

Improving Community Spaces through Collaborative Building and Design Projects in Monwabisi Park, Cape Town



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 goal of this project was to complete necessary renovations on an existing community hall and implement a sanitation system for a new facility, to further the development of sustainable informal settlement upgrading efforts in Monwabisi Park, Cape Town. We worked closely with volunteers, workers and leaders from the community, and the City of Cape Town to develop innovative solutions to basic needs that serve as examples for future, sustainable community development.

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>

The following is an executive summary of a set of project reports that have been implemented as a website available at: <http://wp.wpi.edu/capetown/homepage/projects/p2010/collaborative-construction/>

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VIOLENCE PREVENTION THROUGH URBAN UPGRADING PROGRAMME

PROBLEM STATEMENT

Monwabisi Park is an informal settlement in the township of Khayelitsha, Cape Town that has been chosen by the City to be a pilot community for innovative, sustainable community upgrading. The team worked on two projects that emphasized the importance of collaboration and sustainability of community facility development. The first project included working with community members to complete repairs and improvements on an existing community hall. In the second project, the team worked with stakeholders to design and implement a sanitation system that will both serve the immediate needs of a new community facility and provide a basis for developing a testing site for sustainable sanitation options for informal settlements. Both projects presented significant challenges, such as working to meet a strict timeline,

dealing with shifting goals and design information, and satisfying a variety of needs at once. These projects also offered numerous opportunities, allowing the team to work closely with a variety of stakeholders, exchanging ideas, and learning from each other. In all, these collaborative efforts helped develop community facilities that can serve as building blocks in an innovative *in situ* informal settlement upgrading program in Cape Town.

BACKGROUND

MONWABISI PARK AND INFORMAL SETTLEMENTS IN SOUTH AFRICA

Khayelitsha is a township on the outskirts of Cape Town, South Africa. It started forming in the late 1980s during the post-apartheid era, when many black South Africans migrated

to the Western Cape in hopes of new opportunities. People moved to Khayelitsha because of its close proximity to Cape Town and potential employment offered in the city.

Monwabisi Park was formed in 1997 and is an informal settlement in the township of Khayelitsha. Monwabisi Park, which is divided into four main sections (A, B, C, and M), was originally formed over a local landfill and partly on a nature reserve. Despite initial government efforts to remove “squatters” from the area, the settlement today consists of approximately 5 800 shacks and over 20 000 people (WPI CTPC, 2008). Like many informal settlements, Monwabisi Park lacks basic amenities and sufficient community space. Current redevelopment efforts are working to meet some of the community’s most basic needs.

THE ROLE OF PUBLIC FACILITIES IN INNOVATIVE APPROACHES TO REDEVELOPMENT

The lack of community space within the informal settlements in South Africa limits people’s ability to gather for community meetings, to provide services, such as soup kitchens, and to hold church services or children’s programs. In Monwabisi Park, other than local shebeens (taverns), there are only two community halls and approximately nine formal churches, which is insufficient gathering space for the entirety of the population (Coleman, et al., 2010). The City’s Violence Prevention through Urban Upgrading Programme (VPUU) is taking the lead on the Informal Set-



tlement Upgrading Programme (ISUP), which is an approach to *in situ* upgrading. The program emphasizes developing critical infrastructure through the engagement of community members throughout the process. The VPUU has begun to implement the ISUP concept in Monwabisi Park to satisfy a range of needs, including public facilities for recreation and communal gatherings.

The Worcester Polytechnic Institute (WPI) Cape Town Project Centre (CTPC) meanwhile has advanced the “redevelopment seed” concept, an approach to community upgrading that also begins with creating public spaces (WPI CTPC, 2008; Jiusto and Hersh, 2009). WPI has worked with local residents and organizations, notably the Indlovu Project and the Shaster Foundation, who are committed to the sustainable redevelopment of Monwabisi Park (WPI CTPC, 2008). These organizations have been exploring innovative, hands-on approaches to meet the needs of the community. In large part because of these efforts, Monwabisi Park has been chosen as an ISUP pilot site, under which the VPUU is leading efforts to improve existing spaces through collaborative projects. Innovative approaches allow all stakeholders to gain a new perspective and





to learn from each other when working to satisfy community needs.

PROJECT 1: COMMUNITY HALL RENOVATION

Community centers play a key role in providing opportunities and resources for residents, often functioning as a public meeting space, soup kitchen, church, and more. It is crucial to maintain and improve these areas in order to maximize the impact they have on the community. The B-Section Community Hall is one of two community centers in Monwabisi Park and is used by residents from throughout the settlement's four sections. Because of the high usage of the hall and the limited ca-

capacity of the building, community members recently expanded the hall. Although this created a larger available space, inadequate design and resources led to a leaky, sagging roof and a gap in one of the walls. The building also had a damaged floor and a broken door lock. These problems not only affected its functionality, but also its security. The VPUU asked the team to work with local residents to exchange ideas, methods, and techniques in order to design and repair these areas of the hall.

PROJECT 2: MEETING SANITATION SYSTEM NEEDS AT A NEW FACILITY

The VPUU recently began their work under ISUP in Monwabisi Park. Their

first project was constructing a kick-about (soccer field), which is available to be used by all residents of the settlement. They are in the process of installing their first facility next to the kick-about, which will hold VPUU offices to create an increased city presence in Monwabisi Park. The VPUU will also offer public resources at the facility, including a reading room. There will be two toilets, two showers, and two basins installed in the new facility, introducing a need for a proper sanitation system. This need presented WPI, the University of Cape Town (UCT), and the City of Cape Town with the opportunity to continue their research on water and sanitation issues in informal settlements and to take the first step of implementing an innovative solution (Alex, et al., 2007; Granfone, et al., 2008; Donahue, et al., 2009; Nguyen, et al., 2010).

Developing a sanitation system within Cape Town's informal settlements has proven to be a major public health and infrastructural challenge. While the City of Cape Town has made efforts to implement toilet systems throughout settlements, creating an effective, long lasting and sustainable solution has been problematic. Although the law states no more

than five families are to share one toilet, there are toilets that are shared by up to 69 families within the settlement (Donahue, et al., 2009). The City of Cape Town sanitation facilities are currently near capacity and water shortages are expected within the next few years. The development of sustainable sanitation systems is thus desirable if all residents of informal settlements are to be provided with sufficient access to toilets and sanitation.



The VPUU facility will serve as a pilot site for the development of a sustainable sanitation system for informal settlements. The design of this system was based on an anaerobic baffled reactor (ABR); a non-powered, easily maintainable way to manage wastewater (Nguyen, et al., 2010; Ferraz, et al., 2009; Hammond and Tyson, 1991). These systems are an elaboration of a septic tank, and include baffles that provide multiple chambers within the tank. Using only gravity, water flows through these chambers, and in each one more waste settles out and is anaerobically digested, producing a cleaner effluent.



MISSION STATEMENT AND OBJECTIVES

The goal of this project was to improve community spaces by collaborating with local residents to implement innovative, sustainable solutions to satisfy various existing needs within Monwabisi Park. Specifically, our team worked with the community to complete two projects that serve as creative solutions towards the development of important public resources within the settlement. Objectives were determined for each of two projects:

PROJECT 1: B-SECTION COMMUNITY HALL RENOVATION OBJECTIVES

- ◆ Research and understand current building techniques in Monwabisi Park.
- ◆ Understand the impact community centers have and the resources they provide.
- ◆ Collaborate with volunteers from the community to finalize designs for renovations.
- ◆ Work alongside stakeholders to upgrade the functionality and security of the hall.

PROJECT 2: SANITATION SYSTEM OBJECTIVES

- ◆ Research anaerobic baffled reactor (ABR) systems and wastewater disposal options.
- ◆ Determine the applicability of an innovative ABR system to the VPUU facility.
- ◆ Work with stakeholders to design an adapted ABR system with separate systems for the greywater and blackwater, which will be used for

research and testing purposes.

- ◆ Build a sanitation system that will satisfy the immediate needs of the VPUU facility and allow for future development

METHODOLOGY

PROJECT 1: COMMUNITY HALL RENOVATION

To address our objectives for the renovations on the B-Section Community Hall, we began by observing the existing physical conditions of the hall and discussing desired repairs with local residents. The Safe Node Area Committee (SNAC) is a leadership organization under the VPUU that meets regularly at the hall. We engaged in conversation with SNAC members and neighbors of the hall to learn about its function and history.

Acquiring this knowledge was critical in understanding the importance of preserving and improving existing community spaces, such as this hall.

Once we familiarized ourselves with the conditions of the hall and learned what improvements were desired, we defined tasks to complete. These projects included repairing the roof, ceiling, doorframe, door lock, burglar gate, damaged floor, and gap in back wall, as well as building new benches, adding a second light socket, and installing a light switch near the door. We then developed our own ideas and designs to complete each task. Each design required obtaining accurate measurements in order to formulate construction plans. Also, we planned the materials and tools that would be necessary to complete each



portion of the project and determined which items could best be obtained in Monwabisi Park, and which would require purchase at a building supply store, a 10 minute drive away in Makhaza or Mitchell's Plain. The WPI CTPC paid for all materials, tools, and construction costs.

With hopes of working closely with members of the community, our team planned to recruit volunteers to help with the design and construction processes. Upon commencing work, three men saw us when walking by the hall and inquired about our work. After talking with these men, they were eager to help and volunteered to work alongside us throughout the week-long renovation period. Before finalizing designs for each task, we shared our ideas with the volunteers and added their input. This method allowed everyone to gain a new perspective and allowed us to incorporate various building techniques and methods common in Monwabisi Park into our designs. For example, when we needed to cut zinc roofing sheets, instead of using tin snips, the volunteers demonstrated a creative solution using wire, which was both simpler and more efficient.



PROJECT 2: MEETING SANITATION SYSTEM NEEDS AT A NEW FACILITY

Developing a plan for the innovative sanitation system that would be implemented at the VPUU office site began with research into existing sewerage system plans. Specifically, our team focused on the development of an anaerobic baffled reactor. Once preliminary research was conducted, communications with Dr. Kevin Winter, a lead researcher in urban water management at UCT, provided the team with additional information and design options. The combination of Internet research, past work by the WPI CTPC, and discussions with Dr. Winter, supplied information necessary for the design process.

Communications with our VPUU liaison, urban planner Kathryn Ewing, as well as other professionals, provided the information necessary to determine the system's usage. Knowing the estimated daily usage of the ablu-

tions facilities is one of the most critical design parameters for the system. The VPUU was uncertain as to the number of people who will use the system, stating that it will be moderately used by the live-in caretaker, office employees, and occasional visitors. We designed the system to accommodate an excess usage, which will account for an increase in users of the system and allow for future expansion. Monitoring the system is crucial to avoid overuse of the system. Other important design considerations included function, construction, maintenance, finance, security, and future plans for the system. Once this information was received, we began to determine feasible design options.

To produce the most sustainable results and cleanest effluent, we decided to treat grey and blackwater separately. This requires two sanitation systems, each with a way to store the



wastewater and a way to dispose of it. Next, we decided that the most sanitary way to dispose of blackwater would be to first promote anaerobic decomposition of solids as much as possible, making an ABR preferable (DEWATS, 1998). Taking construction processes and time frames into consideration, we decided it would be more feasible to purchase pre-made septic tanks than to design and make our own with concrete blocks or other materials. Leach fields were chosen as the most practical and beneficial way to dispose of wastewater after it has been filtered through the tanks. Although soakaways are most commonly used in South Africa, we chose to construct leach fields because they release filtered wastewater over a larger area and have more potential for future sustainable projects, such as growing grass.

Once our team consulted UCT, who concurred with our design plans, we

submitted a proposal to our VPUU sponsor for approval. We found little design guidance for sanitation systems that separate grey and blackwater, so it will be crucial that the approach is monitored by UCT and WPI to assess how well it works. After the plans were finalized, a construction timeline was determined. Collaboration with the VPUU, tank supplier 4EVR Plastics, and our team was needed before construction could take place. William Trom, VPUU Operation and Maintenance head, identified local labourers to help with construction and our team managed the process on-site. The VPUU was responsible for inspecting and approving all work, making final decisions throughout the project, including changes to the final designs for encasing the tanks in concrete. The WPI CTPC and the VPUU shared the costs for the project.

RESULTS

PROJECT 1: COMMUNITY HALL RENOVATION

After spending six days working to complete necessary renovations, our team, along with community volun-



teers, successfully built a new roof, installed the ceiling, adjusted the doorframe, fixed the door lock and burglar gate, filled in the damaged floor, mended the gap in the back wall, added a second light socket, and installed a light switch near the door. Later throughout our project we also constructed eight benches, which were delivered to the hall.

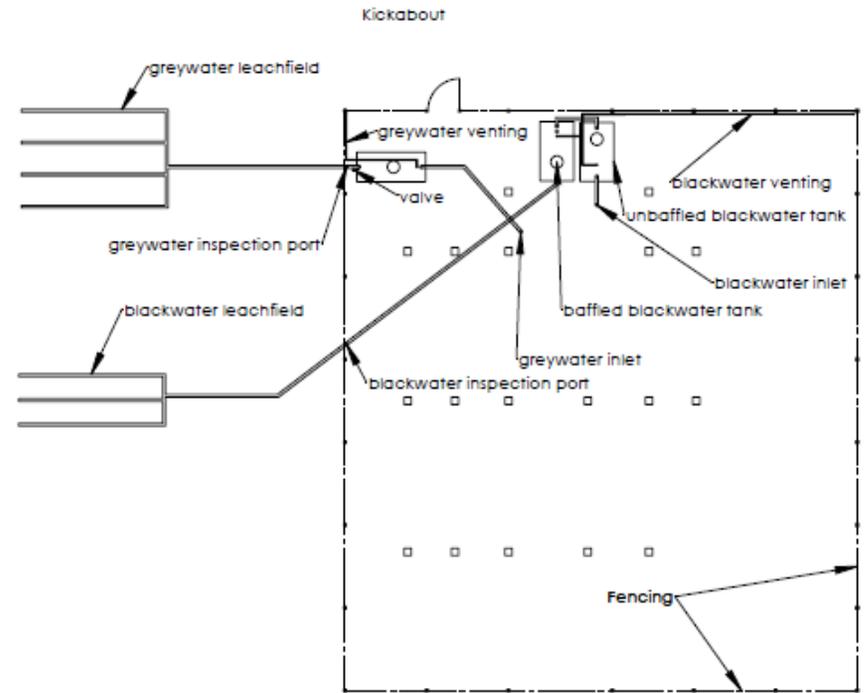
Working on the community hall presented many challenges that were overcome throughout the process. The construction environment in the informal settlement is different than our team was accustomed to. We originally allotted three days to complete the construction of the new roof. When we shared our goals and timeline with the volunteers, they were surprised, saying that it is common to build an entire shack in one day. There was a visible difference in working style, especially in terms of safety and planning. Although our team's "safety manager" was responsible for monitoring the worksite to ensure everyone's safety, most of our volunteers were not as concerned as the team was. Additionally, the volunteers were quick to get started on each task, and often did not wish to fully plan and measure before beginning, which our team considered nec-



essary. Another major challenge was working to overcome the language barrier. At first, it was difficult to communicate our design plans with the volunteers and to receive their input. We learned it was best to not only show detailed drawings, but to draw it out with everyone watching. This enabled everyone to envision the design and to share his or her own ideas.

These B-Section Community Hall construction projects provided a base for the further progress of WPI's efforts and the ISUP within Monwabisi Park. These renovations were highly visible in the community, very appreciated, and widely talked about. Our team received positive feedback from VPUU employees, SNAC, and many community members, who saw the work as an encouraging sign of redevelopment progress in Monwabisi Park.

PROJECT 2: MEETING SANITATION SYSTEM NEEDS AT A NEW FACILITY
We worked alongside five VPUU Operation and Maintenance workers for six days to implement a sanitation system consisting of a greywater system and a blackwater system. Working in informal settlements presents many challenges that our team had to overcome. Because we were unable to purchase many tools and materials locally, it was necessary to make cumbersome travel arrangements. It was difficult to maintain an adequate water supply, as the taps nearest the worksite have a different fitting than those sold in the stores, so our team arranged to borrow a hose from a



local resident each day and worked with a local crèche owner to access a second tap on her property. Additionally, we had to consider and account for overnight disruptions to the work site. This included sand blowing into the holes and trenches, as well as children entering the site and disturbing the progress.

GREY WATER AND BLACK WATER SEPARATION

We designed this sanitation system to address the immediate needs of the ablutions facilities for the new VPUU office site, but we also intend it to be flexible for later expansion. The first major decision was to separate grey and blackwater. One of the long-term goals for this sanitation system is the

installation of a closed loop system. The greywater, which produces a cleaner effluent than the blackwater, can potentially be recycled as flush water. Separating the two systems in the initial phase will allow for future developments of the system.

GREY WATER SYSTEM

We implemented a greywater system consisting of one holding tank and a greywater leach field. Water from the basins and showers in the ablutions container is fed into a 2 200L tank located within the fenced facility area, to minimize potential vandalism. This tank has both a lower outlet controlled by a valve and an upper overflow outlet. Water collects in the tank

until either the valve is released or it overflows out. Both of these outlets lead into the greywater leach field. In order to avoid odor of the system, the valve should be opened daily to empty the tank.

BLACKWATER SYSTEM

To treat the blackwater from the toilets in the ablutions container, our team implemented a system that includes two 3 600L tanks and a leach field. The two tanks are located within the fence, directly behind the ablutions container. Toilet wastewater is piped directly into the first of these two tanks. The second tank, connected to the first in series, contains a 2/3 high baffle in the center. This creates a three-chambered system, which allows the wastewater to be processed in a similar way to an ABR. Once each chamber reaches capacity, the water overflows into the next chamber and the process continues. After flowing through each of these three chambers, the wastewater overflows into the blackwater leach field.



LEACH FIELD DESIGN

Leach fields are a way to release wastewater back into the ground after primary treatment through the settling tanks. These fields consist of a distribution pipe and perforated branches. Water is fed into the distribution pipe from the tanks, and then into the perforated pipes. Water flows through the holes in the perforated pipes into the bed of gravel underneath them, and is distributed back into the ground. This is a simple, low maintenance, sanitary way to dispose of wastewater. In our system, the greywater leach field consists of a distribution pipe and four perforated branches; the blackwater system has three perforated branches. Both systems are located in the lower sandy area outside of the facility's fence.

SANITATION SYSTEM OPERATIONS AND MAINTENANCE

Our team wrote an Operations Manual for the VPUU, in order to explain the systems and to ensure they are properly operated and maintained. This manual includes drawings and details step-by-step procedures on how to empty the greywater tank and how to determine when the blackwater tanks need to be pumped, as well as daily and monthly procedures that should be followed. We also list precautions that the VPUU should take to guarantee proper use of the facility, including installing grates on the drains for the basins and showers and supplying toilet paper for the toilets.

In order to test the system, we installed access points at various places

in the piping. The manual details how to collect water samples from these points, which can be used to monitor the success of the system. Additionally, our team recommends that the VPUU install a chalkboard in the facility to monitor and record how many people are using the basins, showers, and/or toilets on a daily basis. When designing the system, the VPUU specified relatively modest, though unknown initial use, and monitoring to obtain actual usage information is advised.

CONCLUSION AND RECOMMENDATIONS

Although there is still a desperate need for redevelopment efforts in Monwabisi Park, through our experience many residents are eager and willing to help if provided with the necessary opportunities and resources. Our relationship with volunteers and workers enabled us to successfully complete these two unique projects, which can serve as examples of creative solutions to redevelopment challenges.

While working on renovations of the B-Section Community Hall we saw the importance of communication. Understanding the opinions of the community members increases the impact the improvements can have and helps “outsiders” like our team, the CTPC, and VPUU learn over time to work more effectively in this challenging environment. When working on community redevelopment projects, our team recommends taking the time to clearly communicate goals and plans with those affected by the



project.

The sanitation system installed in the VPUU site is the first of a two-step project to explore options for improved sanitation for residents of informal settlements. To evaluate the effectiveness of this system, our team recommends carrying out testing over various stages of the process. Water samples can be obtained from each of the septic tanks, as well as from outlet access points. Soil samples can be used to test the effects the leach fields have on the surrounding soil. Once this system has proven to be successful, expanding it to include public facilities would greatly benefit the local community. We also recommend planting buffalo grass over the leach fields in order to create a grassy field for children to play. Improving public recreational areas similar to this location reflects one of the main goals of ISUP and can serve as an example for future upgrading projects.

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