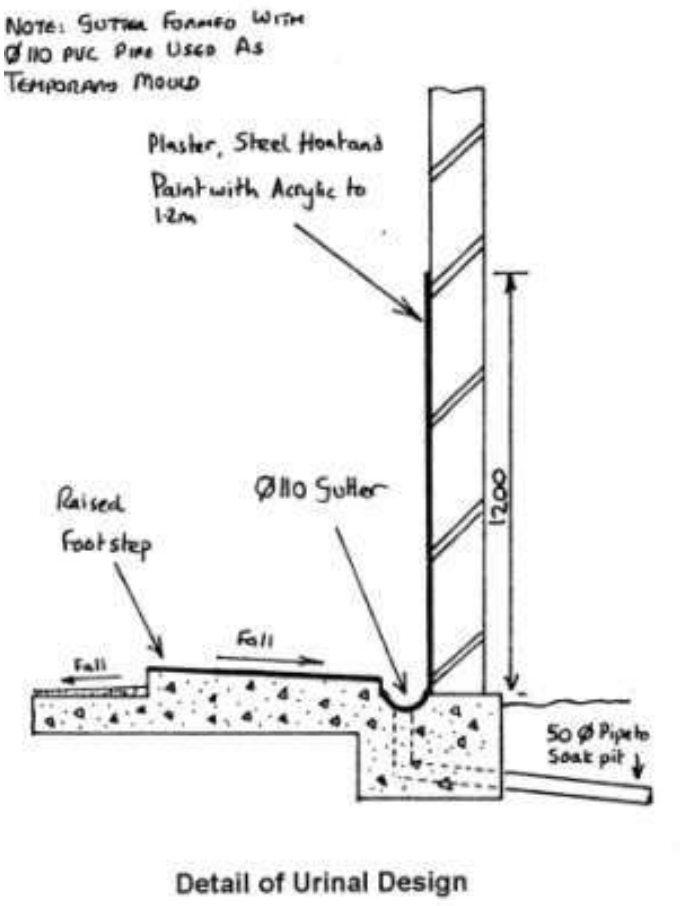


Figure 29 Urinal design (Deverill and Still, 1998)

Deverill and Still (1998) note that urinals can be built as separate buildings or as part of a toilet block. They propose a design with a 110 mm floor level channel running around three sides of the urinal compartment and separated from the screeded concrete floor by a raised foot kerb, which leads to two drain pipes that empty into a soak pit. They recommend that the walls of the urinal compartment be plastered and steel floated up to 1.2 m above the floor and painted with a washable epoxy or acrylic paint. They note the importance of a robust trap in the drain to prevent debris blocking the pipes.

The Ministry of Urban Affairs (India) and WSP/UNDP (1995) advises that 2 m high dividers be placed between urinals, which should have a floor with ceramic tiles and a perforated pipe for flushing.

Note – A urinal space is 600 mm of urinal channel.

Urinals for girls

Urinals for girls and women have been used with success in some countries and are easy for young children to use, are cheaper and faster to build than toilets and reduce unpleasant smells (WHO, 2009). In Europe, the Pollee, a female urinal designed by the Danish design bureau accommodates four users at once and, being a portable system, has been used at public events such as concerts[17]. A

[17] http://en.wikipedia.org/wiki/Pollee Accessed 18 June 2014.

female urinal designed by Uridan, a Danish company, has been tested in public toilets in Germany and India. Users reported that they found it more hygienic but it took time to get used to disposing of toilet paper in a bin[18].

Figure 30 The Pollee, a portable female urinal (left) and the Uridan (right)

For younger children, using urinals for urinating may be easier, cleaner and safer than using pedestals, where they may have to use their hands to lift themselves onto a soiled toilet seat. For older children, defecating may happen only rarely at school and the primary need for a toilet may be for urination. Where school facilities are inadequate it may be possible to add urinal blocks more cheaply and quickly while resources are collected for improving toilets. Urinals for girls can be left unenclosed, as they are for boys, in the case of young girls who do not require privacy from each other. For older girls, if urinals are enclosed in a stall and a water source is provided they can provide a means for cleaning and washing during menstruation. Provision of urinals for girls would have to take into account the need for bins for disposal of wiping materials.

The urinals in Figure 32 were photographed at a Peepoople project[19] at a school in Kenya and were found to be clean and odour free.

[18] http://forum.susana.org/forum/categories/34-urine-diversion-systems-includes-uddt-and-ud-flush-toilet/926-female-urinal-tested-in-europe

[19] http://forum.susana.org/forum/categories/52-mobile-or-portable-solutions-public-toilets/6318-peepoo-bags-at-schools-in-low-income-areas-in-kenya (accessed 18 June 2014).

Figure 31 Girls' urinal in a Peepoople project at a school in Kibera, Nairobi, Kenya (Photo by Elisabeth Muench).

Figure 32 Girls' urinal at a school in Uganda

At Mirembe Infant Primary School in Uganda, the principal initiated the construction of two 5-stance urinals for girls in 2007 (NETWAS Uganda, 2009). The urinals had a slope of approximately 45 degrees to ensure that urine splashes away from the user (angle of incidence is equal to angle of reflection/deflection of the urine) and facilitate drainage. The urinals were not roofed, facilitating drying by the sun in hot weather and rinsing by the rain in the rainy season. Users reported that the urinals reduced congestion and fighting between girls for a turn to use the toilet, facilitated girls washing up during menstruation and were easy to clean. Staff reported improved class attendance and reduced open urination. Staff at four neighbouring schools expressed an interest in obtaining urinals for girls based on their success at Mirembe (ibid).

UNICEF reports high acceptance of school urinals for girls in its Water, Environment and Sanitation project in Malawi.[20]

[20] http://www.unicef.org/Malawi_wes.pdf accessed 26 August 2014.

Figure 33 A female urinal design used in schools in Malawi[21]

In India, the Ministry of Urban Development and Human Resources Development in its National School Sanitation Manual (no date) recommends 1 urinal for every 20 users, both girls and boys. Figure 34 shows a design for urinals for boys and girls recommended by the Government of India (India, 2004).

Figure 34 Designs for girls and boys urinals recommended by the Government of India, with raised footsteps provided for girls

In South Africa, while no trials of urinals for girls or women in schools or public restrooms are known, the concept of a urinal for women has entered the sports arena with portable models such as the Go Girl urinal funnel, which markets itself as "the way to stand up to crowded, disgusting, distant or non-existent bathrooms."[22]

[21] http://www.soafrica.com/Client/AfricaSan/S2/3%20Marieke%20Heijnen%20-%20Wash%20in%20primary%20Schools%20in%20Malawi%20.pdf#page=15&zoom=auto,-40,330 accessed 26 August 2014.

[22] www.go-girl.com

Waterless urinals

While traditionally urinals have been flushed with water, waterless urinals are becoming increasingly popular not only because they conserve water and can be used in contexts where there is a limited or unreliable supply of water, but also because they may in fact be more hygienic. Scale, odour, blockage and subsequent flooding and bacterial aerosols are not spread during flushing.

The EcoSmellStop (ESS) manufactured by Addicom (www.addicom.net/) in South Africa allows the urine to flow through silicon curtains/flaps that stick together when wet but don't stick so tight that the urine couldn't get through.

The NGO WECF retro-fitted conventional flush urinals for a waterless operation were sealed and a condom with a small hole cut into the tip was fitted over the outflow piping. This simple setup allows the gravity driven drainage of urine into the discharge piping, but prevents odours from travelling up from the urine collection vessel. Practitioners working in warm climates have reported that these condoms fail to work because they stick together within a short time, for example if the toilet is not used for a day.[23]

Figure 35 EcoSmellStop (ESS) from Addicom (right); a condom adapted as a water seal (right)

A further option for odour control at the point of the user interface may involve the use of charcoal, which has the ability to adsorb urine odours. Charcoal contained in a mesh bag and placed directly in the urine-diverting section of the user interface has been applied in the Philippines, and shown to be an effective means of odour reduction (Gensch et al., 2010). The adsorptive capacity of the charcoal will be gradually exhausted, and the charcoal thus requires regular replacement. A dedicated pipe can be submerged in the collected urine (or tank) to provide a basic water-seal.

[23] http://forum.susana.org/forum/categories/34-urine-diversion-systems-includes-uddt-and-ud-flush-toilet/6679-simple-urine-valves-to-control-odour-on-waterless-urinals-or-on-urine-diversion-toilets

3.5.3 Menstrual hygiene supplies and bins

The IRC (2005) stresses that the toilet environment must properly accommodate menstrual hygiene for girls and women with consideration for the differing needs and requirements across cultures, ethnic and religious groups and classes even within the same community. UNICEF's initiative to provide "girl-friendly" schools with clean toilets and running water have brought about significant improvements in girls' education (UNICEF, 2011).

The Welsh Government (2012) points out that girls who start menstruating while at primary school may feel shy or embarrassed about being among the first to start their periods and may need help to manage their periods comfortably and hygienically, including obtaining and disposing of sanitary products without drawing attention to themselves. While some sources recommend a shelving unit in each cubicle for girls stocked with sanitary pads, The UK Ministry for Education and Skills (2007) recommends that a vending machine containing sanitary pads be installed in each block of girls' toilets. [24] The Welsh Government (2012) recommends placing dispensers for sanitary pads in all toilets serving girls aged 8 or older so that girls are not required to ask adults. The school must inform girls regularly of where they can obtain sanitary products. If the toilet block is stocked with sanitary pads the container should be situated so that pupils can use it without being visible from outside of the girls' toilets.

Disposal bags or toilet paper must be made available in cubicles for girls to wrap used sanitary products in along with sanitary bins for disposal (Wales). The UK Ministry for Education and Skills (2007) notes that if space is limited it may be necessary to offset the pedestal to allow for the placement of the bin. If schools do not provide private bins in stalls at schools girls will most likely opt to throw pads into the toilet. For flush toilets, this could cause blockages.

3.5.4 Hand washing facilities

Warm water, soap and hand drying all play a role in pathogen reduction. The WHO (2009) advises that a convenient hand washing point with soap must be provided and routine hand washing encouraged. The UK DfES (2007) recommends that cartridge type dispensers should be used for soap, as liquid soap that can be 'topped up' can become contaminated, causing health problems. All fixings should be concealed to avoid pupils tampering and potential dirt and germ build up on visible fixings. While research shows that drying of hands after washing is important for microbial reduction, the cost of purchasing hand drying materials in the South African context may be prohibitive, especially with the issues that are encountered with theft and vandalism. Recycled paper towels are considered the most hygienic and environmentally friendly method of hand drying (UK DfES, 2007) while ERIC (no date) indicates that effective hand dryers are a possible alternative. While UK DfES (2007) recommends that the water supply to the taps should be at a pre-mixed temperature of a maximum 41°C for optimal microbial reduction, the provision of heated water in toilet facilities is far beyond the norm in South African schools.

A school tap stand designed to supply water for hand washing typically consists of a small water tank that can be topped up manually or is connected to a school water supply, a number of taps, and a

[24] Due to issues with theft and vandalism in South African schools it may be that neither of these options would be suitable for this context; however a system of making sanitary pads available must be devised.

drain leading to a soak pit (Deverill and Still, 1998). Without proper drainage, surroundings become muddy, discouraging people from washing their hands and attracting mosquitoes. If flush urinals are used, water can be channelled from hand washing to the urinals to conserve water (ibid).

Thrislington (no date) states that wash troughs are preferable to individual wash basins as they are easier to clean, are aesthetically more pleasing, and reduce the potential for users to flood the toilets. UK DfES (2007) recommends that taps be wall mounted to avoid the dirt and germ build up that can occur around deck-mounted taps.

Deverill and Still (1998) advise that taps should be self-closing so that users cannot leave them open have a restricted flow of 2-3 litres a minute and a separate, lockable maintenance tap should also be provided for cleaning water.

Tap handles are a concern for transmission of pathogens and if the cleaning staff do not understand this it is unlikely they will be cleaned adequately. Users with faecal material on their hands can contaminate the taps and recontaminate their own hands after washing or contaminate others' hands. In Bradley's 2013 Health Hand washing Survey, **37% of** respondents reported using a paper towel when touching tap handles (Bradley, 2013). Self-closing taps reduce contamination as the user does not have to touch a tap that they or another user has contaminated once they have washed their hands in order to turn it off. Many self-closing taps require greater force to operate than a standard tap, which could be a problem for young or disabled users. ERIC (no date) points out that if push taps are used, they need to stay on long enough for pupils to wash their hands properly. Robson (1847) describes two alternative designs for self-closing taps:

> The water cannot be left running for the removal of the child's finger lets drop the leaden (or iron) weight and turns off the tap. This kind of tap has the disadvantage of tending to jar and burst the pipes if the ball be dropped violently. Another kind – having a self-acting screw regulated to run off a certain quantity of water, and closing of itself when this has been discharged – is in some respects superior.

Figure 36 Robson's handwashing facilities with self-closing taps in 1847 (Robson, 1847)

A Aqua has designed a low cost self-closing tap valve that provides a higher flow late at lower water pressures[25]. The valve is operated with a button, which means that it can be operated with less dermal contact than a tap that needs to be turned. It may also be appropriate for the strength level of young users.

[25] http://www.scan-water.com/products.php?vareid=93

Figure 37 A Aqua self-closing tap valve

While many options for hands-free taps are high-tech, involving electronic sensors which may be too expensive for schools to install or maintain, mechanical designs have been developed which could potentially be adapted for schools. In addition to foot pedals and knee operated taps, a lever handle on a tap allows users the option of opening the tap with minimal dermal contact; e.g. pressing the lever with a sleeved arm. Galvin Engineering in Australia has developed a knee operated tap device as well as two self-closing foot pedal operated devices.[26]

Figure 38 Foot operated (left and centre) and knee operated (right) self-closing taps manufactured by Galvin Engineering.

MTE Valves in Thailand also makes a foot operated self-closing valve.[27] Schools in South Africa have experienced problems with steel fitting being stolen from toilets. Tap handles made from plastic, however, can quickly become scratched and then harbour germs.

[26] http://www.galvinengineering.com.au
[27] http://www.valvemte.com/Foot%20Tap%20Valves%20MCM.html

Figure 39 Foot operated self-closing valve manufactured by MTE Valves

These options could also be considered for users with physical limitations.

3.5.5 Cubicles

Deverilll and Still (1998) state that allowing more space than necessary in cubicles can result in greater soiling or use of the toilet for activities other than those intended. They state that 1 m of floor space (including the pedestal or bench) is adequate, or 1.5 m if an alternating pit (two drop hole) arrangement is used. If the door is designed to open inward, more space may be needed.

The UK DfES (2007) advises that cubicle divisions can be built of compact grade laminate, recycled plastic, or a material that performs equally well. ERIC (no date) standards notes that cubicles should be robust enough to withstand normal wear and tear at a school, which can include wilful or accidental damage.

To minimise junctions between the floor and cubicle partitions that lead to dirt and germs building up and hinder effective cleaning of the space, partitions can be lifted off the floor and either ceiling hung or wall and floor mounted with only the front pilasters extending to the floor for support and the rest of the structure supported by the wall (UK DfES, 2007). Partitions and doors to cubicles system should be spaced 100 mm off the floor for ease of cleaning; a greater spacing may jeopardise users' privacy.

3.5.6 Doors and gates

Deverill and Still (1998) advises that while all cubicles should have doors for senior primary and high school users, a privacy screen may be preferable for preschool and junior primary to avoid the difficulties of using door locks. Because of the frequency with which doors are stolen in South Africa, Deverill and Still (1998) recommend that privacy walls be built outside doors to provide some screening in the event that doors are stolen.

For doors which open directly to the outdoors (for example where individual structures are used for each toilet, it is recommended that doors open inward to prevent damage from the wind.

Alternatively, outward opening doors should be secured with a simple catch when they are not in use so that they do not blow open and fitted with a lock for use after hours (Deverill and Still, 1998)

Deverill and Still (1998) note that if timber doors are used correct design is critical to prevent sagging or warping. They recommend using 22 mm treated softwood which is tongued and grooved and battened with 22 mm x 110 mm softwood, taking into account which way the door is to be hung. They recommend that that doors be between 650 and 850 mm wide, depending on the size of blocks used in the superstructure.

A gap of 100 mm above and below the door is recommended to facilitate cleaning and providing assistance in the event of an emergency; in the case of a VIP this gap is important to allow air exiting via the vent pipe to be replaced (Deverill and Still, 1998).

Deverill and Still (1998) recommend that doors be varnished with a polyurethane exterior grade varnish, or painted with a coat of primer and gloss paint. They suggest that different colours be selected by learners to identify the toilets for which they are responsible for cleaning.

If cubicle partitions and doors are extended to finish at floor level the design must provide a means to enter the cubicle in an emergency where the door is locked and a user is slumped against the door (UK DfES, 2007). One way to achieve this is to design doors so that they can either open outward or lift off of their hinges. ERIC (no date), however, advises that doors be fixed sturdily to the walls or partitions so that they cannot be lifted off their hinges to prevent vandalism. Door closures should be robust and close gently against the frame to avoid trapped fingers (ibid). When doors are shut, for the sake of privacy there should not be any gaps between the partitions and the doors (UK DfES, 2007). The IRC (2005), however, notes that young children appreciate small openings in doors at eye height. This must be balanced against the need to prevent others from looking in while someone is using the toilet. A small opening can be positioned to allow an adult to open the latch from outside the cubicle in the event that a locks itself in (ibid); as mentioned elsewhere this could result in other leaners attempting to open the door while someone is using the toilet.

Toilet blocks built at two schools in eThekwini Municipality in 2013 were fitted with gates on all entrances to prevent vandalism. At one school, however, the bars on the gates were far enough apart that vandals could slip through and additional bars had to be added. In the South African context some means of locking the entrance should be provided for each toilet block or standalone structure.

3.5.7 Flooring

UK DfES (2007) states that floors can be made of ceramic tile, vinyl, rubber or a material that performs equally well. Deverill and Still (1998) advise that as tiling is expensive and easily damaged they do not recommend it for schools. SAWASA, however, has had some success in raising funds for tiling of school toilets and believes that learners respond to raising the bar in this way by taking better care of their facilities (Mulaudzi, no date).

Where sheet materials are used, these should be specified and set out to minimise the number of joints (UK DfES, 2007). The material should be impervious to water, with watertight joints to enable

it to be thoroughly washed down without water passing through to the sub floor (UK DfES, 2007). Deverill and Still (1998) propose that floors should be plastered with a strong 1:4 mix and steel floated, then finished with stoep paint. UK DfES (2007) advises that slip resistance be designed into the full depth of the material, rather than as part of the finish, so that it doesn't wear out before the floor itself. The finish should be easy to clean with readily available environmentally friendly products, and as smooth as possible while still meeting the required slip resistance (ibid).

Deverill and Still (1998) advise that the floor be designed to slope gently towards a 40 mm drain hole. UK DfES (2007) and ERIC (no date) advise that flooring within the toilet area be laid to fall and incorporate integral gullies to allow for the entire toilet area to be sluiced regularly or in the event of an incident of incontinence. UK DfES (2007) points out that where integral gullies are included they need to be effectively sealed to the floor finish.

UK DfES (2007) advises that the floor finish have an integral 100 mm high coved skirting in matching material and finish to create a sealed membrane so that the floor can be washed without risk of damage to the wall finish. Thrislington (no date) advises that the top of the skirt should line up with the vertical infill. Deverill and Still (1998) advise that gaps between the panel and walls should be filled with cement mortar and corners should be finished with a slight radius to aid cleaning.

3.5.8 Walls

UK DfES (2007) advises that the surface of walls and partitions should be impervious to water and as smooth as possible to facilitate easy cleaning. Interior wall should be plastered and painted with a washable acrylic paint that is light in colour (though white is not recommended). The joint between the wall finish and the integral coved skirting should be sealed against water and dirt (ibid).

Deverill and Still (1998) state that if a privacy wall is provided to screen the entrance to the toilets, it must be built on prepared foundations and tied in to the structure or buttressed every 3 metres or less to ensure stability.

3.5.9 Roof

Deverill and Still (1998) note that rafters are not required for the small spans over individual toilets. Timber purlins should be built directly into the front and back of the side walls and tied down securely with 8 gauge wire. Roof sheets can be made of corrugated iron, IBR or asbestos cement and should be nailed to the purlins (ibid). If a privacy wall is provided, the roof can be extended over the privacy wall to provide a sheltered space and protect the doors.

3.5.10 Provision for wiping materials

IRC (2005) notes that if toilet paper is not provided to learners other materials will be collected to be used for anal cleansing. If, in turn, a dedicated bin is not provided for disposal of these materials, they are likely to be put into the toilet, clogging it unless the pit is directly under the seat. If containers are provided they must be cleaned on a regular basis to prevent odours and avoid attracting flies (IRC, 2005).

If urinals are provided for girls, disposal bins must also be provided for wiping materials.

3.5.11 Ventilation and lighting

ERIC (no date) notes that it is not always practical to rely on open windows for ventilation, and design should include alternative options, such as extractors. The IRC (2005) recommends using natural lighting in combination with light surface colours. In school toilets built by eThekwini Municipality in 2013, clear fibreglass panels were used for some of the roofing, allowing sunlight to enter the building and creating a pleasant atmosphere.

3.6 Special access facilities

The National Building Regulations and Building Standards Act, (1977) state that any building must ensure that: "Persons with disabilities shall be able to safely enter the building [and] use all the facilities."

The DBE norms and standards for school infrastructure state that "all schools must adhere to the requirements and principles of Universal Design" (South Africa, 2013) which ensures that all facilities are designed for users of all ages and abilities.

DWAF (no date) identifies the key design requirements for toilets for people with disabilities as:

- accessibility
- ability to use without additional help
- preservation of dignity

The following guidelines are drawn from DWAF's *Guidelines for sanitation facilities for people with disabilities* (no date) and Deverill and Still (1998):

I**nternal floor space should be adequate** to manoeuvre wheelchair to be brought alongside the pedestal seat, be able to get on and off the toilet pedestal and in and out the stall. Deverill and Still (1998) recommend a minimum cubicle size of 1600 mm x 1700 mm with an outward opening door located in one of the 1700 mm walls. DWAF (no date) recommends a minimum free floor area of 0.9 m x 1.2 m in front of the seat allows the wheel chair user to enter in reverse, close the door, and go out when finished and a free floor area in front of the seat of 1.2 m x 1.5 m to enable wheel chair user to turn around and to use of the latrine comfortably. The floor should have a non-slip surface.

For existing structures, the internal free floor area in front of the seat can be increased by changing the door to an outward opening door (or in some circumstances a sliding door), and/or by moving the pedestal closer to the back of the latrine cubicle. However to create sufficient space next to the seat may require one of the walls to be broken down and rebuilt such that the internal space is increased sufficiently. In a block consisting of a number of latrines (e.g. at a school), the internal floor area can be increased by breaking down the dividing wall between two latrines. The seat should be positioned such that people with disabilities person's strongest arm is next to the seat when they come alongside in the wheel chair. There should also be sufficient space provided behind the seat for a helper to stand. (Deverill and Still, 1998, propose an allowance of 2,75 m for special access toilets.)

The floor should be constructed of a durable slip resistant material such as a grano screed with suitable stone chip base, which can easily be cleaned. The fall on the floor should be limited to 1:75 and should drain from one or more even falls without channels.

Door. Unless the interior of the toilet is very spacious, the toilet door should open outwards, as this allows adequate space for the user to get through the doorway and close the door behind them. The door width should be at least 0.8 m. The door handle should be such that it can be easily grabbed by a person who does not have the full use of their hands. A lever type handle is recommended. Outward opening doors should have either a rope or a full width door handle so that the door can be easily closed from the inside. The clear doorway width should be a minimum of 0.8 m with the door opening at least 90°. If the toilet door opens to the outdoors, a suitable stop should be installed to prevent the door opening wider than approximately 120° and being damaged by strong winds. No obstruction (e.g. pedestal, wash-basin or tap) should be installed within the normal entrance-way that will hinder a person as they pass through the doorway.

Floor. There should be no step into the cubicle. A low threshold (<2 cm) should be bevelled with a slope of no greater than 1:2. For a step higher than this a ramp with a slope of no greater than 1:12 should be constructed.

Pedestal. The pedestal should be robust in design. It should be non-tapering and at a height to 40 to 45 cm (the same height as a wheelchair), and positioned such that the centre line of the seat is 40 to 45 cm from one side wall. The height of the seat should be 500 mm above the finished floor level. If the pedestal is fitted with a separate seat, the seat should be constructed of solid hardwood or high density composite wood, fitted of corrosion resistant metal fittings and fixings. The pedestal should be securely fixed to the floor slab with masonry anchors; it is important to keep in mind that weak or poorly secured fittings could result in serious accidents in the case of a user with a disability. The pedestal and seat should have a smooth durable finish to facilitate cleaning.

Fixtures. Operating devices should be so shaped and positioned that they are accessible and easy to operate with a closed fist. Deverill and Still (1998) recommend standard lever type "D" handles and locks, noting that all door handles should be fitted to permit knock down opening, to allow disabled users with limited hand function to open the latch or lock. There should also be a slotted emergency opening mechanism which is accessible from the outside face of the door.

Towel rails, soap dispensers and toilet paper dispensers should be installed at a position that is easily reachable from the toilet seat/wheelchair. A mirror may be provided and should be tilted or placed at a suitable height for wheelchair users.

Grab bars should be installed on the side wall closest to the pedestal at a height of 60 to 70 cm. The diameter of the bars should be 3.8 cm to 4.5 cm and the space between the wall and each grab bar should be 4 cm to 5 cm. The grab bar should extend 40 to 50 cm past the front of the seat. The specifications for the minimum requirements apply. In addition the grab bars should be extended vertically to a height of 1.6 m at the end furthest from the seat. The door should also be fitted with an internal grab handle. Grab bars can be purchased from specialised shops, or manufactured from robust plastic pipes (e.g. 50 mm PVC class 16) or 50 mm galvanised piping using standard fittings. These should be fixed to the wall with masonry anchors or bolted in the case of timber construction. The cranked grab bar should be located adjacent to the pedestal, while the straight bar should be located across the rear wall behind the pedestal (see Figure xx).

A stainless steel sheet metal kick plate 300 mm high should be fitted to both sides of the door to protect the door from damage generated by the footrests of the wheelchairs.

Hand washing facility. The hand washing facility should preferably be placed inside the toilet cubicle close to the pedestal seat so that the user can wash his or her hands before getting back onto the wheel chair or crutches. The tap should be fitted with a lever handle. The washing facility should be at a height of between 0.8 and 1.1 m, with a clear space underneath the facility of 0.7 m.

Urinals. At least one urinal should be fitted with grab bars to support ambulant persons with disabilities (for example, crutch users). A stall-type urinal is recommended**.** Grab bars may be installed on each side, and in the front, of the urinal. The front bar is to provide chest support; the side bars are for the user to hold on to while standing.

Lighting and colours. Surfaces should be painted white to maximize light. If natural lighting is not possible, install an electric light. The junction between walls and floor and wall corners should be painted with contrasting colours or additional stripes so that they are clearly visible. The other facilities (pedestal, hand washing facility, toilet paper holder) should be clearly marked in contrasting colours to the walls and floor.

Access. The toilet should be easily accessible for people with disabilities. As wheelchair access is very gradient specific, the topography at the site will determine to a large extent where the toilets can be located in relation to the main area of the school. A smooth, wide path, ideally surfaced with brick or concrete, should be constructed from the main area to the toilet. This pathway should be at least 0.9 m wide to accommodate wheelchairs and users on crutches. The path should have a maximum slope of 1:20, with the exception of short sections of less than 2 m which may have a gradient of 1:10. A guide rope should also be attached to poles along the edge of the pathway for blind or partially sighted persons. A shelter against rain should be provided at least at the entrance to the toilet and at the entrance of the house or school building and the pathway itself should be covered, if possible. Thresholds at doorways should not exceed 15 mm in height. Bog standards advises that ambulant cubicles be situated at the end of a row of cubicles, ensuring that the door opens out onto a wall, reducing potential damage to the door as well as preventing users from being trapped behind a door while a user is entering the cubicle.

Walls. Deverill and Still (1998) point out that walls should be capable of supporting grab rails (and the weight that they bear) on the side and back walls of the cubicle. For this reason block work cavities should be filled wherever grab bars and other fittings are to be secured. In the case of timber structures, reinforcing panels should be provided to carry these fittings.

In addition to the specific adaptions described above, ERIC (no date) points out that there could be other special needs which require adaptations, such as problems with continence which could require private and appropriate disposal facilities. A shower facility, perhaps located in one special access toilet in the school, may also be required to deal with incidents of diarrhoea, vomiting, etc. DWAF (no date) provides specifications for toilets to address the needs for particular disabilities.

Figure 40 shows Deverill and Still's (1998) design for a special access toilet. They stress that the configuration of fittings and the dimensions provide the minimum space for a disabled user to manoeuvre inside the cubicle and it is unadvisable to alter the design without specialist assistance.

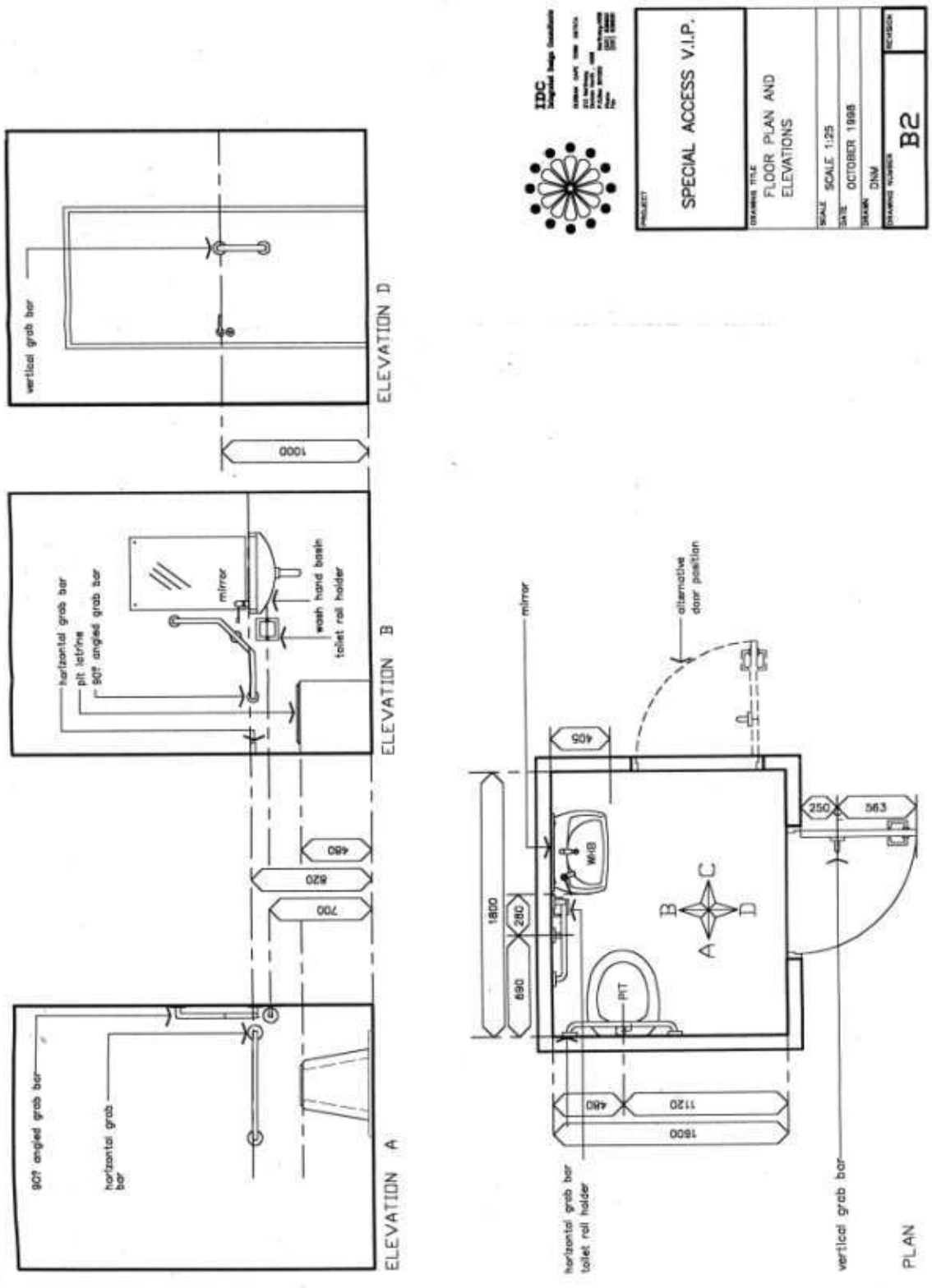


Figure 40 Special access VIP (Deverill & Still, 1998)

4. INFRASTRUCTURE: SELECTING APPROPRIATE SANITATION SYSTEMS

SEI (2004) states that for a sanitation system to contribute towards the goals of equity and a sustainable society it must at least partially meet the following criteria:

- Disease prevention (destroy or isolate pathogens in faeces)
- Environmental protection (prevent pollution, conserve water)
- Recycle nutrients to the soil
- Affordability (accessible to the world's poorest)
- Acceptability (aesthetically inoffensive, consistent with cultural and social values)
- Simplicity (robust enough to be maintained within the limitations of local technical capacity, economic capacity and institutional support)

SEI (2004) further states that the main components of a sanitation system which must work together are

- Nature: climate (temperature, humidity), water (amount available, groundwater level), and soil (stability and permeability).
- Society: settlement pattern (urban/rural), attitudes (faecophobic/faecophilic), habits (washers/wipers), beliefs and taboos related to human excreta as well as the economic constraints of the community
- Process: physical, chemical and biological processes by which human excreta are turned into a non-dangerous, inoffensive, useful product (e.g. dehydration and decomposition)
- Device: on-site structures specifically built for defecation and urination

EAWAG, in its *Compendium of sanitation systems and technologies* defines sanitation as "a multi-step process in which wastes are managed from the point of generation to the point of use or ultimate disposal" (Tilley et al., 2008). It describes a sanitation system as being comprised of *Products* (wastes) which travel through *Functional Groups* which contain *Technologies* which can be selected according to the context. By selecting a Technology for each Product from each applicable Functional Group, one can design a logical sanitation system. A sanitation system also includes the management, operation and maintenance (O&M) required to ensure that the system functions safely and sustainably (ibid).

The requirements for collection chambers such as pits, vaults or soakaways for faces, urine and greywater depend on the type of user interface selected and the type of treatment/product desired.

4.1 On-site and off-site options and considerations

While many users would like to have waterborne sanitation which allows the user to "flush and forget", there are a number of arguments against this option:

- This option is not possible in all rural settings where the cost of extending sewers to a school may be prohibitive.

- The use of clean water to transport hazardous waste is increasingly unsustainable as the burden on water resources becomes greater.
- It can be desirable to utilise urine and sludge on site for nutrients and soil conditioner
- Sewers that are not properly maintained can leak in poorly monitored areas resulting in a health risk and environmental contamination

> The present system does harm in attempting to do good. The intention is good, the result is sad. Men think they are purging the city; they are emaciating the population... A sewer is a mistake.
>
> - Victor Hugo, 1867

Comprehensive monitoring of *E.coli* by water authorities in the Pietermaritzburg/Durban area has shown conclusively that the greatest environmental threat to the areas' rivers is created by dysfunctional sewage systems. Our rivers are far more polluted below sewered areas than they are below unsewered areas with on-site sanitation.

Table 19 Advantages and disadvantages of on-site sanitation for schools

Advantages	Disadvantages
Eliminates the risk of leaks and spills causing major contamination in public areas Enables sanitation in rural areas where connections are not possible. Allows for the possibility of users to recover nutrients in sludge which can be used to increase food security.	Removal of sludge introduces risks of contact with pathogens in sludge. On-site disposal must be done properly or household can be exposed to pathogens over time. If municipality is not prepared to transport and treat sludge from onsite systems, schools will have to manage this. Users may perceive a system in which they have a greater role in management of excreta as a "downgraded" technology

As this study focuses on solutions for schools in rural areas of South Africa, with application as well to informal settlements where municipalities may not be able or willing to lay sewers, standard sewered sanitation is not discussed in this review and options are limited to on-site alternatives.

If an on-site system is selected, it is essential that the following lifecycle issues be considered during design:

- Servicing / utilisation options: how often do you plan to remove collected sludge/compost/urine/etc.; who will do this and how, where will the material be
- Pit capacity: design the size of the pit to match your servicing plan
- Pit design: ensure that pits are located and designed so that the planned emptying programme can be executed (e.g. vacuum tankers can access the area; emptying will not contaminate the circulation area).

4.2 Dry or wet

Flush or no flush

While "flush and forget" technology is standard across the developed world, it has serious drawbacks. SEI (2004) states that over the course of a year roughly 500 litres of urine and 50 litres of faeces are flushed away with 15,000 litres of pure water by each user of a standard flush toilet. More than a hundred years ago, U.S. President Teddy Roosevelt commented that "civilized people ought to know how to dispose of the sewage in some other way than putting it into the drinking water" (George, 2009). SEI (2004) states that the demand for freshwater tripled over the second half of the 20th century and projects that by 2030 more than half the world's population will face a shortage of water.

Low flush or pour flush systems can bridge the gap between the sustainability of dry systems and the convenience of flush systems by reducing the amount of water required to flush dramatically and using grey water, rather than pure water, to flush while still affording the user the preferred experience of flushing.

While removing excreta from sight may feel cleaner to a user, there are some aspects of flushing which may create risks of infection which don't exist with dry systems. Some initial research has shown that flushing produces an aerosol plume which can carry pathogens. To eliminate this plume, a toilet lid should be lowered before flushing. However, the use of a toilet lid has a number of other disadvantages, as discussed in Section 3.5.2. In addition, the use of flush handles create another point of contamination being passed from one user to the next. Alternatives to this are also discussed in Section 3.5.2

Separation of liquids

SEI (2004) presents a number of reasons for not mixing urine and faeces:

- it keeps the volume of potentially dangerous material small;
- the urine remains relatively free from pathogenic organisms;
- urine and faeces require different treatments;
- it simplifies pathogen destruction in faeces;
- it reduces odour;
- it prevents excess humidity in the processing vault; and
- the uncontaminated urine is an excellent fertilizer.

4.3 Beneficial use of urine and sludge

SEI (2004) found that in data from South Africa and four other countries a person produces on average about 5 kg of elemental NPK in excreta per year; about 4 kg is contained in the urine and 1 kg in the faeces. The nutrients found in urine and faeces can be used to increase food security and alleviate undernutrition (ibid). Synthetic fertilizers are expected to become increasingly expensive in the future as phosphorus reserves diminish. The 1.5 litres of undiluted urine produced by an adult each day can be used to fertilize 1 square metre of soil. The NPK in urine is readily available to plants and vegetable and fruit crops grown using urine fertilization have been found to produce 2-10 times the amount of crop by weight as those grown in unfertilized, poor soil (SEI, 2004). Collecting urine

from a school sanitation system can provide a free fertilizer with a lower concentration of heavy metal than commercial fertilisers.

In addition, as urine contributes the largest share of nutrients to household wastewater, removing urine from the waste water stream reduces the concentration of nutrients in wastewater. If urine is not separated from faeces, the resulting sludge will have value as a fertilizer but will first need to be treated to destroy pathogens. If urine is separated, the resulting sludge will contain fewer nutrients but will still, after treatment, have value as a soil conditioner which can increase the organic matter content of the soil, improve its water-holding capacity and increase the availability of nutrients (ibid).

SEI (2004) states that storing undiluted urine for a month will render it safe for use in agriculture; however when urine from different households is used storage times of up to 6 months can be recommended, depending on the crop. In the environment of undiluted urine micro-organisms find it difficult to survive, increases the die-off rate of pathogens and prevents the breeding of mosquitoes. It is important that urine that is collected be stored in a covered container with restricted ventilation to prevent the loss of nitrogen to the air (ibid).

4.4 EcoSan

IRC (2005) describes ecological sanitation as "part of a broader vision of bringing society in balance with nature to ensure a more sustainable future." In its manual *Ecological Sanitation,* SEI describes the three principles of ecological sanitation (SEI, 2004):

- Prevent pollution (rather than attempt to control it after we pollute)
- Sanitize urine and faeces
- Use the sanitized products for agricultural purposes

Typically, urine is diverted and faeces is stored in a vault where it is either dehydrated by means of heat, ventilation or the addition of dry material or decomposed (ibid). Using alternating vaults allow faeces to dehydrate or decompose in the vault that is not currently in use without being mixed with fresh faeces.

SEI (2004) warns that if EcoSan systems "are not designed, built and operated properly, taking into account natural environment, traditional beliefs and the chosen process (dehydration or decomposition), they may indeed smell and can even provide a habitat for flies."

IRC (2005) notes that "ecological sanitation systems require more promotion, support, education and training than conventional systems since they are more sensitive to bad design and management". School sanitation and ecological sanitation can go hand-in-hand.

Ecological sanitation systems are not necessarily more expensive than well-constructed traditional systems. Money can be saved because excavation is often not necessary and the lifespan of the facility is longer than that of a traditional latrine. The system does not depend on water and pipe networks and operation and maintenance costs are low (IRC, 2005).

4.5 Choosing an appropriate technology

The sanitation landscape in South Africa is dominated by two technologies on opposite ends of the spectrum, with only small numbers of alternatives in operation: on the one hand is standard waterborne technology, connected either to a municipal sewer or to a septic tank; on the other hand is the pit latrine. “Unimproved” pit latrines, which are follow no standard design, are considered, as a category, to be structurally unsafe (often having a slab of questionable stability over an unlined pit also of questionable stability) and a threat to health (in terms of the spread of diseases by flies visiting the pit) and they fall below the minimum standard for basic sanitation used by the government for service delivery and for school sanitation (South Africa, 2013). The Ventilated Improved Pit latrine (VIP), which is reviewed in Section 4.5.1 which follows, meets basic criteria in its design for safety and health and has been implemented widely as the government’s favoured option for basic sanitation both for housing and for schools. Both acceptable options, standard flush toilets and VIPs, have limitations in terms of meeting the various sanitation, environmental, political or psychological needs of users. On the one hand, standard flush toilets use more water than is sustainable in water-scarce South Africa; on the other hand, VIPs are seen as inferior, smelly and sometimes unsafe while flush toilets are seen as a symbol of political equality among users. Neither system makes beneficial use of the products of the sanitation system (faeces and urine).

There is a recognition across the global sanitation community of a need for more options along the continuum of sanitation technologies. On 3 September 2014 the brand new Department of Water and Sanitation (DWS) announced the Sanitation Innovation Challenge to mobilise innovative sanitation technologies and solutions towards providing more appropriate solutions to South Africa’s sanitation challenge. The DWS defines sanitation innovations as “those systems or solutions which are alternative to conventional waterborne sewerage and onsite ventilated improved pit latrines” and specifies that “technologies should provide sustainable sanitation services to urban, peri-urban and rural areas and take into account effectiveness, social preferences, water resource availability, affordability, possible beneficiation of waste products, economic development and cost reduction in the sanitation delivery chain” (DWS, pers. comm. 3 Sept 2014).

In addition, a number of publications have come out in the past few years showcasing existing and new technologies in the attempt to empower designers with options. These include:

- *Compendium of Sanitation Systems and Technologies* (Tilley et al., 2008): EAWAG
- *Smart Sanitation Solutions* (Netherlands Water Partnership, 2006)
- *A collection of contemporary toilet designs* (Shaw, WEDC, Loughborough University, 2014) showcases the Bill and Melinda Gates Reinvent the Toilet competition. Many of the designs not appropriate for school sanitation in South Africa for reasons such as they have too many moving parts (difficult to source, would not stand up to much abuse), rely on high tech components which are too costly or difficult to source or maintain in the South African context, are designed for “squatters” or “washers” or are specifically designed for mobile or household use and do not lend themselves to communal use.
- *Encyclopoodia* (compiled by Chin, Russel and Tilmans for Resourcesanitation.com) which describes itself as “A compendium of toilets for the sake of inspiring great solutions to meet that need that no one wants to talk about”. The compendium covers latrines such as the elephant toilet and Blair VIP and toilets developed on projects such as the Clean Team’s

Uniloo and Sanergy's Fresh Life toilet, as well as historical toilets, mobile toilets, high tech and playful designs.

- Ecological Sanitation (2008): The Swedish Environmental Institute's manual on EcoSan
- The Sustainable Sanitation Alliance (www.susana.org), an online discussion forum, is collecting case studies of sustainable sanitation in schools from all over the world which will ultimately be compiled and published.

Many of the technologies presented in these publications are not suitable for school contexts, but some of those which may be are discussed in the sections that follow.

The choice of technologies and user interfaces must take into consideration whether users are "wipers" or "washers" – i.e. use a dry material or water for anal cleansing – and whether they are "sitters" or "squatters" – i.e. whether they are accustomed to sitting on a pedestal or squatting over an opening in the floor. While in South Africa it is common within the Indian community to use water for anal cleansing and to use a squat plate arrangement rather than a pedestal, this project is geared at finding solutions for rural schools and informal settlements where the population is overwhelmingly black. For that reason, technologies designed especially for "washing" or "squatting" have not been considered in this review. They may, however, have application in terms of the need for areas for washing for menstrual management, something which cannot easily be accommodated by a pedestal toilet. They also may provide useful design ideas for female urinals.

4.5.1 VIP

In South Africa the Ventilated Improved Pit latrine has been the government's minimum standard technology which has been rolled out across the country. In India, however, VIPs are considered below the minimum standard (India, no date). The main design objectives of the VIP is to reduce the unpleasant smell associated with unimproved pit latrines, reduce disease transmission from flies visiting the sludge heap, and ensure the safety and stability of the latrine structure. Because the pedestal is situated directly over the pit the strength and stability of the slab are critical for safety.

Deverill and Still (1998) describe the principle of the VIP: Wind passing over the vent pipe sucks air from the pit which pulls air into the cubicle and down the pedestal. This effect is enhanced if the vent pipe warms up in the sun and if any ventilation gaps in the superstructure faces the prevailing wind. While flies are attracted by the smell of the air leaving the vent pipe, 1 mm mesh covering the exit of the vent pipe prevents them from entering the pipe. Flies which enter the pit through the pedestal are attracted to the light at the top of the vent pipe (the cubicle is kept

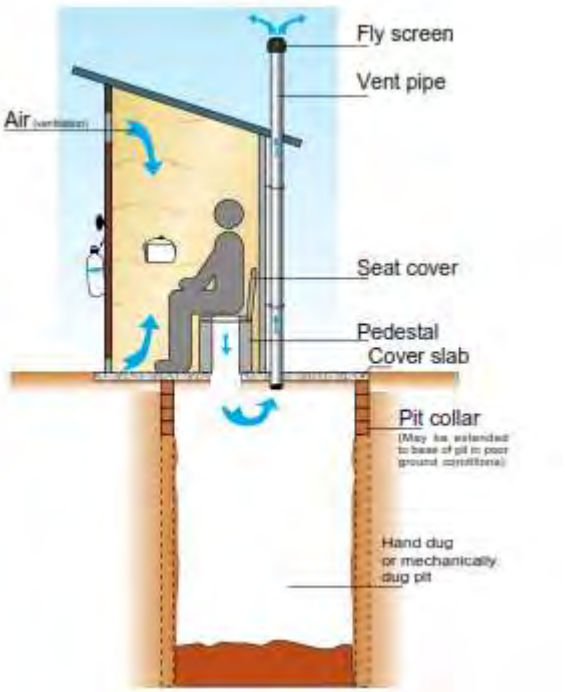


Figure 41 The essential elements of the VIP design, DWAF 2002

dark to aid this) and are trapped by the fly screen and eventually die before existing the system.

IRC (2005) notes that while keeping the facility fairly dark is a condition for the successful functioning of this system, this can undermine the "child-friendliness" of the facility. Anecdotal evidence shows also that there is a widespread fear that small children could fall through the pedestal of a VIP into the pit and that because of this it is common for parents to encourage open defecation. While this issue is being studied further, it is possible that the government's strategy of delivering VIPs to eliminate open defecation has failed quite seriously. While this is less of a concern at school, where children are bigger, the question should be explored whether some young school children at schools with VIPs avoid elimination during the school day because they are afraid of falling in, with potentially serious health risks.

A design for VIP pits in a sanitation block is provided in section 4.6.1.

Table 20 Advantages and disadvantages of VIP toilets

Advantages	Disadvantages
• Simple to construct • No water is required	• Unpleasant smell • The excreta pile and insects are visible below the user. • There is a risk of small children falling through the toilet seat into the pit; to avoid this risk parents encourage open defecation. • Sludge can prove difficult to remove because the chamber is directly under the pedestal. • Cannot be located indoors. • There is a risk of the slab collapsing and a user falling into the pit if the slab is not properly constructed. • The facility must be kept dark, which may be unpleasant for children. • Users can throw rubbish into the pit through the pedestal, resulting in a faster filling rate and creating a sludge that can be difficult to remove with a vacuum tanker.

4.5.2 Urine diversion

With a urine diversion dry toilet, urine is collected and drained from the front area of the toilet. In the case of a urine diversion dry toilet faeces pass through the open area at the back into a collection chamber while in a wet toilet they are flushed out of the rear of the pedestal. The Blue Diversion toilet used in Namibia, however, uses surface tension to allow urine to travel down the wall of the pedestal into collection trough around the base of the pedestal instead of splitting the pan into two sections (Shaw, 2014). It is important that the two sections of the toilet are well separated to ensure that a) faeces do not fall into, and clog the urine collection area in the front, and that b) urine does not splash down into the dry area of the toilet. When the toilet is cleaned with water, care should be taken to ensure that the faeces are not mixed with water.

Figure 42 Left: UD flush toilet (Envirosan); right: dry UD toilet used by eThekwini municipality

The Dubbletten flush UD toilet uses two bowls to separate urine and faeces. The front bowl catches urine and uses only .013 gallons to rinse the bowl, while the solids bowl uses .9-1.05 gallons to flush[28]. Solazone's dry urine diversion toilet features a door to shut off sights and smells from the composting chamber.[29]

[28] http://www.wateronline.com/doc/rosie-s-natural-way-epa-promote-performance-water-efficiency-0001. Accessed 3 July 2014

[29] http://solazone.com.au/composting-toilets-and-greywater/pedestals/ Accessed 3 July 2014

Figure 43 Dubbletten flush UD (left) and A dry composting toilet manufactured by Solazone (right)

Other alternatives to diverting urine at source is liquid separation from combined excreta (and flushwater, if used). The Aquatron, a composting urine diversion toilet developed in Sweden, is a device with no moving parts which uses the velocity of the flush (either standard flush or low flush) to force the liquid into the inner wall of a circular collector while the solids fall through an opening in the middle into a collection chamber[30].

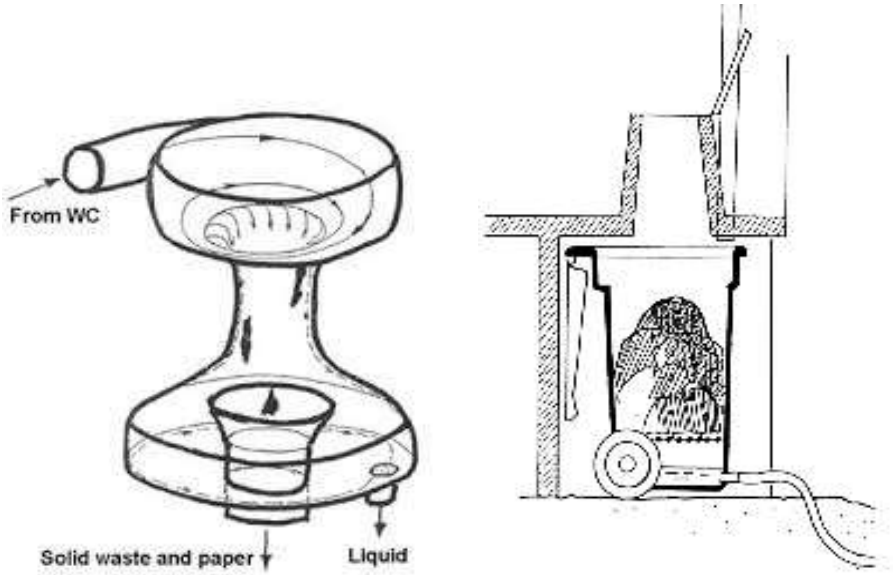


Figure 44 The Aquatron separator (Aquatron International) left and a composting toilet with liquid separation through a perforated floor, right (SEI, 2004).

[30] http://www.aquatron.se/index-2.php, Accessed 5 September 2014

SEI (2004) describes a novel sanitation system installed in 1996 by a municipal housing company in Norrkoping, Sweden, in a renovated 18 apartment building. Urine is separated in the pedestal and piped into underground tanks and later used as fertilizer by local farmers. Faeces is separated from flush water in an Aquatron separator (see 4.3.2) and then composted in an automatic composting device together with paper-, kitchen- and garden-waste and wood pellets. The compost product is used by the tenants in vegetable and flower cultivation. The flush water separated from the faeces in the Aquatron is treated with ultraviolet radiation for disinfection. The flush water is then, together with the greywater, collected in a three-chamber septic tank. From there it is channelled into a reedbed where the plants take nutrients from the water before it is discharged into a small stream.

Another way of separating liquids is to allow them to drain through a net or perforated floor in the bottom of the collection chamber (SEI, 2004). It must be kept in mind that, in contrast to urine diversion where liquids do not come into contact with faeces, in liquid separation the liquids that are collected are contaminated and must be treated before they can be used (SEI, 2004).

Urine diversion could be used with a number of different kinds of systems (VIP, pour flush, etc.) in order to collect urine for use or to reduce liquids in the collection chamber for the purpose of composting, dehydration, incineration or easier manual emptying. Depending on the treatment and use that will follow, drying material such as lime, ash or earth should be added into the collection chamber after defecating.

Table 21 Pros and cons of a dry urine diversion system

Advantages	Disadvantages
Less smell than VIP A shallow vault presents less risk to users in the event of a child falling in or a pedestal collapse. Urine can be easily collected for use as a fertilizer. Sludge is drier, resulting in reduced volume and easier removal.	The excreta pile and insects are visible below the user. Sludge can prove difficult to remove because the chamber is directly under the pedestal Cannot be located indoors. User interface can feel awkward to users. Some users may be unable to separate urine and faeces streams. Separate urinal is also required, otherwise male users have to sit while urinating. Faeces can be accidentally deposited in the urine collection area, causing blockages Urine pipe can become clogged or come loose, resulting in urine leaking around base of pedestal.

4.5.3 Pour flush and low flush

Pour flush technology has been used extensively across Asia with a squat plate. As users in Asia use water for anal cleansing, modifications both for pedestal and to cope with toilet paper and even newspaper were needed to adapt the technology to the South African context. In 2010 Partners in Development developed a pour flush prototype on behalf of the Water Research Commission and the first units were installed in September 2010. To date 38 units with fibreglass pedestals have been

installed in homes in KwaZulu-Natal and the Western Cape and 44 units have been installed in schools in Limpopo. In 2013 the prototype was modified to accommodate a cistern and a flush; 9 of these low flush units were installed in schools in eThekwini municipality. Six hundred units are planned to be installed at homes in eThekwini municipality in 2014/2015.

Figure 45 Pour flush/low flush toilet system arrangement, DWAF 2002

With a pour flush toilet, 1-2 litres of water is poured into the bowl to flush the toilet. This pushes the excreta through the waterseal and into the collection chamber. With a lowflush, a cistern dispenses 2-2.5 litres of water around the pan with each flush. Greywater can be used for flushing. The toilet has also proven capable of handling newspaper as an anal cleansing material.

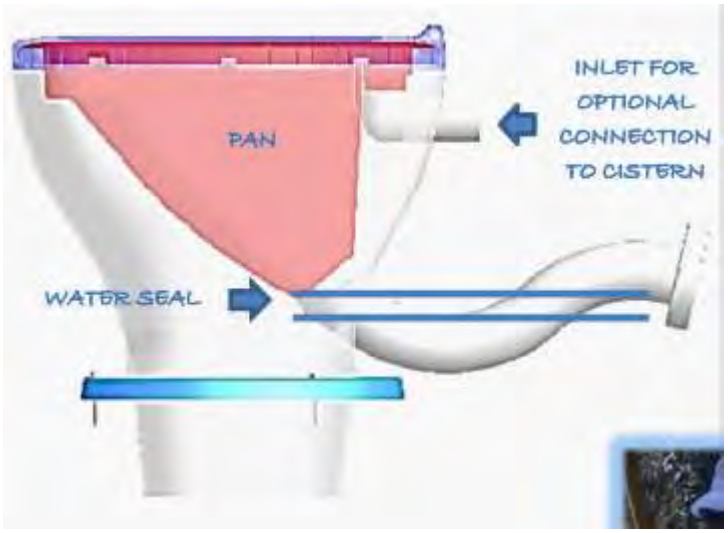


Figure 46 Design of pourflush/lowflush pedestal by PID

Figure 47 Pour flush design used at schools in Limpopo with water dipped from a cistern kept at a constant level

Advantages	Disadvantages
Child cannot fall through pedestal into pit. No risk of slab collapsing as pit is offset from pedestal. Water trap eliminates smells and insects from pedestal. Can be installed indoors. User controls flush volume. Meets political needs for flush technology while not requiring full flush or sewer connection Meets psychological needs for "cleanness" as user does not have to see the excreta of previous users. Eliminates the use of the pit for rubbish Can use a simple soakaway instead of a septic tank. No leaky cisterns. Grey water can be used for flushing. Costs significantly less than a full flush toilet (20% more than a VIP).	Requires specialised parts that may be difficult for householders to source. Possibility of blockages from newspaper, menstrual rags, etc. Bucket of flush water must be kept available or toilet will block – someone has to fill this Requires access to water, though tolerates unreliable water supply better than full flush toilets.

Government of India School Toilet designs and options presents several designs for pour flush school complex designs.

Figure x below shows the soakpit used by Partners in Development for pour flush and low flush systems (with twin or single pits). Twin pits allow the contents of a full pit to reduce over a number of years while a second pit fills, resulting in a sludge that has fewer viable pathogens and reduced volume when it is removed. Leaching from the pit in use into the full pit should be prevented by adequate distance between the pits or by a barrier.

Figure 48 Soakpits used with pour flush and low flush systems (PID)

4.5.4 Ecosan

With the Ecosan toilet, excrement falls down a vertical chute into the end of a helical screw conveyor. Each mechanism rotates the conveyor, moving the excreta along the conveyor until, in approximately 25 days, it reaches the end of the screw and falls into a collection container. The dehydrated material is roughly 5-10% of its original mass. Objects like beverage cans are claimed to not block the system[31].

[31] www.waterlesstoilet.com Accessed 10 July 2014

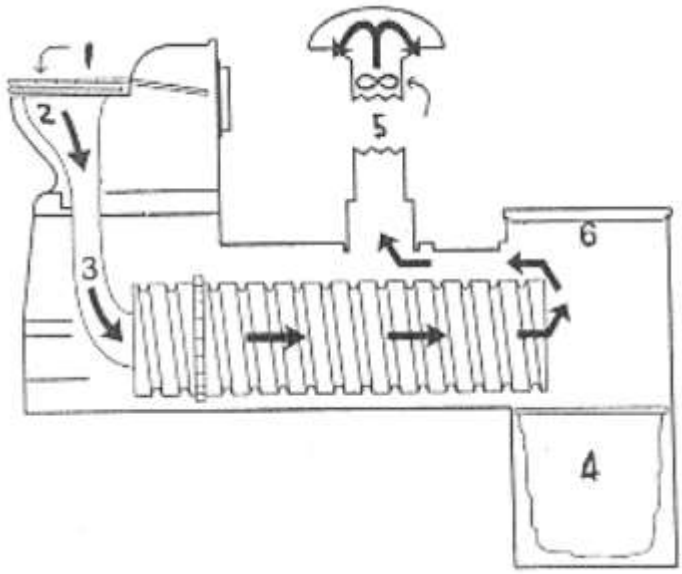


Figure 49 Ecosan waterless toilet

4.5.5 Enviro Loo

Enviro Loo, a South African company with installations in a number of countries, states that it has installed 33,500 units in schools to date,32 while the DBE documented Enviro loos at 1,294 schools in South Africa in 2011 (DBE, 2011). Enviro loos can be found at schools in all provinces except the Western Cape, with Limpopo having the highest proportion of them (ibid). The DBE has indicated that it is working with Enviro loo providers to assess whether Enviro loos at schools have been properly installed, are being properly used, that the school was given adequate training on their use, and to identify an issues schools are encountering with their Enviro loo systems (Mafoko, DBE, pers. comm., 14 Aug 2014). The DBE is also in the process of implementing a programme to install Enviro loos at 51 schools in Limpopo using an approach aimed at ensuring their sustainability (ibid).

When liquid and solid enters the collection container liquid waste drains to the bottom of the container while solid waste remains on the drying plate. Both the liquid and the solid waste are exposed to a continuous flow of air driven through the unit by the forced aeration ventilation system. The movement of air is assisted by the ventilation extraction unit positioned on top of the outlet vent pipe with air being drawn into the container via the inlet vent pipes and toilet bowl. As the air moves through the system, it dehydrates the solid waste as it migrates down the perforated drying plate, causing the liquid that has drained to the bottom of the container to evaporate.

Sunlight absorbed by the black vault cover increases the ambient temperature within the container aiding the dehydration of the sludge. The negative pressure within the container prevents the escape of any odour through the toilet bowl or through the air inlet pipes. The odour is vented into

[32] http://www.enviro-loo.com/ Accessed 4 July 2014.

the atmosphere via the wind driven extractor. Enviro Loo claims that at the end of the process the material is reduced to roughly 5% of its original volume.

Figure 50 Enviro Loo toilet block (left) showing vent pipe and black collection chamber covers and pedestal (right)

Regarding operations and maintenance, Enviro Loo states that the system:

> "needs to be inspected on a regular basis to check on the quantity of solid waste on the drying plate and whether the dried waste needs removal. The period between servicing, i.e. removal of dried waste will depend on the number of users per toilet per day. It is therefore recommended that the units be inspected on a regular basis for the first 3-6 months after commissioning to ascertain usage, which will determine the periods necessary between inspections and waste removal services thereafter. The service intervals could range from every 6 months to approximately every 3 years, depending on usage. The dried material is simply raked from the drying plate into the drying bag. The drying bag is then positioned inside the unit adjacent to the manhole cover and below the vent pipe. The material is then further subjected to increased temperatures and high ventilation which will ensure that the waste is adequately stabilised prior to removal from the container."

4.5.6 Incinerator toilets

Most toilets which are equipped with an incinerator are self-contained (and sometimes portable) units which would not easily be adaptable to a school context. The principles of the EcoJohn, however, could possibly be applied in a communal setting. After the toilet has been used, all waste material and paper is moved into the burn chamber by an auger[33]. The incineration process continues until all of the waste material is gone. This process takes about 5-10 minutes for a short cycle (liquid waste) and 35- 40 minutes for long cycle. Electricity is required to run the auger and commence the burn cycles. Sterile ash is removed periodically from the burn chamber. The EcoJohn is equipped with a small water reservoir; the bowl and auger can be rinsed with the push of a button

[33] http://ecojohn.com/ecojohn_sr.html Accessed 3 July 2014

Advantages	Disadvantages
No handling of pathogenic sludge Greatest reduction of volume of sludge Easy disposal of waste	Requires electricity or fuel More specialised maintenance issues Possible odours during burning Harmful gases released during burning Anti-foam agents, catalysts or other additives are typically required for use Nutrients are destroyed

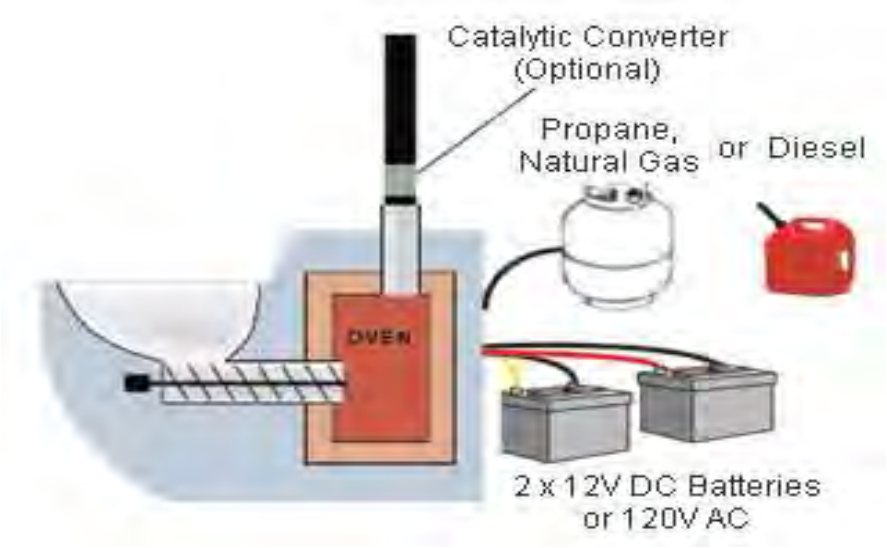


Figure 51 EcoJohn incineration system

4.5.7 SANIX waterless toilet

The SANIX waterless toilet developed at Rhodes University diverts urine using the angle of the pan to direct the urine flow into a pipe which leads to a storage container or onto an orchard or a bed of Vetiver grass[34]. A rotating "dry flush" handle drives a conveyor belt that sends the solids into a drying chamber where solar/ambient heat and constant ventilation produces a dry material which can be used as a soil conditioner.

Figure 52 Sanix toilet

[34] (http://www.ru.ac.za/environment/resources/waterlessl

4.6 Collection of solids or liquids

The requirements for collection chambers such as pits, vaults or soakaways for faeces, urine and greywater will depend on the technology selected (e.g. VIP, pourflush, UD, composting toilet or other) and in some cases (e.g. incineration chambers) the requirements are very specific. This section covers some standard options not discussed in Section 4.5.

SEI (2004) offers the following advice with regard to managing sludge in a pit or vault:

- **Keep the volume of pathogenic material small**: divert urine and don't allow water to enter sludge collection.
- **Prevent the dispersal of material containing pathogens**: store securely
- **Reduce the volume and weight of pathogenic material to be treated**: dehydrate and/or decompose to facilitate storage, transport and further treatment.
- **Reduce pathogens to a harmless state** with primary and secondary treatment

The capacity and lifespan of the collection chamber should be considered in the design phase in order to ensure that it is compatible with emptying or beneficial use cycles. The use of pits for disposal of rubbish by users can dramatically increase filling rates and reduce lifespan. This factor is reduced for flush toilets. However it should be kept in mind that users require receptacles for rubbish and sanitary products and if schools do not provide these disposal in the pit at least provide users with an option. The introduction of flush toilets, therefore, should only be considered if there is a strong commitment (and budget allocation) on the part of the school to provide and empty bins.

Deverill and Still (1998) provide guidance on calculating the size of VIP pits for schools which could be adapted for other kinds of collection chambers. Calculations are based on the following reduction factors

- Schools are typically open only 200 days or approximately 55% of the year (unless used by outsiders)
- The solids accumulation rate is less for children than it is for adults. In high schools, it can be reduced by 25% (i.e. multiply by 0,75), in primary schools, 50% (i.e. multiply by 0,50) and in nursery schools by 75% (i.e. multiply by 0,25).
- The accumulation rate must be reduced by a further 50% (i.e. multiply by 0,50) to allow for the fact that many learners do use the bush or toilets at home outside of school hours.

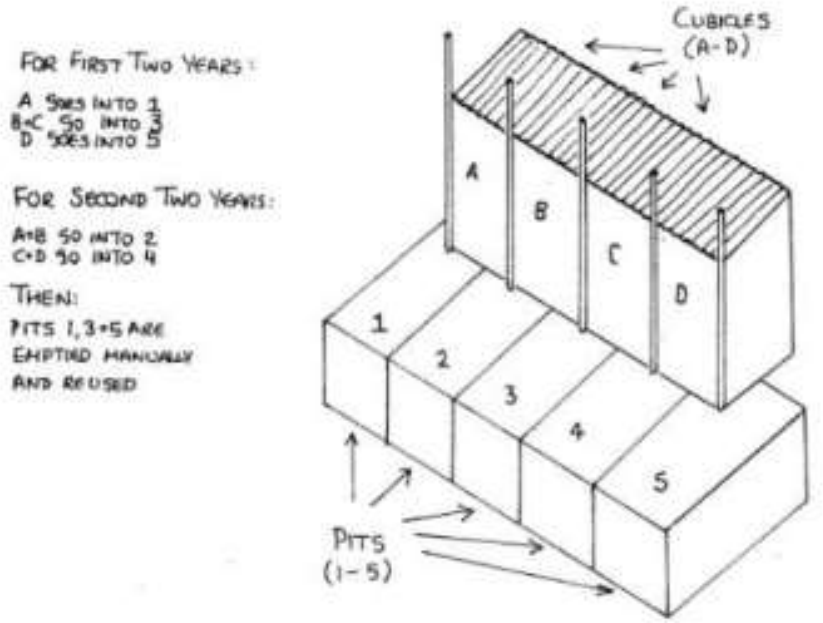
4.6.1 VIP pit arrangement for schools

Deverill and Still (1998) describe a pit arrangement for schools using double pits shared between cubicles. Two holes in the cubicle are positioned over each of the two pits and one pit is used by two cubicles simultaneously while the alternating pits are not used. When the pits in use become full, their contents may be left decompose for several years, and the pedestals are shifted to the holes over the alternative pits. As this option requires slightly larger cubicles and additional block work, they are somewhat more expensive to build. This does, however, allow a shallower wider pit (1.6 m deep) which is easier to excavate than the deeper single pit option and reduces the likelihood of contaminating shallow ground water if this is a possibility. The advantages of this arrangement are as follows (Deverill and Still, 1998):

- Sludge less offensive to remove after several years of decomposition

- Shallower pits reduce risk of contaminating groundwater
- Shallow pits allow easier removal
- Shallower pits allow for easier construction in hard soil
- Results in a drier sludge which can be removed with shovels if access by honeysucker is impossible

Table 22 Ventilated improved double pit arrangement



4.6.2 Composting vaults

In single-vault composting toilet systems the vault functions as a continuous reactor, with excreta being added to the top, and compost removed periodically from the bottom (Berger, 2011). Liquid draining from fresh material added to the pit may contaminate the finished compost, however, and so compost from single-vault systems should undergo a second treatment before it is used. A vault with multiple compartments that strictly separate old and new material can prevent cross contamination, however as this generally means the size of each section is smaller (for example 4 x 250ℓ) it could be at the cost of optimal heating and biodiversity in the heap. Smaller storage units may also make maintenance and management more difficult. Using a double vault system instead of a multiple vault system can allow sufficient volume while protecting against contamination of the final product by pathogens in fresh material (ibid).

The vault is usually positioned directly beneath the pedestal and has a steeply sloping floor, allowing leachate to drain down to a separate container. To provide the best conditions for continuous aeration in order to facilitate self-heating of the heap and for biological diversity, the vault should be at least 1 m^3 (Berger, 2011). Aeration can be aided by adding a bulking agent that creates air

pockets inside the pile or by fitting the vault with perforated pipes that carry air into the centre of the pile (SEI, 2011).

Ventilating the collection chamber reduces odours and aids both dehydration and aerobic decomposition processes (SEI, 2004). The need for a vent pipe is determined by climate and the wetness of material added to the vault, as well as odour. A vent pipe with a diameter of 10-15 cm should be adequate, although in climates that are exceptionally humid it may be beneficial to use a vent pipe as large as 25 cm in diameter (ibid). The pipe should extend 50-90 cm above the roof and not have any bends in it, as this reduces draft. A wind driven extractor fan or electric fan can be fitted to the top of the ventpipe.

A water content of at least 40% should be maintained; faeces contains 65-80% water which is adequate for good processing with the addition of toilet paper and bulking material (Berger, 2011). If urine is separated, there will be less leachate produced, but the heap may need to be watered if the water content drops too low. In addition, the nitrogen content of the compost will be less, requiring less balancing with carbon-rich additives (ibid). Conversely, if urine is not diverted the resulting higher water and nitrogen content will have to be balanced with dry bulking material, increasing the total volume of the heap.

4.6.3 Soakpits for containing liquids

Deverill and Still (1998) recommend that while water used for cleaning floors can be swept into the collection pit of a VIP unless the ground is almost impermeable, soakpits should be provided for waste water from hand washing stands and urinals (if urine is not collected). The sizing of soak pits should be determined based on the volume of liquid they are expected to receive and the permeability of the soil. They recommend a pit 6 m long, 1.25 m deep and 0.5 m wide for 10 urinal spaces (500 learners) or a hand washing stand. The pit should be filled with stone or rubble, covered with a polythene or similar barrier and the top 500 mm backfilled with the excavated soil.

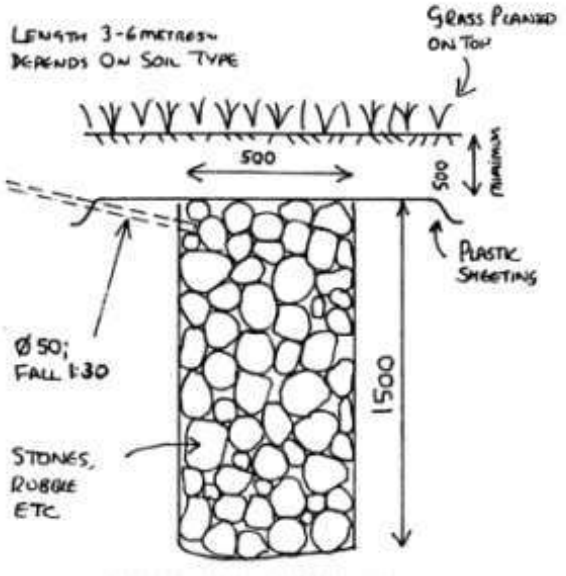


Figure 53 Soakpit for liquids (Deverill and Still, 1998)

To test the drainage capacity of the ground a small pit can be dug to the required depth and filled repeatedly with water to a mark until the ground around the pit is fairly saturated. The volume of water needed to maintain this level is then measured over a number of hours. If the daily volume of urine and waste water is known or can be reasonably estimated, the results of this test can be used to size the soak pit.

IRC (2005) advises that to minimise the risk of pollution a sand filter can be provided around the pit. In areas where pits could overflow as a result of extra rainfall or floods, posing health risks, pits should be constructed at an elevated level or another suitable solution should be found.

4.6.4 Septic tank/soak away or small bore solid-free sewer arrangements

DWAF (2002) describes two models to be used with flush systems. In a septic tank and soakaway excreta is flushed into the settling chamber. Liquids pass out of the tank and into the soakaway system. Digested sludge gradually builds up in the tank. In a small bore solid-free sewer liquid effluent is carried by a system of small-diameter pipes to a treatment or disposal site (e.g. soakpit for liquids) or sewer connection, while solids are collected onsite.

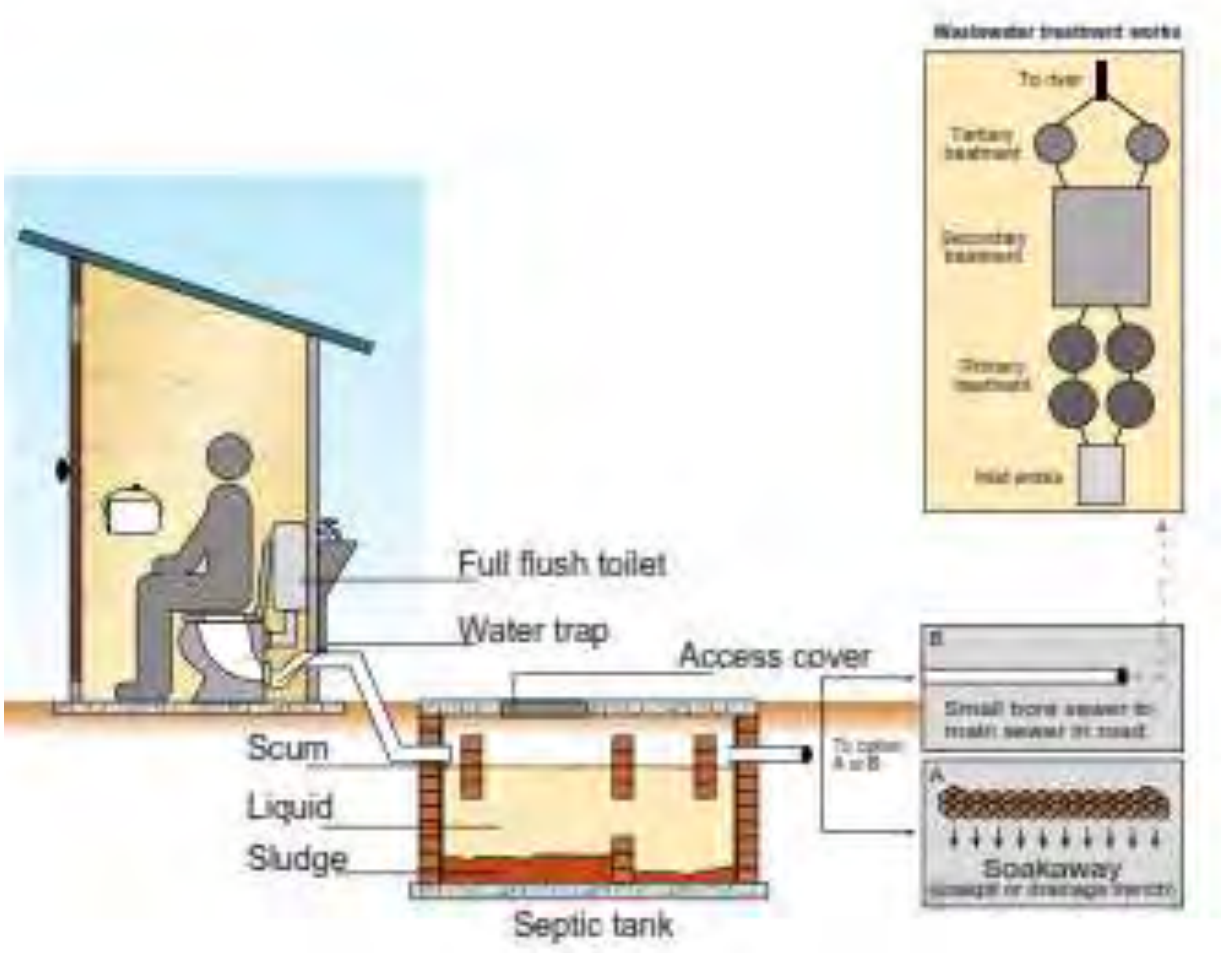


Figure 54 Septic tank/soak away and small bore solids-free sewer options, DWAF 2002

4.6.5 Other types of chambers

Low-flush and pour flush systems do not require full septic tanks because due to the small flush volume a simple leach pit is adequate to allow liquids to leach away. Section 4.5.3 describes this pit arrangement.

Where urine is diverted and sludge is expected to be dry, an above the ground vault can be used which allows for easier emptying. This system has been used by eThekwini Municipality for its urine diversion (UD) toilets as shown in Section 4.5.2. As stairs are required to reach the toilet, this arrangement can have drawbacks for elderly or disabled users.

4.7 Treatment

The final disposal or use of sanitation products (sludge and possibly separated urine) will determine what treatment is needed during and after collection. The Swedish Environmental Institute's manual *Ecological Sanitation* (SEI, 2004) addresses many of the issues involved with handling sludge from on-site systems, including deactivation of pathogens, treatment options, design and management features for treatment options and the use of sludge and urine to recover nutrients. The manual distinguishes between primary and secondary process of sludge. The purpose of primary processing, which takes place while sludge is stored beneath or near the toilet, is to reduce the volume and weight of sludge for the purpose of storage, transport or further (secondary) treatment. During this period the number of viable pathogens will decrease and decomposition and dehydration will occur. This process can be aided by the addition of other materials to aerate or raise the pH, as well as the presence of organisms in the sludge. The purpose of secondary processing, on the other hand, is to render sludge ready to return safely to the environment. Processes such as high temperature composting, pH increase by the addition of urea or lime could be used but cannot be relied upon to ensure total deactivation of helminth eggs; carbonization or incineration can be used if a completely sterile product is required.

4.7.1 Dehydration

Dehydration is a form of primary treatment which uses evaporation and the addition of dry material to lower the moisture content of sludge to less than 25% (SEI, 2004). This deprives some pathogens of the moisture needed to survive, but cannot be relied upon to deactivate helminth eggs. If dehydration is the desired treatment programme, flush water and urine should be diverted and ash, lime or urea added after each defecation to reduce moisture raise the pH to at least 9 prior to secondary treatment (ibid). Because dry material is added this method does not result in reduced volume, and the low moisture content inhibits degradation. Solar heaters, such as a black cover, can be fitted to the processing chambers in order to aid evaporation.

4.7.2 Biodigestion

EAWAG describes the use of biodigestion to generate biogas in its Compendium of Sanitation Technologies (Tilley et at, 2008). Biogas sanitation systems utilises anaerobic digestion of sludge and organic material, which produces methane gas (biogas) that can be separated off and used as a fuel for heat or electricity production. The anaerobic process produces gasses in the sludge through fermentation; the gasses then rise to the top of the digester mixing the slurry as they rise. As the gas is removed the slurry flows back down into the chamber.

The digester facilitates the anaerobic digestion and separation of the biogas. It can be built above or below ground and from materials easily sourced locally. The digester should be designed for a retention time of 15-25 days, but extremely pathogenic sludge should be for 60 days. Ideally the digester should be heated to 50^{o}C to ensure pathogen destruction but it may not be realistic to try to achieve this in developing countries. The slurry that remains is odourless but will still need secondary treatment in order to be pathogen free. The slurry will need to be removed every 6 months to 10 years depending on the capacity of the digester.

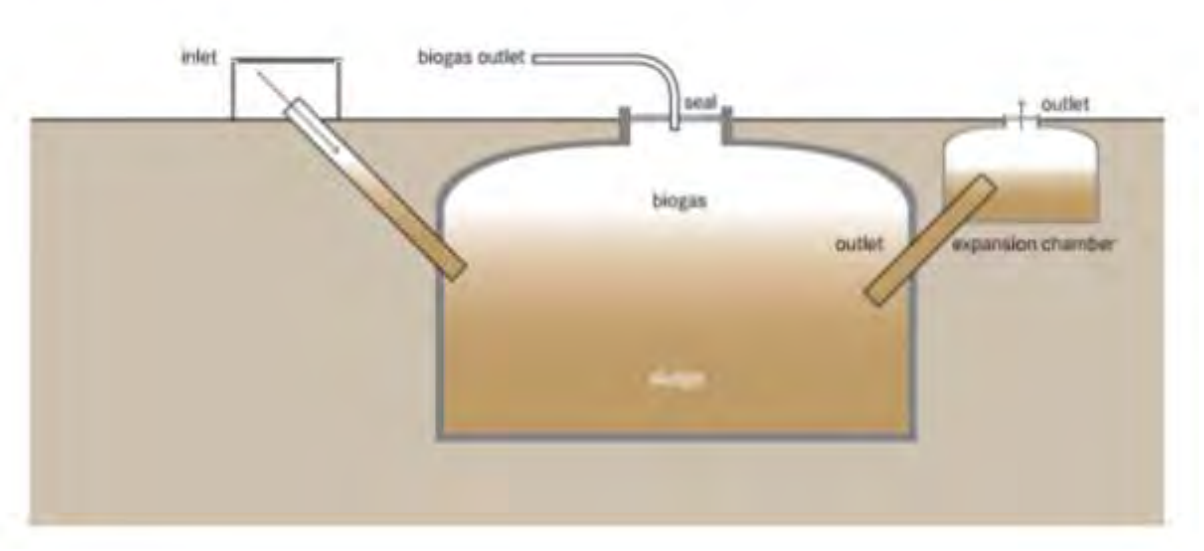


Figure 55 Biogas digestor (Tilley et al., 2008)

Bio-digesters require skilled design and construction to ensure the tight seal of the system to prevent gas leaking and that the flammable gases are managed safely. The equipment also needs regular cleaning to prevent corrosion. To establish the system active sludge is needed to seed the system. Once established the system is self-mixing, however stirring once a week is recommended to keep reactions even.

Table 23 Advantages and disadvantages of biodigestion

Advantages	Disadvantages
Generates energy	Skilled design and construction needed
Low operation costs	Careful management required to ensure safety
Long life span – if maintained well	Cannot produce gas at temperatures below 15^{o}C
Can be built and maintained with locally available resources	Digested sludge and effluent still needs treatment
No electricity required to operate	
Small land area required	

4.7.3 Incineration

Systems which incinerate liquids or solids have the following advantages and disadvantages.

Advantages	Disadvantages
No handling of pathogenic sludge Greatest reduction of volume of sludge Easy disposal of waste	Requires electricity or fuel More specialised maintenance issues Possible odours during burning Harmful gases released during burning Anti-foam agents, catalysts or other additives are typically required for use Nutrients are destroyed

4.7.4 Composting

Optimal composting involves controlling a number of conditions (moisture content, oxygen supply, C/N ratio, pH-value, biological activity, temperature (Berger, 2011) which may be difficult for a school already struggling to manage its sanitation to keep up with. The purpose of composting is to achieve a product that can be used to improve the soil for agriculture, however if pathogen destruction is not ensured, which it may not be if the composting process is not carefully monitored, the product of a compost toilet may not be safe to use. High-temperature aerobic composting, where temperatures reach over 60ºC, is effective in destroying most pathogens, but it is difficult to achieve these temperatures consistently across a pile in a composting toilet because the volume of material is too small and compact and it is difficult and unpleasant to turn the pile to aerate the central part (SEI, 2004). To raise the temperature in order to speed the process carbon rich material should be added to the amount of 4-5 times the weight of the faeces. Occasional turning is also needed to ensure adequate oxygen in the pile (ibid). Berger (2011) explains that the heap should be turned after two weeks of heat development (> 55°C). The mixing will stimulate the composting process and the surface material of the compost heap will also be composted. Thereby another self-heating process will be activated.

4.7.5 No treatment option: On-site burial

While use of the products of sanitation systems to return nutrients to the soil is desirable, many rural schools are already struggling to maintain their infrastructure and the additional burden of managing a treatment plan is likely to be beyond their capacity. Due to the high prevalence of assumed to be extremely pathogenic and unless rigorous methods have been used to ensure that treatment has deactivated all pathogens, schools should not attempt to use sludge from their collection chambers for food gardens. In addition, the vast majority of rural schools already have sanitation systems such as the VIP which do not easily lend themselves to treatment options.

Urine may, however, be easily collected and safely used if it is carefully separated from faecal collection (e.g. collected from urinals rather than from UD pedestals where urine collection areas in the pan could be contaminated with faeces.

Still et al. (2012) describe a simple method of transferring untreated sludge from vaults to pits, trenches or holes on-site. On site burial of sludge safely contains pathogens and eliminates the costs

of transporting sludge to a disposal or treatment site. In order to utilise the sludge beneficially, trees which yield fruit, building material, shade or fuel can be planted above or alongside the buried sludge, with the following benefits:

- Nutrients which could potentially contaminate the groundwater are taken up by the trees
- Nutrients available in sludge improve the quality of fruit or wood, enhancing food security or economic security
- Children are unlikely to expose the pathogens buried in sludge through play, creating a health risk, if trees are planted over the burial site(s).

. The following factors should be considered in siting burial locations for sludge on site:

- If groundwater is present in the VIP pit, sludge should not be buried at locations lower on the site and should be placed in shallower holes.
- On-site burial should not be used in very sandy or gravelly soils because of the potential of groundwater contamination. (See Section 2.3)
- Burial holes should not be located on eroded banks or cutaways where activity could erode the vertical face into the sludge itself, exposing pathogens.
- Burial holes should not be located within 15 m of a stream.

Care should be taken while transferring sludge to protect workers and the environment from pathogens in the sludge through the use of barriers.

Holes or trenches should be prepared of adequate proportions to contain the sludge while also allowing for 300 mm of soil backfill on top of the sludge surface to prevent sludge from becoming exposed over time.

5. MANAGEMENT: FULFILLING THE RESPONSIBILITY TO PROVIDE A SAFE AND HEALTHY ENVIRONMENT FOR CHILDREN

It is impossible for schools to maintain an environment that is safe and healthy for learners if operation and maintenance of sanitation facilities is not properly planned and budgeted for (Wall and Ive, 2010; Deverill and Still, 1998; Zomerplaag and Mooijman, 2005; Government of India, ND; Welsh Government, 2012).The Welsh Government (2012), however, recognises a common problem: *"school toilets may not be high on the list of school's budget and priorities for improvement".* Deverill and Still (1998) go one step further, stating that "*If the cleaning of the toilets and their surrounds is neglected there may as well not be any toilets*".

The IRC states that the intermediate goals of operation and maintenance are to prevent transmission of disease through the sanitation facilities and to improve hygiene practices, with an ultimate goal of improved health among users (Figure 56) (Zomerplaag and Mooijman, 2005).

Figure 56 The goals of O & M for school sanitation (Zomerplaag and Mooijman, 2005:15)

In addition to the technical and health reasons for maintaining facilities it is important to recognise the psychological role which operations and maintenance plays for learners. When sanitation facilities are in poor condition both educators and learners may have little motivation to look after them. Many facilities are in such bad repair that the task is overwhelming and in some cases impossible. In addition to the filth and unpleasant smells which learners often report in poorly maintained facilities, many learners report fears of finding animals, snakes and insects in their school toilets (Zomerplaag and Mooijman, 2005).

5.1 Guidance

In response to the documented deterioration of schools owning to inadequate maintenance, in 2010 the Department of Basic Education drafted the *National School Infrastructure Maintenance Guidelines* as part of its Asset Management Policy (DBE, 2010). The guidelines state that the key outcomes to be achieved through maintenance are the following (in priority order):

2 All statutory and technical requirements to ensure health and safety, security and reliability are met
3 The physical condition of immovable assets is kept up to a standard appropriate to their service function and value to the community
4 Functional and operational requirements of the working environment are met

The guidelines provide for planned and unplanned maintenance. Planned maintenance includes any maintenance that is statutory, preventative maintenance, scheduled, condition-based or addresses backlog. Unplanned maintenance includes breakdown, rehabilitation, major repairs, renovations, minor new works and replacement.

The guidelines task each provincial Department of Education with ensuring that the maintenance policy addresses planning, budgeting, implementation, monitoring and reporting, noting that monitoring is needed to ensure value for money is achieved. The provincial departments are required to develop a management framework for immovable assets that coordinates between the use of the assets and the service delivery objectives. For all of this there needs to be a set of minimum standards and principles for effective asset management and maintenance and integration of maintenance plans with the various planning tools used by DBE.

The guidelines stress that maintenance needs must be given careful consideration during the planning and construction phases of infrastructure to ensure sustainability. Lifecycle costing (for planning, capital, recurring and disposal costs) is encouraged in order to determine the most cost effective maintenance programme and set a baseline for monitoring and controlling costs over time.

The guidelines task the school governing body (SGB), in collaboration with the school principal, with maintaining the school building and premises. It also advocates nominating an educator to take responsibility for maintenance operations who reports to the principal and SGB. For day to day maintenance needs the principal is required to contact the district or regional office which will then send a works inspector to carry out a thorough inspection. Work that falls under day-to-day emergency maintenance should be completed within 48 hours of being reported. The SGB should utilise funds from the provincial Department of Education for planned preventative maintenance, reactive maintenance and for breakdowns and emergencies. Due to the high cost of major repairs SGBs are encouraged to take out building insurance using the school's fund allocations.

While WASH has gained increasing attention in international health initiatives, operations and maintenance often receive little direct attention. Much of the international literature calls for investment from the community either in the form of financial support, community mobilisation or labour (Chatterly et al., 2014; Snel et al., 2002). UNESCO (2003) notes that rarely is government funding alone sufficient for managing school sanitation infrastructure, and that schools need to build partners in the community and together address water and sanitation in the wider community and the school.

As mentioned earlier, this model has not established itself in South Africa as communities are aware that responsibility lies with their provincial Department of Education.

Figure 57 Elements of operation and management (Zomerplaag and Mooijman, 2005)

The IRC recommends that at the school level a plan for operations and management should be drafted which specifies who is responsible for O and M as well as how and when it should be carried out (Figure 57). The plan should address supervision, maintenance, the supply of water, soap and cleaning tools, cleaning and monitoring and evaluation of use (Zomerplaag and Mooijman, 2005).

The Welsh Government (2012) advocates for the development and implementation of a school toilet policy that is agreed on by teachers, the school governing body, parents and learners. It states such a policy or plan provides "*a powerful indication to learners and parents/carers that the school values and respects the health, safety and well-being of its learners"*. This approach relies on schools providing and maintaining good quality facilities with learners in turn treating facilities with respect.

The Welsh Government (2012) also recommends that the education department develop a programme of audits to ensure that schools have adequate toilets and hand washing facilities. Within schools, a reporting system should be put in place for problems and complaints should be taken seriously and quickly acted upon and issues relating to toilet management should be raised at relevant opportunities with staff, school governors, parent-teacher associations and local authority meetings (ibid). It is important to note that in Wales schools have a budget allocation for toilet repairs, maintenance and cleaning (ibid).

The follwing table extracts the key elements raised in the literature for ensuring that operations and maintenance at a school is sustainable.

Table 24 The key elements for making O and M in schools sustainable

Element	Description
Planning	
Consideration of O and M in technology choice	Appropriate technology choice and planning for the long-term O and M for that technology. The factoring of the cost of O and M required for the structures life span and if the necessary skills are locally available. Assigning responsibility for managing and paying for the activities to ensure sustainability (UNESCO, 2003).
Develop and implement and O and M plan	The plan should be developed in partnership with staff, learners, parents, communities and the SGB and include forming a toilet committee of the stakeholders. It should include annual planning, reporting, budgets and assigning responsibility for activities (Government of India, ND; Zomerplaag and Mooijman, 2005). Responsibilities should be defined, discussed and agreed upon and the rights of stakeholders considered so that plans are non-discriminatory (Deverill and Still, 1998; Welsh Government, 2012; Zomerplaag and Mooijman, 2005)). It is also suggested the plan include non-compliance ramifications (Zomerplaag and Mooijman, 2005). Ideally planning of O and M should be started before construction to ensure it is factored in technology choice. Should this not be possible the plan should be developed before facilities are completed and bad habits can develop (Zomerplaag and Mooijman, 2005).
Involve the wider community	By involving the wider community and parents in the school and the sanitation facilities it allows them to contribute to a community facility and increases their feeling of responsibility and ownership (Government of India, no date). This also allows for consideration of religious and cultural practices (UNESCO, 2003).
Include sanitation in overall plan to improve school facilities	Develop a plan for overall improvement in school facilities and include the sanitation plan. This will help build a community-based school with a child-friendly and healthy environment with all stakeholders involved (Zomerplaag and Mooijman, 2005).
Administration	
Regular Inspection and reporting of issues	Facilities should be inspected regularly, this will allow for regular maintenance to be planned and carried out. The inspections will help with budgeting for supplies and parts and, in the long run, enable sustainable management of facilities (Deverill and Still, 1998; Zomerplaag and Mooijman, 2005). The issues relating to sanitation facility management should be raised at relevant forums such as the AGM, local authority meetings, SGB meetings and pupil forums (Welsh Government, 2012).
Regular audits	Undertake audits of consumable items and facilities themselves at regular intervals. It should be encouraged that the local authority conduct facility audits (Zomerplaag and Mooijman, 2005; Deverill and Still, 1998).
Monitoring and Evaluation of facilities	To ensure the overall objective of O and M (see Figure 3) in creating a healthy, safe school environment monitoring and evaluation needs to be built into the sanitation plan. This will help ensure the effectiveness and efficiency of the O and M (Zomerplaag and Mooijman, 2005).
Facilitate an open dialogue	By establishing an open dialogue with learners, staff and communities it allows for easy reporting lines of problems and easy diagnosis of problems. If this process is reviewed periodically it will safeguard the value of the O and M plan (Zomerplaag and Mooijman, 2005).

Funding	
On-going budgeting for O and M activities	Budget for consumables (toilet paper, soap, cleaning materials, etc.), replacement parts and potentially a designated cleaner (Government of India, ND; Deverill and Still, 1998). A method of storing, monitoring the use of consumables, and reordering as needed should also be developed.
Finding alternative funding opportunities	While schools generally receive funding support from the government, and in South Africa each school receives a maintenance budget, it may be that the availability of government funds is slow or limited so alternatives should be investigated. These could include parents contributing funds or services, donations from the wider community of cash or services, reallocation of general maintenance budgets to increase spending on toilets, contributions from staff, fines for abuse of facilities or finding alternative government funding (Government of India, no date).
Activities/action	
Management regime	To prevent pressure on sanitation often limited facilities, and long waiting times for toilets allowing time-tabled gaps between lessons or staggered brake times. This will prevent rushes at centralised break times (Deverill and Still, 1998).
Employ a cleaner	Deverill and Still (1998) advocate employing a cleaner from the community for the sanitation facilities for roughly 2 hours a day to maintain facilities.
Learner training	Pupils should be educated and trained on how to use sanitation facilities. This should also include educating learners on the O and M plan and their responsibilities (Deverill and Still, 1998).
Facilities kept secure	Facilities should be locked outside of school hours, the reasoning behind this should be communicated to the community (Deverill and Still, 1998)
Assign toilets to defined groups	By assigning specific toilets to defined groups, such as particular classes, it increases the feeling of responsibility and ownership for the facility. If possible, including the teacher will ensure supervision of the facilities (Zomerplaag and Mooijman, 2005).

5.2 Models

Lessons from Bangladesh

Recent research conducted in Bangladesh investigated the necessary components for well-managed school sanitation. The project aimed to understand what conditions promote continued management of quality school sanitation and hygiene services to effectively utilise resources and the lasting impact of investments (Chatterly et al., 2014). The area in which the research was conducted was rural and had been receiving support from an INGO which had developed and implemented sanitation hygiene clubs throughout the region.

The findings of the research were that there were two 'pathways' to well-managed services. The first was that quality construction is maintained with financial support from communities and a champion for sanitation at the school. The other pathway was that quality construction is maintained with support from government grants and a maintenance plan supported by the school management committee (in the case of SA the SGB). In particular financial support was the key condition for sustainable management of facilities, but insufficient on its own.

Specifically the research found that the SGB had to not only be active but also involved and focused on sanitation as well as having a local champion at the school who is accountable for school toilets, a maintenance plan and hygiene promotion. It is also important to note that the research found that

the pupil to toilet ratio did not have an impact on how well managed school sanitation facilities were.

This approach is holistic and involves the community, educators and pupils in the process of managing sanitation facilities. It encompasses all stages of the life cycle of the facilities and ensures sustainable funding through community involvement.

The South African Water and Sanitation Academy

The South African Water and Sanitation Academy (SAWASA), based in Limpopo, has adopted a 3 tiered approach to O and M in schools which involves the following:

1. Helping schools to talk about and understand the problems they experience with sanitation and to initiate change themselves
2. Training and development programmes for schools and communities
3. Marketing of the programme to private companies and international organisations

SAWASA's key principle is that clean facilities are the most powerful form of social change persuasion: "the more visible the change, the more convincing are our public toilet and sanitation resolution strategies" (Mulaudzi and Bozwana, no date). The focus of the organisation is education and motivation of learners to maintain their own facilities. The model is based on the belief that through clean, usable facilities a sense of accountability will bring about a change in the way individuals view and use facilities.

The organisation has two ways to help schools to understand the need to change their sanitation habits. One approach is to carry out an initial clean of school toilets to reverse apathy resulting from unsanitary facilities and bring about a recognition of the need for ongoing maintenance. Users are then encouraged to take responsibility for maintaining the cleanliness of facilities and promoting hygiene education within the school. The other approach is to engage pupils in discussions around the state of their facilities and their awareness of the issues relating to hygiene, especially for school girls, to create support and buy-in for the next phase of the programmes. The 'School Toilet and Classroom Revolution Project' team then conducts an audit of the condition of the school's sanitation infrastructure. Using the audit a plan of action is drawn up that includes cleaning, upgrading facilities and educating staff and learners regarding hygiene. The project team and the school then seek funding from private companies to carry out the necessary renovations. Once facilities have been renovated the on-going O and M is carried out by the learners and staff at the school.

Funding for the programme either comes in the form of donations from private sector companies as part of their social responsibility initiatives or through encouraging the school to sell hygiene material such as cleaning supplies and toilet roll, supplied at cost price, to the community for profit.

Social Franchising – Impilo Yabantu Services

Impilo Yabantu Services is a company based in the Eastern Cape which focuses on the operation and maintenance of water services. While the company also serve households its main contract is with the DoE of the Eastern Cape to service the educational districts of East London, Butterworth, Dutywa and Cofimvaba.

The approach the company has adopted is that of social franchising which address the problems with service delivery across the region by training local community members to operate under the franchise brand to carry out a range of services that are offered by the company (Wall et al., 2014). The franchisee pays a franchise fee to the franchisor to operate as part of the company; in return, they are supported with technical training, ongoing support and regular work within their area of operation. The franchisor liaises with the client, for example the DoE, managing the contractual side of the work and offering a guarantee for the work being done. Unlike a commercial franchise, such as KFC, the organisation is not profit driven but motivated by the social outcomes of the approach. The financial rewards are the incentive for the franchisee to operate according to the procedures given to them.

This initiative has been led by a private sector company, Amanz'abantu Services, in partnership with the CSIR and WRC. After a pilot programme in the Butterworth Educational District the programme was recently scaled up to cover the additional districts. The key to the programme's success is the incentive structure that, unlike in-house options, motivates the franchisee to carry out the required work effectively and efficiently (Wall et al., 2014).

The Impilo Yabantu franchisees visit schools twice a year. On the initial visit an assessment of the schools facilities is undertaken, recording the state of the infrastructure and any minor repairs required. The facilities are then cleaned and sanitised and the information is sent back to the franchisor. The franchisor records the information and prepares a 'job card' for each school so the repairs can be approved in time for the franchisee's next visit. At the next visit the franchisee carries out the repairs and empties the pits to a fenced area on the school grounds. In this way the sanitation facilities are maintained in a cost effective way.

The approach hinges on a business model and defined scope of work that is designed to make the franchisee profit and keep the franchisor's costs covered. The franchisor formalises a previously unregulated sector offering a guarantee to the client for the quality that work is carried out and that the appropriate regulations and legislation is followed. The localised approach also addresses the issue mentioned previously of Section 21 schools often not knowing of appropriate service providers able to carry out the required services. This also reduces the travel costs which across rural areas can be extremely high. However, the model relies on the client, in this case the EC DoE, committing funds to the programme and outsourcing the work to be done to the franchise.

6. KEY ISSUES

The purpose of sanitation facilities at schools is to protect the health and dignity of learners. The need to be able to perform basic, private bodily functions without a threat to one's dignity, health or safety is fundamental and must be met before a school can be considered to be a functional learning environment. The reality, however, is that managers face numerous other competing demands and school sanitation may come last on their list of concerns. In so far as sanitation is the response to our children's most basic needs during the hours that their welfare is entrusted to the school, the state of school sanitation facilities effectively serves as a barometer of how children are valued in our society. The reality is not good.

The difficulties experienced in school sanitation in South Africa cannot be attributed solely to the need for new infrastructure – and flush toilets are not a silver bullet where infrastructure is concerned. Stakeholders at all levels of the system – officials, planners, managers, principals, teachers, maintenance and cleaning staff, school governing bodies and learners – need to share a vision for a "total solution" which works with needs, resources, constraints and issues in a coherent way. This total solution must put the rights and needs of children first and requires proactive management at all levels. WASH and PHAST programmes provide models for achieving this and these will be explored in the course of this study. The key issues to be considered include the following, which demonstrate the necessary integration between management and infrastructure considerations:

Key rights issues

- School staff must understand their role with respect to learners in loco parentis. Younger children must not be treated as having a lower place in a school hierarchy; rather, staff must ensure that the youngest children have access to the safest and most secure toilets rather than reserving these for themselves. Young children have a right to sanitation facilities that are scaled appropriately for their size.
- The rights of children to a safe environment must be protected by ensuring that facilities are well constructed of robust materials that will not collapse over time. The structural integrity of stairs, buildings, and especially slabs over pits, pedestals and seats must be monitored rigorously and maintenance issues which impact on safety attended to without delay.
- The rights of children to a healthy environment must be protected by maintaining a hygienic environment where children do not face an increased risk of contracting a disease when they visit the sanitation facilities.
- Where children feel afraid or disgusted when they use the school toilet their ability to learn is impacted. If they avoid using the toilets altogether their health and their learning are put at risk. The rights of children to a functional learning environment must be upheld by ensuring that their basic need to eliminate is accommodated in a way that is clean, safe and comfortable.
- Failed school sanitation facilities are a deterrent to menstruating girls attending school. The rights of girl children to education must be upheld by ensuring that menstruating girls are provided with pads discreetly and with clean, private facilities for managing their periods.

- Children with physical challenges have a right to attend school with their peers. Children must not be made to stay at home or attend schools outside of their community simply because the physical environment at their local school does not accommodate their needs. Sanitation facilities, like other school infrastructure, must be universally accessible.

Key health issues

- Pathogens take a heavy toll on the wellbeing of South African children; in addition to the increasing number of dangerous microorganisms which may be present in faeces chronic worm infections can impair cognitive functioning and growth. It is vital that faecal contamination of surfaces in school sanitation facilities be addressed through regular and effective cleaning.
- In addition to frequent cleaning of contaminated surfaces, fittings should be selected to minimise dermal contact with surfaces while using the toilet and washing hands. Minimal dermal contact should be a criteria when selecting flush devices, door handles and locks, tap handles and soap dispensers. Fittings which can be manipulated with an elbow, forearm, knee or foot are preferable to those manipulated with the fingers.
- If children avoid eliminating during the school day because they consider the sanitation facilities too unpleasant to use (or because there are no sanitation facilities) they are at risk for developing lifelong health problems. This issue has been studied in depth by ERIC in the UK.

Key infrastructure issues

- **Safety** is paramount. Materials which may lose their structural integrity over time should not be used over the pit where there is a risk of a user falling in.
- Infrastructure must be **sustainable over its lifecycle**. High tech technologies are not suitable if parts or technicians with the expertise to service them are not available locally.
- **Full pits** are a scourge at many schools, where they sometimes cannot be safely emptied and schools have resorted to using portable toilets. Pits must be built to withstand desludging without collapsing and be designed with the end in mind – how long will it take for them to fill up? How will they be desludged? Where will the sludge be taken? Cyclical pit emptying must be built into budgets.
- **Open pits or holes** in the ground where pedestals used to be represent a safety threat. Toilets that are no longer in use must be filled in.

Key management issues

- **Budget** for sanitation is not ring-fenced. Many schools do not have a budget for sanitation management or maintenance.
- **Hiring a cleaner** must be non-negotiable. Without daily cleaning the condition in toilets will quickly become unbearable.
- **Maintaining stock.** Management must ensure that a system is in place for ensuring that there is stock of cleaning supplies and equipment and hygiene products including soap, toilet paper and pads. Bins must also be provided and replaced if they are damaged or stolen.

- **Monitoring.** The condition of sanitation facilities both in terms of structural integrity and cleanliness needs to be monitored by staff according to a clear plan. User behaviour also requires monitoring to prevent an environment where some users intimidate others or where vandalism occurs.
- **Consultation.** Users should be engaged to find solutions to problems and address needs; respect shown by managers to users may have payoffs in the way in which users treat infrastructure.

Key education issues

- **Ethics.** Principals and teachers may view their position as one of status rather than service and be resistant to even entering school toilets to monitor them. In addition they may view themselves as higher in the school hierarchy than learners and expect learners to serve them, rather than see their role as to serve and care for learners, and may feel it is appropriate to have learners clean toilets or to reserve the best toilets for themselves and allow learners to use unsafe toilets. Training of teachers and principals may not adequate address the ethical basis of the teaching profession, the rights of children and responsibilities of staff towards learners.
- **Accountability.** Circuits may not involve themselves in the condition of school sanitation facilities, resulting in a situation where principals are not held accountable for this aspect of the school environment and face no consequences if they allow toilets to be in an unsafe or unhealthy state.
- **Appropriate use of technologies.** Learners may not have the same kind of sanitation technologies at home that they do at school and may not know how to use them appropriately.
- **Health and hygiene.** Learners may not have the knowledge to follow healthy hygiene practices and need regular instruction in disease transmission and hygiene. Principals, teaching staff and cleaning staff may not have a sound knowledge of disease transmission and hygiene practices themselves and may require training in these as well in order to maintain hygienic conditions at the school and promote healthy practices among learners.

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ANNEXURE A: SCHOOL SANITATION ASSESSMENT TOOLS

SCHOOL: **INTERVIEWER:** **DATE:**

INTERVIEW WITH PRINCIPAL

Name of interviewee: _____ If not principal, identify position at school:_____

Introduction: Introduce yourselves and identify the organisations you work for.
As we explained on the phone, we have been tasked by the Water Research Commission to study sanitation issues in rural schools in order to identify the common problems with infrastructure and O and M. We are also looking for ideas from the people who work closely with sanitation for overcoming challenges faced with infrastructure, management and user behaviour. We are conducting assessments at 100 schools across KZN, Limpopo and the Eastern Cape. All of the data will be collated and our findings will be presented at a national seminar in June next year and then used to select and test interventions which may provide solutions to some of the difficulties schools face with regard to sanitation. At the end of the study we are tasked with developing a model for school sanitation and a training module for O and M. We would like to interview you to learn about sanitation at school and gain insights from you into the issues you face and ideas you have. We would also like to interview the cleaner and some learners and do an assessment of your actual infrastructure. Do you have any questions? May we begin?

1. PROFILE OF SCHOOL SANITATION

1.1 Year school was built:		1.2 Grades served:			
1.3 Number of learners:	Total number:	Girls:	Boys:	Grade R:	
Number of learners with disabilities:	Number:	Type of disabilities:	Number of staff:	Women	Men

1.4 To begin with, can you tell me the story of sanitation at your school? If you have different kinds of toilet, what they are, when they were built, the issues or successes you've experienced with them, other issues, things you have tried, and so on:

Fill in the following questions from the information given or else ask them after the "story" has been told:

1.5 Type of sanitation system 1: Year built: Year desludged:
Other details?

Type of sanitation system 2: Year built: Year desludged:
Other details?

Type of sanitation system 3: Year built: Year desludged:
Other details?

1.6 Is the number of toilets adequate for Girls Y / N Boys Y / N Men Y / N Women Y / N

1.7 If any are considered inadequate, what problems are you encountering:

1.8 Are there any toilets that are used by both boys and girls? Y / N If yes, describe:

1.9 Are there any toilets that are used by both staff and learners? Y / N If yes, describe:

1.10 Are there any toilets that can accommodate learners with physical challenges? Y / N If yes, describe:

1.11 Are there toilets on the grounds that are no longer in use? Y / N If yes, describe:

Water

1.12 What is your water source?

Is it reliable? Y / N If no, explain

Is it adequate? Y / N If no, explain

1.13 Do you harvest rainwater or have any interventions to save or recycle water? If yes, describe:

Wastewater and solid waste

1.14 Do you have a kitchen on site for food preparation: Y / N How often is food prepared there?

1.16 Where does water from the kitchen or outside taps drain to?

1.17 Have you encountered any problems with the drain pipes and soak away?

1.18 Do you have municipal rubbish collection? If Y, is it reliable? Y / N If N, how do you dispose of waste?

2. ASSESSMENT. Could you describe for me how you see the state of the toilets at your school.

2. 1 What words would best describe the current state of sanitation at your school?

2.2 What do you think about the type of sanitation system itself? What are its strengths and weakness?

2.3 Do you consider the toilets safe for learners to use? Y / N Why/why not?

2.4 What are the good features of the sanitation systems at your school?

2.5 What do you do to maintain these good aspects of sanitation at your school?

2.6 Has there been a change in the sanitation system at your school since you have been principal? Y / N
Describe:

2.7 What do you consider to be the key problems with sanitation at your school?

2.8 What do you believe drives these problems?

2.9 What have you tried to do to address these problems?

2.10 What do you believe is required to solve these problems?

2.11 How do you think learners feel about the toilets?

2.12 Do you think there are any learners who feel afraid when they use the toilets? Y / N

Who? _____Why?

2.13 Do you think there are any children who feel they do not have enough privacy at school? Y / N

Who? _____Why?

2.14 How do you think the state of sanitation at your school affects learners?

3. OPERATIONS AND MAINTENANCE

3. 1 How do you handle O and M?

If he/she mentions a sanitation plan say: That's wonderful! Could I see it? Could I have a copy of it?

Do you have a budget for sanitation? Y / N If Y, how much?_____ How is it broken down?

3.2 Do you have any system for monitoring infrastructure and identifying when repairs are needed? Y / N Describe:

3.3 Do you ever have someone go and inspect the toilets? Y / N Who? _____ How often? _____

3.4 Does your Circuit Manager ever inspect the sanitation facilities at your school?

3.5 Who does repairs? 3.6 What issues have you faced with repairs?

3.7 What current O and M needs do you have?

3.8 Have you ever had blocked pipes in the kitchen, toilets or taps? Y / N

What do you think caused it? What did you do?

Is there any way to prevent this from happening again?

3.9 Have your toilets ever gotten full? Y / N What did you do?

Who emptied the pits? _____How much did it cost? _____Where was the sludge disposed of?_____

How will you know when they need desludging again?

What will you do next time? _____Have you budgeted for this? Y / N How much? _____

3.10 Do you use any additive to reduce the sludge? Y / N? What is the name of it? _____

How do you use it? Does it work? Y / N

4. ROLES, RIGHTS AND RESPONSIBILITIES (Make additional notes in your notebook if you run out of space)
4.1 What is your role with regard to the health and safety of learners?
4.2 What role do sanitation facilities play in the health and safety of learners? 4.3 Do you believe that at your school sanitation facilities PROTECT the health and safety of learners or THREATEN the health and safety of learners?
4.4 What do you believe should be the role of the department with regard to sanitation at the school? In reality, do you think you fulfil this role? Y / N Explain:
4.5 What do you believe should be your role with regard to sanitation and hygiene at the school? In reality, do you think you fulfil this role? Y / N Explain:
4.6 What do you believe should be the role of the teachers with regard to sanitation and hygiene? In reality, do you think they fulfil this role? Y / N Explain:
4.7 What do you believe should be the role of the SGB with regard to sanitation and hygiene? In reality, do you think they fulfil this role? Y / N Explain:
4.8 What do you believe should be the role of learners with regard to sanitation? In reality, do you think they fulfil this role? Y / N Explain:
4.9 What do you believe are the rights of staff with regard to staff toilets? Do you think these rights are protected at your school? Y / N Explain:
4.10 What do you see as the rights of learners with regard to learner toilets? Do you think these rights are protected at your school? Y / N Explain:
4.11 How do you think Batho Pele principles apply to school sanitation?

4.12 Do you think toilets should be used to take care of physical needs only and learners should spend the minimum time needed there, or do you think it is acceptable for learners to use the toilets as a social or a private space?

5. MANAGEMENT

Cleaning

5.1 Do you employ a cleaner? Y / N How often does he/she clean the toilets? _____

5.2 Are learners ever required to clean the toilets? Y / N Which learners? _____How often? _____

5.3 What is the cleaning programme (probe for all details – supplies and cleaning routine)
Floors?
Toilets?
Urinals?
Walls?
Basins?
Taps?
Handles?
Rubbish bins?

5.4 How do you monitor that the cleaner has done his/her job properly?

5.5 Do staff have any duties with regard to the toilets? What are they?

Stocking supplies

5.6 Do you provide soap? Y / N What kind? _____ Where is it provided? _____

5.7 Do you provide toilet paper? Y / N If yes, where is it provided? _____

5.8 Do you provide pads? Y / N Where do you dispense them? _____ How often do you buy? _____
5.9 How do you keep track of stock needed for the toilets – soap, t.p., pads, cleaning supplies?

Special needs of users

5.10 Do small children face special issues with the toilets? Y / N Does anyone assist them? Y / N
5.11 What could be provided to make things easier for them?

5.12 What happens if a child has an accident in his/her pants at school?

5.13 What issues do girls face when they are menstruating?

What do girls do with the used pads?

Do any girls use cloths? Y / N How do they clean these at school?

Is there anything else that girls need during their periods in order to feel comfortable at school?

5.14 Have you ever had learners with physical challenges at your school? Y / N

What issues did they face with regard to school sanitation?

5.15 Are there other learners with physical challenges in the community who are not at school? Y / N
Why do you think they are not at school?

If they needed to come to your school how would you accommodate them in terms of the toilets?

Monitoring of users

5.16 How do you monitor user behaviour in the toilets during breaks?

During class time?

5.17 When are children allowed to use the toilet? _____

What happens if a child asks to use the toilet during class?

5.18 What behaviour issues have you faced?

What do you think drives these behaviour issues?

5.19 How did you address them?

Were you successful: Y / N

5.20 What do you think is needed in order to solve behaviour and user problems you still experience?

5.21 Do you have any issues with the way the staff use the toilets? Y / N _____

5.22 Do you allow members of the community to use the school toilets? Explain?

Health and hygiene education

5.23 Do you do any education with learners around health and hygiene besides what is in the school curriculum? Y / N
What is covered?

How is it implemented (how often)? Could I have a copy of the materials you use?
Do you feel it is effective? Y / N If No, explain:

5.24 How could you have a greater impact on learners' hygiene behaviour and knowledge of health issues?

6. STANDARDS (Make additional notes in your notebook if you run out of space)

6.1 If you were given the opportunity to design a new sanitation facility for your learners what choices would you make for the following?

Type of toilets: Learners _____ Staff _____

Type of urinals: Boys_____ Male staff _____

Number of toilets: Girls_____ Boys_____ Female staff _____ Male staff _____

Number of basins: Girls_____ Boys_____ Female staff _____ Male staff _____

Type of taps: At indoor basins: _____ Outside:_____

Location of outdoor taps: _____

Sanitation block design (space, lighting, ventilation, cubicles, doors, locks)

Location of sanitation blocks

6.2 What would you do in terms of design to make the atmosphere in the toilets comfortable and pleasant?

6.3 Provision for learners with physical challenges:

6.4 Provision for children in Grade R or Junior Primary (if applicable):

6.5 What do you consider to be a decent basic standard for the CLEANING of sanitation facilities?
Toilet bowls

Toilet seats

Toilet lids:

Stall handles:

Floors:

Basins:

Tap handles:

Urinals:

Walls:

Outside taps:

6.6 What equipment and supplies would be needed to meet these standards

6.7 What budget would be needed to meet these standards?
(e.g. equipment, budget, commitment)?

6.8 What changes do you think are needed to improve sanitation at your school?

6.9 What does the department need to do differently?

6.10 What do YOU need to do differently?

6.11 What message would you like to give DBE nationally with regard to school sanitation?

6.12 What message would you like to give (KZN) DoE with regard to school sanitation?

6.13 What messages do you think your learners need to hear with regard to sanitation?

6.14 Is there anyone at your school who is passionate about the sanitation? It could be a learner, parent, teacher or cleaner.

What have they done? Could we speak to them?

Interview with cleaner		
Date:	**School:**	**Interviewer:**

1. CLEANING REGIMEN			
1.1 How often do you clean the toilets? Twice a day Daily Weekly Other:_____			
1.2 Please can you tell me which things you clean in the toilets, what you use to clean and how you do the cleaning? ***(Do not ask the cleaner the questions below. Only ask the question above and then fill in below. Put an "x" the item if it is not present at the school – e.g. lids or basins.)***			
Areas mentioned	**Materials used**		**Method used**
Inside of pedestal Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Toilet seats Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Toilet lids Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Stall door handles Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Floors Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Basins Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Tap handles Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Urinals Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Walls Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:
Outside taps? Y / N	Water Jik Handy Andy Sunlight Jeyes Pine Gel Domestos Other:		Wipe Sweep Scrub Other:

1.3 How often do you clean outside taps? Never Weekly Daily Other:
1.4 Which areas do you find the hardest to clean?
1.5 Do you also clean the classrooms and the kitchen? Y / N If yes, Do you use the same mop? Y / N Do you use the same cleaning cloths? Y / N
1.6 How do you clean your mop or cleaning clothes when you are finished? Don't clean Rinse with water Soak with Jik Other: _____

1.7 Are learners ever made to clean the toilets? Y / N

Who? (check if girls only) _____ Why/when? _____

2. SUPPLIES

2.1. What does the school supply you with for cleaning?

Gloves Protective clothes Boots Other:
Broom Bucket Mop Toilet brush Cleaning cloths
Sunlight Jeyes Handy Andy Jik Other:

2.2. Is there anything else that would be helpful for you to have?

Gloves Other:_____

2.3. How do you get new cleaning supplies?

Report to principal Other: _____

2.4. Did you ever run out of gloves or cleaning supplies? Y / N

If yes, what did you do about it?_____

2.5. Do you provide toilet paper? Y / N

How? Provided in each toilet stall Provided in one place in toilet block Learners collect from class teacher

Learners collect from admin block Other:_____

If in the toilets, how often do you restock?

2x a day 1x a day 1 x a week Other:_____

2.6. Do you supply soap? Y / N If yes, how often? Daily Weekly Other:_____

2.7. IF there are rubbish bins, how often do you empty them? Daily Weekly Other:_____

2.8. How do you dispose of the rubbish? Burn Municipality collects Other:_____

2.9. Are you ever without water? Y /N

If yes, what do you do for cleaning when there is no water?

What do learners do for drinking and washing hands?

3.	O & M
3.1.	Do you think there are enough toilets for: Girls Y / N Boys Y / N Men Y / N Women Y / N ?
3.2.	Is there anything else that is needed in the toilets?
3.3.	Is there anything that needs to be fixed in the toilets?
3.4.	Is there anything about the toilets that you think is unsafe?
3.5.	Have you had problems with leaks? Y / N If yes, what did you do?
3.6.	How does the principal respond when you report breaks, theft, etc.?
3.7.	Do any of the staff have responsibilities around the cleaning of the toilets?
3.8.	Is there one of the staff who comes and checks the condition of the toilets? Y / N How often? _____
3.9.	Is there one of the staff that comes and checks your work? Y / N How often? _____
3.10.	Does the principal ever come to see the learners' toilets? Y / N How often?

4. HYGIENE PRACTICE AND KNOWLEDGE OF DISEASE TRANSMISSION
4.1 How does the work you do help the learners?
4.2 Do you feel that there are any dangers in your job? Y / N What are they? What can you do to protect yourself?
4.3 Where do you think the germs in toilets come from? 4.4 How do they get spread around?
4.5 What do you think causes diarrhoea?
4.6 What do you think causes worms in the body?

5. USER BEHAVIOUR
5.1. How does the school monitor learners in the toilets during breaks? During class time?
5.2. What behaviour problems have you seen in the toilet? 5.3. Do you try to do anything about them? Y / N What:

5.4. How does the school handle them?

5.5. What do YOU think could be done to stop these problems?

5.6. If toilet paper is not provided, what do learners do?

Do small children face special issues with the toilets? Y / N Does anyone assist them? Y / N
What could be provided to make things easier for them?

5.8 Did you ever see a child have an accident in his/her pants? Y / N
What happened?

5.9 Do you have any learners with physical challenges? Y / N

Do they have any problems using the toilets? Y / N Describe:

What could be done to make things easier for them?

5.10 What issues do girls face when they are menstruating?

What do girls do with the used pads?

Do any girls use cloths? Y / N How do they clean these at school?

Is there anything else that girls need during their periods in order to feel comfortable at school?

6. OBSERVATIONS AND INSIGHTS
6.1 Do you have any ideas for making your cleaning job work better?
6.2. If you were asked to design a new school toilet, what would it be like?
6.3. Is there anyone at the school who really cares about the toilets – a learner, teacher, parent? Y / N What do they do?

WRC school sanitation project: VISUAL ASSESSMENT	
School name	
Researcher	

Walk around everywhere at the school and make sure you know where everything is before you begin. Note all the sanitation blocks you find and document the number of seats + urinals here. Group same type of sanitation/same user group together.
Give them a number on the table and map and use this number for the following sheets. M and F staff can be grouped together.

Block no.	1	2	3	4	5	6	7	8	9
Type									
User									
Original no. seats+urinals									

Draw a diagram of the layout of the infrastructure at the school. Check (X) that you have labelled the following					
	Admin block		Outdoor taps (T)		Boys toilets (B) – type (VIP/UD/EL)
	Classrooms		Jojo tank (J)		Girls toilet (G) – type
	Playground (P)		Septic tank		Female staff toilets (F)
	Kitchen		Pit		Male staff toilets (M)
	Perimeter fence		Rubbish burning/burial site		Disabled toilets (D)
	Indicate estimated distances between toilets and classrooms, toilets and admin and toilets and playground				

Condition of drains: Wet Dry Grass /weeds Standing water Mosquitos Rubbish
Notes:

SCHOOL:		BLOCK NUMBER:		TAKE PHOTOS OF TYPICAL EXAMPLES AND EXCEPTIONS!!	
Item	**Material/design**	**Condition**	**Item**	**Material/design**	**Condition**
Pathway to block	Soil Cement Other:	Uneven Steep Long grass Rubbish Other:	**Locking gate/door**	Steel bars Steel door	None Good Damaged
Pit cover/hatch	Cement Steel Other:	Good Missing Rusted Broken Gaps	**Inside walls**	Paint Unfinished Other:	Clean Dirty Wet Urine Faeces Mud Rubbish Broken
Rainwater harvesting	Gutter & Jojo tank Other:	Good Damaged Not used	**Floors**	Cement Other:	Clean Dirty Filthy Urine Faeces Rubbish Broken
Structure	Brick Cement block Other:	Good Damaged Unsafe	**Lighting**	None Windows Other:	Good Broken
Vent pipe	Pipe and mesh Big whirly bird	None Good Damaged No mesh	**Ventilation**	Steel vent Airbrick Other:	Good Damaged Missing
Roof	Zinc/corrugated iron Other:	Good Damaged Leaky Unsafe	**Smell**	N/A	Inside: None Some Strong Outside: None Some Strong
Notes:					

Item	Material/design	Original number	Broken or missing	Still working	Condition	Notes
Basins	Ceramic Plastic				Clean Dirty Rubbish Damaged Clogged Leaking taps	
Taps	Plastic Steel Water saving				Good Damaged Clogged Clean Dirty Filthy	
Urinals	Steel wall Plastic Ceramic				Good Damaged Clogged Smelling Clean Dirty Filthy	
Pedestals	Cement Plastic Ceramic				Rubbish Unsafe	
Seats	Ceramic Plastic Wood None Other				Clean Dirty Wet Urine Faeces	
Doors	Metal Wood Other:				No locks No handles Can't close	
Soap: None Liquid Bar		**Toilet paper:** Yes No			**Mirrors:** None Small Full body	**Bins:** None Some stalls All stalls Main area
Adaptations for disabled					**Innovations/ decorations**	

LEARNERS FOCUS GROUP QUESTIONS (45 min-1 hour)

School: _____ Date: _____ Researcher:_____

Details of participants: (Age/Gender):

RESEARCH QUESTIONS: WHAT DO USERS EXPERIENCE TO BE THE ISSUES AROUND SCHOOL TOILETS AND WHAT DO THEY SEE AS THE SOLUTIONS? WHAT IS THEIR KNOWLEDGE OF DISEASE TRANSMISSION? WHAT DO THEY VIEW AS THE RESPONSIBILITY OF MANAGEMENT OR USERS IN ACHIEVING THIS?

1. How do you feel when you use your school toilets? (5-10 min)

2. What are the problems you have with the school toilets? What do you think are the reasons for these problems? What could be done to solve these problems? (15-20 min)
Probe:
   - Are there any problems which small kids face?
   - Are there any problems which menstruating girls face?
   - Are there any problems which kids with physical challenges?
   - Do people using the toilets face any dangers to their health?
   - Are there any problems with bad behaviour in the toilets?
   - Is there anything the principal is not doing right?
   - Is there anything the cleaner is not doing right?
   - Is there anything kids are not doing right?

3. What do you think are the health problems that can result if the toilets aren't clean?
   Which do you think are the places with the most germs in the toilets? (Probe re taps)
   Where do the germs come from? How do they get moved around?
   What has your family taught you about poo? (5 min)

4. If you were in charge of designing new school toilets, what would they be like? (15-20 min) Probe:
   - Type of toilets:
   - Location:
   - Numbers:
   - Circulation space:
   - Light in the toilets:
   - Air in the toilets:
   - Distance from the classes:
   - Doors:
   - Locks:
   - Basins:
   - Taps:
   - Soap:
   - Towels:
   - Bins:
   - Colours?
   - Decorations?

- What would be needed in order to make sure the toilets were always safe?
  Probe: distance, surveillance, structural stability
- What would be needed to make sure the toilets were always clean?
  Probe: cleaning methods and frequency
- What would be needed to make the toilets private enough?
- What could be done to make the toilets feel like a comfortable and friendly space?
- What should be provided for learners with physical challenges?
- What should be provided for small kids?
- What should be provided for girls when they are menstruating?

5. What do you think is the PRINCIPAL's job in keeping the toilets in good condition?
   What do you think is YOUR job in keeping the toilets in good condition?
   What do you think is the CLEANER'S job in keeping the toilets in good condition? (5-10 min)

SCHOOL TOILETS USER SURVEY

We are trying to learn about school toilets all over South Africa.
Your answers will help us understand problems and get ideas for solutions. We will not share your paper with your teacher or principal.
Please fill in answers or circle ALL the choices you agree with.

I am a BOY / GIRL My age is: My school is:

A. What do you think about your school toilets?	
1. Is there anything you think is good about your school toilets?	Yes No
What?	
2. Is there anything you think is bad about your school toilets?	Yes No
What?	
3. Which of the following words describe your school toilets?	
Comfortable Clean Relaxing Private Ok Dirty Dangerous Smells bad Broken Scary Dark Wet Other words:	

B. How do learners at your school use the toilets?	
4. Do you use the school toilets?	Yes No
If NOT, why not?	
5. Do you know of anyone else at school who doesn't use the school toilets?	Yes No
6. What are the reasons you or others don't use the toilets?	
They are full Afraid the toilet might break and you could fall in Afraid you might get diseases Afraid that there could be animals, snakes or insects	They are too dirty Don't like the things others do in the toilets (e.g. smoking, drugs, bad language) Embarrassed to do my business with others around

Other reasons:
7. What do you or other leaners do if you feel you cannot use the toilets?
Hold it until we go home Go home during school Find a private place outside to do it

8. Do you sometimes spend time in the toilet to be alone or to chat privately with your friends?	Yes No
9. Do you ever wash your hands while you are at school?	Yes No

If YES, when?
If NO, why?
10. What things do people throw in the toilet?

11. Have children at your school broken things in the toilet?	Yes No

If YES, why do you think they did that?

12. Have children at your school stolen things from the toilet?	Yes No

If YES, why do you think they did that?

13. Do you usually tell someone if there is a mess or something broken in the toilet?	Yes No

If YES, who do you usually tell? Do they usually fix the problem after you tell them? YES / NO

C. Please tell me about your school toilets	
14. Are there enough toilets at your school?	Yes No
15. Are the toilets close enough to the classrooms?	Yes No
16. Is there soap in the toilets?	Yes No
17. Does the school give you toilet paper?	Yes No
Where do you get it?	

Are you happy with this way?	Yes No
If no, what do you and others clean yourselves with?	
18. Does the school provide pads for girls?	Yes No
19. Does anyone you know miss school because of their periods (bleeding)?	Yes No
20. At break do you usually have to wait in a line to use the toilet?	Yes No
21. Are you allowed to go to the toilet during class if you need to?	Yes No
22. Do you always have drinking water at school?	Yes No
If NO, what do you do?	
23. Who usually cleans the toilets? CLEANER TEACHERS LEARNERS NO ONE	
24. How often are the toilets cleaned? 2 times each day 1 time each day 2-3 times each week 1 times each week Never	
25. Is there any place in the toilets that doesn't get cleaned properly? If yes, where:	Yes No
26. Have you ever had to clean the toilets?	Yes No
27. Do the teachers ever clean the toilets?	Yes No
28. Does the principal ever come and check the toilets? If yes, how often?	Yes No
29. Do you think that the principal cares about the situation in the toilets?	Yes No
30. Have you ever felt afraid of another learner in the toilets?	Yes No
31. Have you ever felt afraid that you could fall into the toilet?	Yes No
32. Have you ever experienced any of these problems in the toilets:	
Someone threatening you Someone smoking Someone stealing something Someone breaking something Someone weeing on the floor Someone pooing on the seat Someone pooing on the floor Someone doing drugs Other problem_____	
33. Circle any of the things below you would like to see happen in your school toilets. Place a **1** next to the most important to you, **2** next to the next most important. Choose as many as you want.	
___ More clean ___ More safe (no danger of falling into pit) ___More safe (no one threatening me) ___Give us toilet paper ___Give us pads ___Give us bins	

___Mirrors in the toilets
___New paint
___Fix broken things
___No more bad smell
___More toilets
___More basins
___Soap
___Shower
___Windows
___Doors on toilets
___Locks on the doors
___ Other: _____

___ Other: _____

34. Is there anything that learners can do to improve the situation?

35. What message would you like to give to your principal about the school toilets?

36. What message would you like to give your government about the school toilets?

37. What kind of toilet do you have at home?

VIP MADE BY US FLUSH NONE OTHER:

38. What do you use at home to clean yourself?

TOILET PAPER NEWSPAPER STONES MEALIES OTHER:

39. What kind of place do you have to wash your hands at home?

TAP BASIN DISH OTHER:

40.	Do you usually have soap to wash hands at home?	Yes No
41.	Do you yourself wash your hands after using the toilet at home?	

42. What causes diarrhoea?

43. What can you do to help someone with diarrhoea?

44. What can you do to protect yourself from getting diarrhoea?

45. Is it GOOD or BAD to drink water when you have diarrhoea?	GOOD BAD
46. How do people get worms in their stomachs?	
47. What can worms do to you?	
48. How can you get rid of worms?	
49. What can you do to protect yourself from worms?	

Thank you for helping us with this information!