WaSHUp: Innovating Water, Sanitation, and Hygiene Upgrades in Langrug

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science.

ABSTRACT

The current top-down, subsidized, government-led approach to water, sanitation, and hygiene (WaSH) provision in South Africa has not been successful. The goal of this project was to establish a framework for the development of innovative, multi-stakeholder, multipurpose, and community-driven WaSH alternatives in Langrug, an informal settlement in the Stellenbosch Municipality. In collaboration with local co-researchers, government and NGO partners, we developed a process for incremental upgrading, constructed an innovative tap, implemented paintings to foster early childhood development in an ablution block, and proposed designs for a future multi-purpose hall. The work created a starting point for Langrug to become a centre for global learning and research in WaSH provision.

This project report is part of an ongoing research program by students and faculty of the WPI Cape Town Project Centre to explore and develop options for sustainable community development in the informal settlements of South Africa. For more information please go to http://wp.wpi.edu/capetown/wash

The following executive summary has been implemented as a website available at: http://wp.wpi.edu/capetown/homepage/projects/2011-2/wash/

AUTHORS

MACAULEY KENNEY
PATRICK SHEPPARD
RYAN SHOOSHAN
JUSTIN SIEMIAN

PROJECT ADIVSORS

PROFESSORS
SCOTT JIUSTO AND
STEVEN TAYLOR

SPONSOR

THE STELLENBOSCH
MUNICIPALITY'S
DEPARTMENT OF
INTEGRATED HUMAN
SETTLEMENTS (DIHS)

PROBLEM STATEMENT

Urbanization has led to the widespread development of informal settlements. People migrate to urban areas in search of economic opportunity and find that they cannot afford formal homes. Therefore, they settle on unoccupied, low-quality land. These illegal squatter camps are often densely populated and contain little infrastructure. Because of this, governments struggle to provide basic services to the residents of these settlements. Water, sanitation, and hygiene (WaSH) provision is particularly challenging, and 2.6 billion people are currently unserviced (Wertz et al. 2011). In Sub-Saharan Africa, this lack of services leads to 1.2 billion cases of diarrhoea annually and 770,000 fatalities to children under the age of five (Bahri, 2008).

In South Africa, the government is currently the primary organization responsible for WaSH provision. However, too often its top-down, subsidized, and non-inclusive approach is not successful. The facilities are typically unclean, smelly, and undignified. In addition, they regularly break. In Cape Town, for example, two thirds of the Cape Town Water Services Department's (WSD) annual $125 million budget is spent on new equipment and repairs (Jiusto, 2010). A. Mels and colleagues (2008) report that providing conventional sewage solutions to Cape Town's informal settlements would far exceed the budget of the WSD. The people of Langrug, the informal settlement in South Africa where this project is located, deal with these issues every day. In Langrug, the ratio of toilets to people is 1:49 (Informal Settlement Network et al, 2011), and people often defecate in the bushes because the toilets that do exist are often broken and unclean.

Figure 1: Ablution Block in Langrug

The magnitude of challenges facing WaSH provision is too great for the government alone to solve because it does not have the required personnel, innovative capacity, or capital. New community-engaged, multi-stakeholder approaches are needed, but few successful examples exist.

BACKGROUND

Because the aforementioned challenges to WaSH provision are widespread, NGO's, universities, governments, and even businesses are working to develop solutions. The team studied and compared many of these solutions, and, from this analysis, was able to identify three principles that aided WaSH provision: multi-stakeholder involvement, multipurpose facilities, and community-driven efforts.

"Multi-stakeholder involvement is essential to effective WaSH upgrading"

The first principle is that multi-stakeholder involvement is essential to effective WaSH upgrading. Governments do not have the resources necessary to supply WaSH services to all those who lack access. Therefore, new stakeholders need to be involved in WaSH provision. Many successful alternative systems, such as Ecotact in Kenya (Murray, 2010), Bio-Centres in Uganda (Aubrey and Shaw, 2009), and MobiSan in South Africa (Narnajo, 2009) demonstrate collaboration among stakeholders other than government. These stakeholders include private businesses, non-governmental organizations (NGOs), and communities, all of which contribute different resources that positively influence the system with which they are involved. These examples illustrate the success of multi-stakeholder models at providing adequate WaSH services.

"WaSH spaces should be multi-purpose"

The second principle is that WaSH spaces should be multipurpose. In informal settlements, WaSH spaces are not valued. As a result, they are commonly misused and vandalized. If these spaces were to simultaneously address needs such as unemployment, education, and communal space, residents would be more likely to care for them (Bell et al., 2010). From this, we developed the idea of WaSHUp spaces, or WaSH upgraded spaces. WaSHUp spaces "upgrade" WaSH spaces so that they meet water and sanitation needs in a holistic, high-quality manner. These spaces would incorporate many non-toilet features to encourage residents to gather around the space, such as laundry stations, clotheslines, and picnic tables for adults as well as educational games, toys, and other activities for children. The amenities and programs included in the WaSHUp facilities would depend on the needs of the community where they are located.

"WaSH must be community-driven."

The third and final principle we identified is that efforts to improve WaSH must be community-driven. Even if the government had the resources to supply WaSH services to all the people who lack them, it would not be successful if it continued to provide subsidized, barebones toilets without adequate community consultation. Manikutty (1998) supports this in his analysis of two sanitation projects in India. One project involved the community, and 80% of residents used the installed toilets. Another did not initially involve the community, and only 50% of residents used the installed toilets.

Similar to this, when the Stellenbosch Municipality put chemical toilets in Langrug without consulting the community, residents rejected them and tipped them over.

The goal of our project was to begin to test these three principles in the community of Langrug. Langrug is an ideal location for this project because it is already progressive in its multi-stakeholder partnerships, our first principle. One of these partners, the Stellenbosch Municipality, has developed a Department of Integrated Human Settlements, which focuses directly on providing innovative solutions to improve informal settlements. Their approach has led to a unique partnership with two NGOs: Shack Dwellers International (SDI) and its affiliate, Community Organisation Resource Centre (CORC). These organisations work in a partnership outlined in a formal agreement. Langrug is one of the first communities in South Africa where such an overarching agreement exists between a government and NGOs. Together, these partners have begun a process of sustainable, incremental upgrading.

Langrug is also an ideal community to begin our work in WaSH provision because one of their key upgrading strategies is community engagement, our third principle. In this settlement, the Stellenbosch Municipality no longer simply builds a tap or toilet, but instead works closely with the community to find a sustainable solution. A "nothing for us, without us" mentality has been adopted where no upgrading is done unless the community is directly involved in the process.

Figure 2: Langrug

WPI brings to this partnership four years of experience working with WaSH issues in Monwabisi Park, an informal settlement located outside of Cape Town. In addition, it brings a grant from the General Electric Foundation for innovations in WaSH provision. It is in this multi-partner, community driven context that this project began.

MISSION STATEMENT AND OBJECTIVES

The goal of this project was to establish the framework for a community-based, multi-stakeholder WaSHUp program to meet community needs and create a learning environment to test our three principles. To achieve this goal, we identified six key objectives.

1. Develop a partnership with the Langrug community, Stellenbosch Municipality, and other stakeholders
2. Understand and assess the current WaSH situation in Langrug
3. Develop a process to incrementally transform existing sanitation facilities into valued WaSHUp spaces
4. Apply the WaSHUp process to upgrade an ablution block in Langrug
5. Capacitate our co-researchers so that they can incrementally upgrade sanitation facilities after our departure
6. Design a WaSHUp facility for inclusion in a new multipurpose community centre

Figure 3: Informal Community Meeting at an Ablution Block

METHODOLOGY

To accomplish these objectives, we applied action research. In a traditional scientific inquiry, we would generate a hypothesis, perform an experiment, and analyse the results. These steps would be distinct and conducted largely within our group. However, action research required that we complete these steps concurrently (Ladkin, 2004) and alongside our co-researchers and other community members.

This method helped to break down the barriers that keep communities disempowered and researchers empowered. In our project, we did not hold all the knowledge; community members held it as well. Action research is ideal for our project because it coincides with our third principle, that upgrading must be community driven. By working alongside community

Figure 4: Assessing Sanitation Facilities

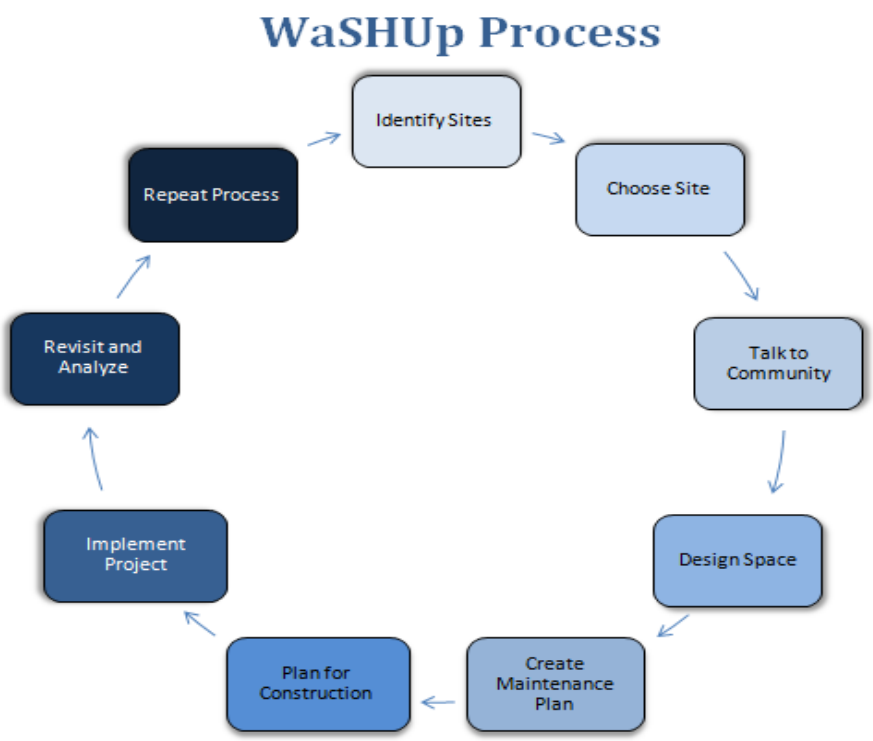

Figure 5: WaSHUp Process

members, as we did with our co-researchers, they gain the same knowledge and insights that we do, and therefore communities are more able to initiate change on their own.

Although action research empowers the community, it does not lend itself to traditional reporting (Ladkin, 2004). As noted earlier, it is an iterative process: hypotheses are made, experiments are conducted, and analyses are performed simultaneously. Therefore, results and methods mix, and to separate them would fail to express the continuous nature of our work. Consequently, the results section will contain methods as well as key outcomes.

RESULTS

Development of a WaSHUp Partnership

In line with our first principle, the team formed partnerships with the Stellenbosch Municipality, CORC, and the Langrug community. Both the municipality and CORC will oversee and finance many of the initiatives being pioneered by our co-researchers over the next year. The municipality will also take on the managerial roles of bookkeeping and collecting regular progress reports, while CORC will collaborate with WPI to create a WaSHUp facility. The relationship with the Langrug community has paved the way for these initiatives as well as provided a starting point for future WPI projects.

Assessment of WaSH in Langrug

To understand the WaSH situation in Langrug, we walked through the community, spoke to residents, analysed each toilet facility, and identified each on a map of the settlement. The co-researchers participated in this process by photo-documenting each facility, translating from Xhosa to English, and encouraging residents to speak about the ablution facilities. Every community member spoken to was briefed that the team was doing research on toilet facilities and that participation was optional. Common themes mentioned were toilet blockages, theft and vandalism of plumbing fixtures, unsafe and poorly lit facilities at night, and winter flooding. We synthesized all this information into a comprehensive database that can be found on our website.

Development of the WaSHUp Process

After gaining an understanding of sanitation in Langrug, we collaborated with our co-researchers to determine how best to incrementally upgrade the existing WaSH facilities. Together we modified the 2011 WPI Greywater Team's informal settlement upgrading process to address WaSHUp ideas. This step by step approach, titled "The WaSHUp Process," guided our implementation work in D section and will be used to direct future incremental upgrades to sanitation facilities. As seen in Figure 5, this process is cyclical and designed to be a model that can be repeated or modified by community members, governments, NGOs, and other interested organisations. The co-researchers will use this process on their own to upgrade existing facilities and evaluate their efforts, which helps promote our third principle.

Figure 6: Painting the D-Section Wash Basins

Application of the WaSHUp Process in a Toilet Block

Using the database we developed of existing facilities and input from residents, we and our co-researchers implemented educational paintings and an innovative water tap in D-Section, an area near the top of Langrug. Both of these upgrades help promote our second principle, that WaSH spaces must be multipurpose.

Figure 7: Completed Toilet Stall

Educational Children's Paintings

To encourage early childhood development, our team and co-researchers painted the alphabet and numbers on wash basins as well as letters, words and shapes inside toilet stalls. Since mothers go to ablution blocks to complete many of their chores, they will be able to work with and expose their children to letters, numbers, shapes, and colours. This exposure is especially beneficial for families who cannot afford to send their children to crèches.

Foot Operated Tap

With the help of a local plumber, the team adapted the 2008 WPI Water and Sanitation Team's foot pedal tap design. This tap consists of a basin and a tall concrete column with an overhanging slab protecting the faucet. There are several advantages that this design offers over the standard twist or push models in Langrug. First, a bucket can be rested on a platform so that it is no longer necessary to bend to pick the bucket up. Second, water release from the tap is controlled by a foot pedal, which reduces hand-to-faucet contact and the spread of disease. Last, all of the piping of the tap is encased in concrete. This last feature was critical to the success of our design, because many taps are broken due to vandalism and misuse. Few alternatives address this issue, and so our innovative design can be used as a model for learning.

Figure 8: Co-Researcher Nyameka Using the Foot Operated Tap

CO-RESEARCHER CAPACITATION

To advance the work of the WaSHUp partnership formed between WPI, CORC, the Stellenbosch Municipality and the Langrug community, the co-researchers will continue their work throughout the next calendar year with the support of "WPI Co-Researcher Scholarships" and the guidance of the municipality and CORC. As a result, it became important for us to ensure that they gained the necessary skills that would allow them to continue upgrading after we leave. To build this capacity, we completed steps of the WaSHUp process alongside the co-researchers. They then utilized the skills they had learned and carried out steps of the WaSHUp Process by themselves, demonstrating the ability to think critically about WaSHUp facilities, identify issues, and propose solutions.

The co-researchers also learned basic computer, typing and camera skills. WPI and partners supplied them with a computer, a camera, and internet access, and we set up a blog for them to document their progress and communicate their work. Finally, we left them with our guidebook and sketchbook, which contained the process we developed, space assessment forms, design forms, and implementation ideas.

Creation of a guidebook and design book

The guidebook and design book that we left with our co-researchers and sponsors will help them as they continue working after our departure. The guidebook contains a documentation of toilet facilities, the WaSHUp process, the D section implementations, and suggestions that our team has for future work. The WaSHUp design book contains our ideas for the proposed multipurpose centre.

DESIGN OF A WASHUP FACILITY

The team created design ideas for a future WaSHUp facility in Langrug, shown in Figure 12, that will ultimately serve as a model for learning in the field of water and sanitation. The foundations of this design are high quality WaSH services. Toilets would stay clean because a paid, onsite caretaker would manage them. Free soap and toilet paper, stocked by the caretaker, as well as pay-per-use showers with hot water would be available (Granfone et al., 2008). Handicap accessible bathrooms and changing tables would also exist for those who needed them.

Figure 9: Foot Operated Tap

Adhering to our first and third principles, we involved community members, CORC, and other stakeholders before we drafted our designs. One method of in-

Figure 10: Co-researchers Designing WaSHUp Additions

volvement that was especially successful was our visit with Langrug residents and interested stakeholders to MobiSan, a successful urine-divergent, composting toilet system near Cape Town. Prior to the visit, residents were opposed to non-flush toilets. However, their opinions changed after they saw the facility. Showing community

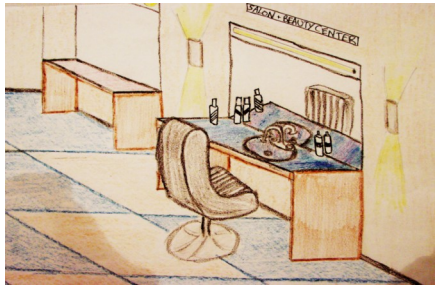

Figure 11: Salon Design for WaSHUp Facility

residents possible alternatives is an effective way to involve them in the process of WaSH upgrading, but few of these alternatives currently exist. Ideally, the future WaSHUp facility in Langrug will become one of these model sites that residents from other communities will be able to visit.

Our WaSHUp facility design includes spaces that satisfy other community needs, in accordance with our second principle. The community expressed interest in laundry facilities, sinks, and showers, so all of these were incorporated. We addressed education with an interactive children's space, lack of community space with a women's salon, and unemployment with entrepreneurial opportunities for beauticians and caretakers. These ideas were presented directly to CORC, community members, municipal workers, and business leaders at a community poster fair in order to spark conversation about the possibilities for this future WaSHUp facility.

CONCLUSIONS

Traditionally, sanitation facilities are eyesores in informal settlements. They are smelly, vandalized, and unclean. If WaSH is to improve, this needs to change. We propose that one way to spark this change is to create WaSHUp spaces that are valued by the community. If people valued WaSH spaces, they would be less apt to vandalize and misuse them. To create value, we suggest making WaSHUp spaces high quality, clean, bright, safe, and welcoming - entirely opposite of how they are now. To do this, we advise adherence to three principles: that these spaces be multi-stakeholder, multipurpose, and community driven.

We set the groundwork for these three principles in Langrug; now, we recommend that further research be done. Our small scale implementation should be analysed and new WaSHUp spaces should be created. Langrug, with its strong community, multitude of partners, and plans to develop a multipurpose centre, is the ideal place for this research to continue. Because of this, we recommend that WPI continue a process of learning and experimentation in WaSHUp provision in Langrug. Below we offer a set of recommendations for this future work.

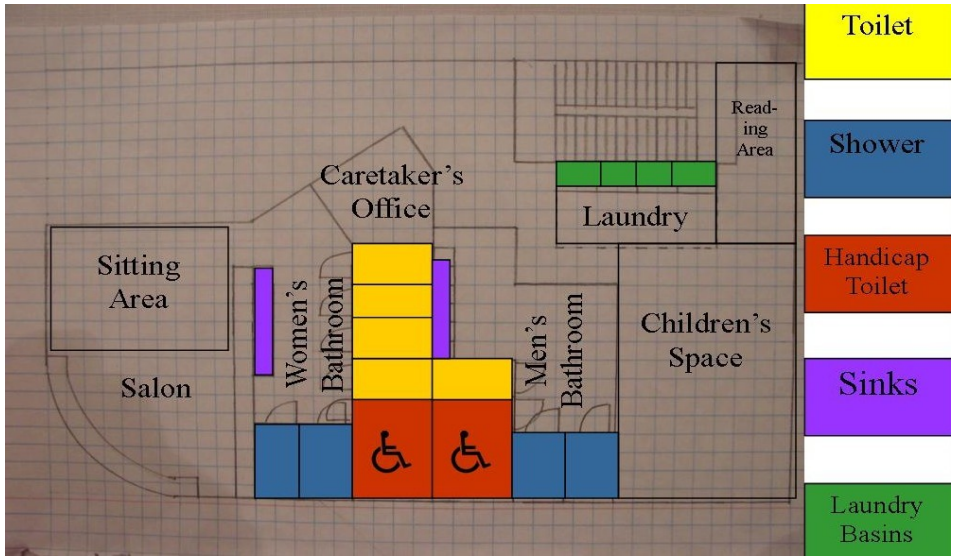

Figure 12: Floor plan Design f or WaSHUp Facility

Future Implementations

We recommend that the co-researchers use the WaSHUp Process to implement the remainder of the design plan for D section, which includes signs, a place to dump food waste/trash, a soap dispenser, lights, a retaining wall, a laundry wringer, and door locks. Once they finish in D section, they should move on to other sections and do further research within the community.

Community Involvement

Future efforts should involve residents in all stages of implementation. Open communication, idea solicitation, and community review will be core components of a successful process. Also, any external party seeking to perform upgrades in the settlement should make use of the co-researcher partnership. Working with the co-researchers was pivotal in our interactions with community members and in our understanding of sanitation in Langrug. To maximize communication within this relationship our team recommends making use of visual and tactile approaches in addition to verbal communication.

Technical Research

We recommend that the Cape Town Project Centre build off past WPI water and sanitation projects and continue technical research on alternative sanitation systems. Specific areas of research that we suggest are waste composting, grew water recycling, waste-to-energy systems, and urine divergent toilets.

Entrepreneurial Analysis

The salon, children's area, and caretaker's office in our designs offer the possibility of employment. Further research is necessary to determine if these ideas are feasible and to identify community members who could fill these roles. Also, we suggest research to determine the marketability of waste's valuable by-products such as fertilizer and electricity.

Observation and Analysis

The above recommendations aid the implementation of WaSHUp spaces. However, once these spaces are implemented, they must also be observed and analysed to determine what was successful and what was not. This will help to facilitate a process of learning from which interested parties can benefit, ideally creating innovations that will help to provide WaSH to the 1.2 billion people who currently suffer from inadequate service.

REFERENCES

Aubrey, D., & Shaw, R. (2009). Community-based sanitation entrepreneurship in Mukuru and Korogocho informal settlements, nairobi. Paper presented at the *Water, Sanitation and Hygiene: Sustainable Development and Multisectoral Approaches. Proceedings of the 34th WEDC International Conference, United Nations Conference Centre, Addis Ababa, Ethiopia, 18-22 may 2009*. 58-63.

Bahri, A. Water Woes. 2008. Nature, 456(39)

Bell, H., Barbour, I., Gottshall, A., & Sparrell, C. (2010). *Supporting early childhood development in Monwabisi Park*. Worcester, MA: Worcester Polytechnic

Granfone, M., Lizewski, C., Olecki, D., (2008). *Executive summary -- solutions for the future sustainability of water and sanitation in Monwabisi park, Cape Town*. Worcester, MA: Worcester Polytechnic

Harris, L., Kates, A., Momose, T., Overton, C. (2011). *Developing a sustainable process for upgrading greywater management systems.* Worcester, MA: Worcester Polytechnic

Informal Settlement Network, Stellenbosch Municipality, Langrug Community Leadership, & Community Organisation Resource Centre. (2011, June). *Langrug settlement enumeration report*. Franschhoek: Stellenbosch Municipality.

Jiusto, S. (2010). *Proposal to GE for Support of the WPI Cape Town Project Centre Sustainable Infrastructure Initiative*

Ladkin, Donna (2004). Action Research. Seale et al. (Eds.) Qualitative Research Practice (pp. 536- 548). London, England: SAGE.

Manikutty, S. (1998). Community Participation: Lessons from Experiences in Five Water and Sanitation Projects in India. Development Policy Review, 16(4), 373-404.

Mels, A., D. Castellano, B. Braadbaart, S. Veenstra, I. Dijkstra, B. Meulman, A. Singels, and J. Wilsenach. Sanitation Services for the Informal Settlements of Cape Town, South Africa.248(1-3).

Murray, S. (2010, Keep it clean: The world's water and sanitation challenge. *Financial Times,* Retrieved from http://www.ft.com/intl/cms/s/0/c8da979c-38d7-11df-9998-00144feabdc0.html#axzz1X1zAvD2M

Naranjo, A. (2009). *Case study: The MobiSan approach in informal settlements of Cape Town.*

Wertz, B. A., Odekova, A., & Seaman, M. (2011). Building capacity with demand-driven partnerships: A case study of partners for water and sanitation. Environment, Development and Sustainability, 13(1), 19-33.

ACKNOWLEDGEMENTS

Aditya Kumar, Sizwe Mxobo: CORC
Alfred Ratana, Nyameka Magele, and Siyanda Madaka: Langrug Co-researchers
David Carolissen: Sponsor, Stellenbosch municipality
General Electric Foundation
Harold Lamberts, Hendri Steenberg, Johru Robyn: Stellenbosch municipality
Langrug Residents
Scott Jiusto and Steven Taylor: Advisors