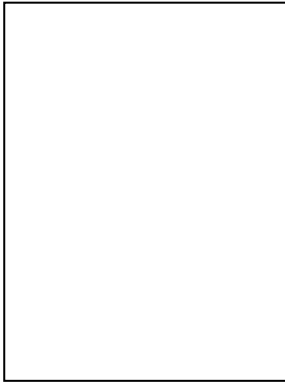


No Urban Shelter Without Basic Sanitation



Sofia Kac

1 Introduction

According to WHO, the World Health Organisation, 28 000 – 142 000 deaths are due to cholera every year (WHO, 2016). It has been known since 1854 how cholera is spread through unsafe water, due to an English doctor called John Snow, who connected a cholera outbreak to a water pump contaminated with human excreta. (BBC, 2014)

Poor water and sanitation is one of, if not the main reasons for the spreading of diseases among the world citizens. Children die, productivity is lost and costs due to healthcare are only some of the problems related to this issue. Millennium Development Goal (MDGs) 7c aimed to halve the amount of people without access to sanitation by the end of 2015. This was not met. It is seen as one of the biggest failures of the MDGs. (UN, 2016)

In some parts of the worlds slums more than 1000 people can share one pit latrine (Unicef, 2003). One of the main problems when it comes to sanitation for the urban poor is the question of responsibility. In the slums where public toilets are implemented, there is seldom a feeling of responsibility from the users, leading to toilets getting so unclean that the users prefer defecating in open areas.

With this paper the aim is to identify the different approaches to reach the goal for better sanitation for the urban poor. What different solutions are there today in the different “slums” around the world. A couple of examples will be analysed and further discussed.

The main literature chosen is Planet of Slums written by Mike Davis, published in 2006. Planet of Slums highlights many aspects of urban slums, and one of these is the sanitation issue. Besides this book, publications and reports about sanitation and websites from organisations focused on water and sanitation for the urban

poor have been used as sources. In order to make valid comparisons, experiences from slums in Rio de Janeiro will be used.

2 Literature Review

2.1 Urbanization and the Definition of Slums

According to UN-habitat there are five characteristics that define a slum household; inadequate access to safe water, sanitation and infrastructure, poor structural quality of housing, overcrowding and insecure residential status.

(UNHabitat, 2012)

In the 1950s it was estimated that 30 percent of the worlds population was living in urban areas, in 2014 the UN estimated that it was 54 percent of the global population. The prediction is that in 2050, 66 percent of the worlds population will be urban. (United Nations, 2014)

Rapid and unplanned urban growth leads to unsustainable development as the necessary infrastructure is not developed. In some cities, unplanned or inadequately managed urban expansion leads to rapid sprawl, pollution and environmental degradation. (United Nations, 2014)

Historically there was a bigger health difference between towns and countryside, but today the difference between urban middle classes and the urban poor is much bigger. The mortality rate for children under the age of five in Nairobis slums is two or three times higher than the city as a whole, and half as high as in the poor rural areas. In Quito infant mortality is 30 percent higher in the slums than in wealthier neighbourhoods. (Stephens, 1996)

2.2 Lack of Sanitation

90 % of all the wastewater in developing countries is not treated at all. (Corcoran, 2010)

In the Millenium Development Goals, MDGs presented by the UN one of the targets, 7c, were “Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation”. Despite progress, there are still 2.4 billion of the worlds 7.3 billion (Census, 2016) who are using unimproved sanitation facilities, and out of these 946 million people are practicing open defecation. (UN, 2016)

In the place of the MDGs, the UN has now developed new goals called Sustainable Development Goals, SDGs. One of the goals is “By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations”. (UN, 2016)

Many of the countries that today face water and sanitation problems were once colonies. The European Empires did not provide sanitation and water infrastructure for the native neighbourhoods. Racial zoning was used to segregate garrisons and white suburbs from epidemics and disease. These huge sanitation problems are inherited by postcolonial regimes, and few have done anything about them. Though Latin American cities have huge sanitary problems, it is nothing compared to the magnitude of those in Africa and South Asia. Kinshasa, a megacity in Kongo with 10 million inhabitants has no waterborne sewage system at all. As a result residents in slums rely on “flying toilets”. The waste is put in a polythene bag and thrown on the nearest roof or pathway. (Harding, 2002) This can be compared with Gamla Stan in Stockholm seven hundred years ago, when people threw their waste from their windows out on the street. (Lindberg, 2015)

Experts estimate that 90 percent of Latin America’s sewage is dumped untreated in streams, rivers and ocean. (Davis, 2006)

Although clean water is the cheapest and most important medicine in the world, public provision of water and free toilets often compete with powerful private interests. Water is a lucrative business in poor cities. A study shows that the population of Kibera slum pays up to five times more for a liter of water than average American citizens. (Taffa, 2004)

In Kumasi, Ghana, members of the Ghanaian Assembly won the contract for construction and handling of private toilets. The cost to use these for one family is about 10 percent of the basic wage, too expensive for most poor people, who then defecate in the open and spend their money on water and food. (Davis, 2006)

2.3 Consequences of Deficient Sanitation

In low and middle-income countries it is estimated that each year 842 000 people die as a result to inadequate water, sanitation and hygiene. (WHO, 2015) They also present a list of water-related diseases, there are 23 diseases listed, some of the more commonly known are Cholera, Dengue Fever, Diarrhea, Ringworm, Malaria, Hepatitis A and E. According to WHO there are 28 000 to

142 000 deaths due to cholera every year. Provision of safe water and sanitation is critical to control cholera and other waterborne diseases. (WHO, 2016)

Some estimate that 75 percent of the illnesses afflicting humanity are related to water supply and waste disposal. (Stillwaggon, 1998)

Mike Davis cites in his book a journalist called Asha Krishnakumar who says that “The absence of toilets is devastating for women. It severely affects their dignity, health, safety and sense of privacy, and indirectly their literacy and productivity. To defecate, woman and girls have to wait until dark, which exposes them to harassment and even sexual assault”.

Mike Davis mentions in the book Planet of Slums that for men it is easy to urinate at any time at any place, women on the other hand can only do it during the dark hours. Women therefore go in groups of five in the early hours to avoid hazards, often to marshy land where snakes can be found and deserted dumping grounds with rats and other rodents. Many women say that they do not eat during the day to avoid having to go to an open field in the evening. (Davis, 2006)

2.4 Sanitation Solutions

Slums are usually not connected to a conventional wastewater system. It is therefore in most cases more viable to focus on decentralized options. Meaning wastewater treatment that is not connected to a centralized big waste water treatment plant. Decentralized system has no need for long and expensive pipe lines, both for the implementation and the material. By using conventional treatment, a lot of nutrients such as nitrogen and phosphorous is lost. These are important fertilizers when growing crops.

Below, some examples of decentralized options will be presented.

2.4.1 EcoSan

Water free toilet developed in the 1990s. Launched in 2000 and has since then been installed in many places. The EcoSan does not need a sewage system or water connection and does not use chemicals. It is a biological process that convert human waste into compost-like odourless and dehydrated material.

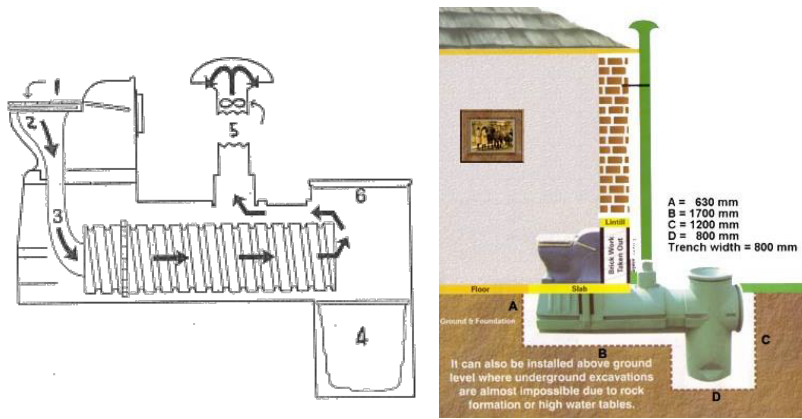


Figure 1 How the EcoSan works, EcoSan

2.4.2 Loowatt

“The Loowatt toilet uses a patented, simple and efficient sealing technology to contain human waste within biodegradable film, with a unique odor-inhibiting system. The waste is then stored in a cartridge for periodic emptying, which can be weekly or daily, depending upon level of usage and capacity requirements.”

The waste is then transferred from the toilet to a digester where the biological process can start. Micro-organisms consume the waste and as it decomposes the waste releases biogas. The biogas and compost produced can be used for cooking and generating energy. (Loowatt, 2016)

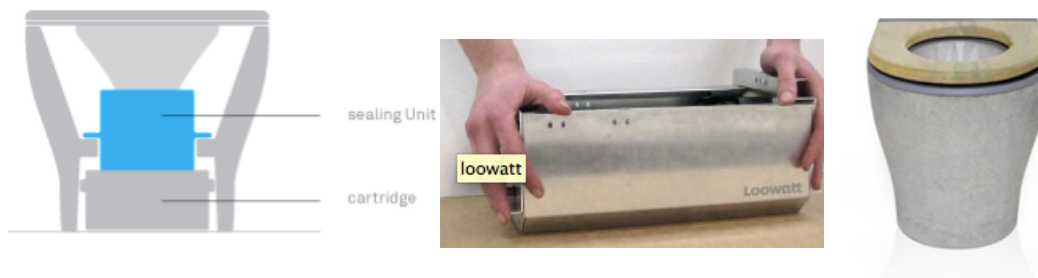


Figure 2 Loowatt <http://loowatt.com>

2.4.3. Peepoo

Peepoo is a Swedish company founded in 2005, they have developed a simple sanitation solution for places where there is no access to sanitation, called peepoo. They write the following about it; “Peepoo is a personal, single-use, self-sanitising, fully biodegradable toilet that prevents faeces from contaminating the immediate area as well as the surrounding ecosystem. After use, Peepoo turns into valuable fertiliser that can improve livelihoods and increase food security.”

The peepoo bag can be used anywhere and will not start to smell the first 24 hours. It can therefore be stored in the house until it is possible to through it somewhere safe.

(Peepoople, 2016)



Figure 3. Peepoople
<http://www.peepoople.com>

2.4.4. Pit Latrine

There are a couple of different types of dry toilets, also known as pit latrines. Some are simple, a hole in the ground pretty much, and then a small house on top to keep it dark and also for privacy. This type of solution will surely generate bad smell and is therefore not a sustainable option for a growing urban population. However, there are some positive sides with pit latrines. For one, they do not need water to function, they are not hard to construct neither to maintain.

One pit latrine option is the *Double-vault Ecological Toilet with Urine Separation*. It has two vaults placed on a solid reinforced concrete floor. The vaults are covered by a special slab that diverts urine and water for cleansing from faecal material. The faecal material falls down to the vault, with a small amount of ash added. Each vault has a vent pipe so that moisture can evaporate. As this is dry it will not smell. There is also an opening for removal of dry material. In locations with floodings, this opening must be placed at least 0.6 m above ground. Urine, which is completely free of pathogens can be diverted while the faeces decompose and the pathogens are broken down.

In this double vault system, one vault is used at a time. When a vault is nearly full, design period is six months, the vault is sealed with dry soil and the other vault is used. After six months, when the second hole is filled, removal of dry material can easily be done with a shovel. These kind of solutions are suitable for areas with high water table and areas with regular flooding. It is preferred that the soil has low permeability.

Advantages with this solution is that is cheap and easy to construct.

On the other hand, it is important that the users are motivated to make it work, by keeping the material in the vault dry, so that it wont smell and attract insects, which will help the pathogens to survive longer. It is also needed some maintenance for shifting the vaults. (WSP, 2005)



Figure 4. Eco-dry toilet in Romania (Stefan Deegener, 1998)

3 Discussions about Urban Shelter Design

3.1. To Have in Mind in the Pursue of Basic Sanitation

It is clear that unsafe sanitation is a big factor for poor health in the world. Not only in direct correlation to diseases, but also the quality of life, mainly for women and children. Nevertheless the effort to improve water and sanitation for the urban poor is too often neglected and forgotten. If it is due to education and knowledge or interest from higher powers can be discussed.

However, just by observing our surroundings in a first world country such as Sweden, it is obvious that people see water and sanitation as something that is there and available for us. People who do not need to think about water do not think about water. This is many times reflected in the works of engineers, architects and politicians. There are examples of places in Brazil where large scale public housing is being implemented, where architects and engineers have done planning for the buildings to have running water and water toilets, but there is nowhere for the sewers to be connected as there is no existing sewer system.

As architects and as engineers water and sanitation should be the first thing to take into account when planning and constructing.

Nevertheless, it is important to take into account that different cultures have different toilet traditions. For example some cultures use water for anal cleansing, which is different from most of the western world where it is done with paper. We also have to see what social impact the different sanitation solutions will have in the area. There is an example from a slum in India, where private water taps were installed for all the residents of the slum. The NGO who stood behind the project was very pleased with the result, but what they did not think of was that the collection of water at the shared tap was a reason for the women to leave their homes and meet with the other women in the area, as well as urinate and defecate. (Cimbritz, 2016)

As an engineer or architect it is vital to have all this in mind. We must be humble to the needs and traditions of the people we are supposed to assist.

The urban areas are growing fast, and the infrastructure is not following this world wide trend. With more people in urban areas it is of great importance to focus on sanitation solutions. United Nations have understood this and both the MDGs and the more actual SDGs focus on water and sanitation for all. The MDGs were not reached, hopefully the SDGs will be met. But for this to happen, a bigger focus has to be put into this cause. It is pleasing to see that the fact that women and children are the biggest victims when it comes to deficient sanitation has been enlightened and added to the new SDGs.

3.2 Different Locations, Different Technologies

As mentioned in section 2.2, Latin American cities have big problems when it comes to sanitation, but it is nothing compared to South Asia and Africa. Consequently the problem has to be tackled differently depending on where you are. Once again, it is important to be well informed about the culture and needs of each location. It has to be discussed if the issue should be solved fast and temporarily, like with peepoole bags, or to think bigger with implementation of toilets. In this report only decentralized solutions have been presented. To build a treatment plant and the infrastructure with pipes to transport the sewage is a huge and expensive project. To get a country to invest in this will most probably be harder than doing small scale implementations for immediate solutions of the present health risk that open defecation brings.

In the slums of Rio de Janeiro, the vast majority have toilets with running water, but few of these are connected to a sewer system. Usually the wastewater from the houses is transported untreated to a stream or open canal that is conveniently located, leading to bad smell and the risk of pathogens being spread (EMOP, 2012). These solutions are neither sustainable or good for the common health of the neighbourhoods, but to tell these people to disconnect their water toilets is not an option. To present solutions like pit latrines is definitely not an option.

For people who are used to the convenience of a water closet, a solution comparable or better must be presented. The Loowatt could be a solution for these places, there is no smell, the toilet can be placed inside the house and it does not need so much space. However, it is necessary to empty the container, which is more work than what their present toilets require. Nevertheless, the effort to take out the waste from the toilet, will not be much different than taking out solid waste. Maybe it could be viable for people to do this extra work, for the reward of having a sewage free living environment. For the collection it will be necessary to have trucks that collect the waste and transport it to a digester. Usually these unplanned settlements, slums, do not have a great road access, which complicates it for the trucks.

The EcoSan solution will in this aspect be a better alternative, but these are more expensive to install and it will need more space. But if it is possible to dig down the tank, EcoSan is favourable in many aspects. It does not need water, the waste generated will already be compostable so it can be sold or used as fertilizers. It will however have to be transported somewhere. Rarely houses in slums have direct contact with farmland. But maybe this is what should be done. All the houses in the slums should have a small planting lot where they can produce their own food and dispose their faeces. However, this demands information campaigns about hygiene.

The pit latrine could be an option for slums that does not have any toilet solutions. It is also attractive for more rural areas, where the waste can be used as fertilizers for the farmland. There is however some need of maintenance for the emptying of the vaults. Besides this, it does occupy a bit of space, so the question is if there is supposed to be one per family or if there should be a shared bathroom for many. It is known that public toilets often become so unclean that people choose to defecate outside in the end. The reason is supposed to be that no one feels responsibility for the toilet and therefore do not take care of it. Pit latrines

could therefore be a good option for schools and other public buildings, where there is space and probably a person who will be in charge of the maintenance.

3.3 Water Scarcity Defining Sanitation Development

Many discuss if water toilets are the best option for a sustainable urban city. Cities around the world are facing water scarcity and toilets are being flushed with water that could be used for drinking. Perhaps solutions similar to the Loowatt should be analysed. As the UN has made it priority to improve sanitation around the world, it is important to do some long and hard thinking of which solution is the most sustainable. Millions of people have to be connected to some kind of human waste collection, if it will be “wastewater” or only “humanwaste” is the question. Maybe water flushing toilets should not be the option for the future. Maybe these places in the world that at this moment do not have any treatment should have totally different solutions. Just as Africa jumped the step of having land telephones and went straight to mobile phones, this could be the outcome for handling sanitation. Maybe it is not necessary to follow the evolution of the western world. Besides this, different natural conditions provide different solution possibilities. The African continent for instance, where water scarcity is vast, water toilets do not seem like the smartest solution.

With this said, the development of a world with basic sanitation for all, the solutions have to be customized to culture and traditions, the conditions of the surrounding nature and most importantly, the influence of the people living in the area.

4 The Role of the Professionals

Architects and engineers have to work together in the quest for sustainable and virtuous urban shelter design. Not only are these two professions supposed to work together, anthropologists and sociologists are needed for the observations of traditions and cultures. Most importantly, as already mentioned in a previous section, the knowledge and wish of the locals should be central. All projects must start from the need and desire of the resident. When this information has been collected, architects and engineers will together with the anthropologists find the best solution for these requests. When these professionals have come to a conclusion, the idea should be presented and discussed with those who are going

to live in the area, and only when a proper plan has been found, the project can begin.

When it comes to urban shelter design it is of greatest importance that the so called professionals, often coming from other parts of the world, are aware of their unfamiliarity to the needs of the locals. As a citizen of the western world, unfortunately we do think of ourselves as better and more intelligent than people in other parts of the world, distant from ours. We are educated to think that people in the third world countries starve and do not have access to education. This does not imply that they are stupid, and this should always always always be of highest importance in the minds of any professional.

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