Envisioning Endlovini:

Options for Redevelopment in Monwabisi Park

Cape Town, South Africa

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Water and Sanitation

Chapter Four Contents:

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Introduction

Population growth in both urban and rural environments has forced the displacement of millions of people into informal settlements. A worldwide poverty and sanitation crisis exists where nearly 40% of the world's population defecates in buckets, exacerbating the spread of bacteria and viruses [m]. Attempts have been made to remedy this situation, but organizations are faced with a lack of sufficient data, resources, organization, and monetary support.

South Africa is one of the many countries burdened with a sanitation crisis in its informal settlements. Land controversies and discrimination laws led to the relocation of many into squatter camps. These unregulated towns were erected quickly with little infrastructure and without adequate resources. Because their rapid creation was without official planning, the squatter camps received little government support leaving water and sanitation services scarce. There is limited access to water pipes, clean drinking water, toilets, showers, sinks, and drainage pipes [c].

Recognizing the immense problems facing the residents of these informal settlements, government organizations and non-profit groups have attempted to improve the standard of living in these shanty towns. The City of Cape Town Water and Sanitation Department (CTWSD) has set basic requirements for water sanitation in informal areas. The number of water pipes and toilets are regulated based on the densities of houses. Basic emergency services are provided, usually in the form of buckets to dispose human waste. One viable method that has been attempted by the Shaster Foundation in Monwabisi Park is the implementation of eco-friendly sanitation systems such as anaerobic toilets and biodigesters. However, when residents are unaware of proper operation and maintenance of these facilities, they fall into disrepair.

The goal of this project, narrated and organized in the following chapter, is to improve the quality of life in Monwabisi Park by creating a design for a replicable public water and sanitation system that upholds the principles of permaculture and sustainability. In turn, general health and safety in the settlement will improve while environmental risks are reduced. Working closely with the residents in order to establish an understanding of the project and its goals in the community is essential so as to increase the effectiveness of results. Water and sanitation service points, hazards, and other water-related infrastructure are mapped and various analytical data is deduced likewise. The various sanitary facilities in Monwabisi Park are identified and the costs, benefits, and problems associated with these services are assessed based on social, health, and cultural perspectives. It is also essential to work with the local community to help create a water and sanitation specialist who can act as a liaison with city agencies to aid and increase cross communication. Finally, a plan for a communal facility that integrates water services with eco-friendly principles is designed and proposed in the integrated planning chapter.

A standard water tap in Monwabisi Park is depicted.

SERVICE QUALITY MAP

Water and sanitation is an integrated system with all aspects working together to provide valuable services to the community. The city has provided taps and toilets for use by residents. Pit latrines, water standpipes, and pour/flush toilet groups make up the current water and sanitation based utilities present in the settlement. The City of Cape Town Water and Sanitation Department is responsible for all systems and looks for improvements to implement in the future.

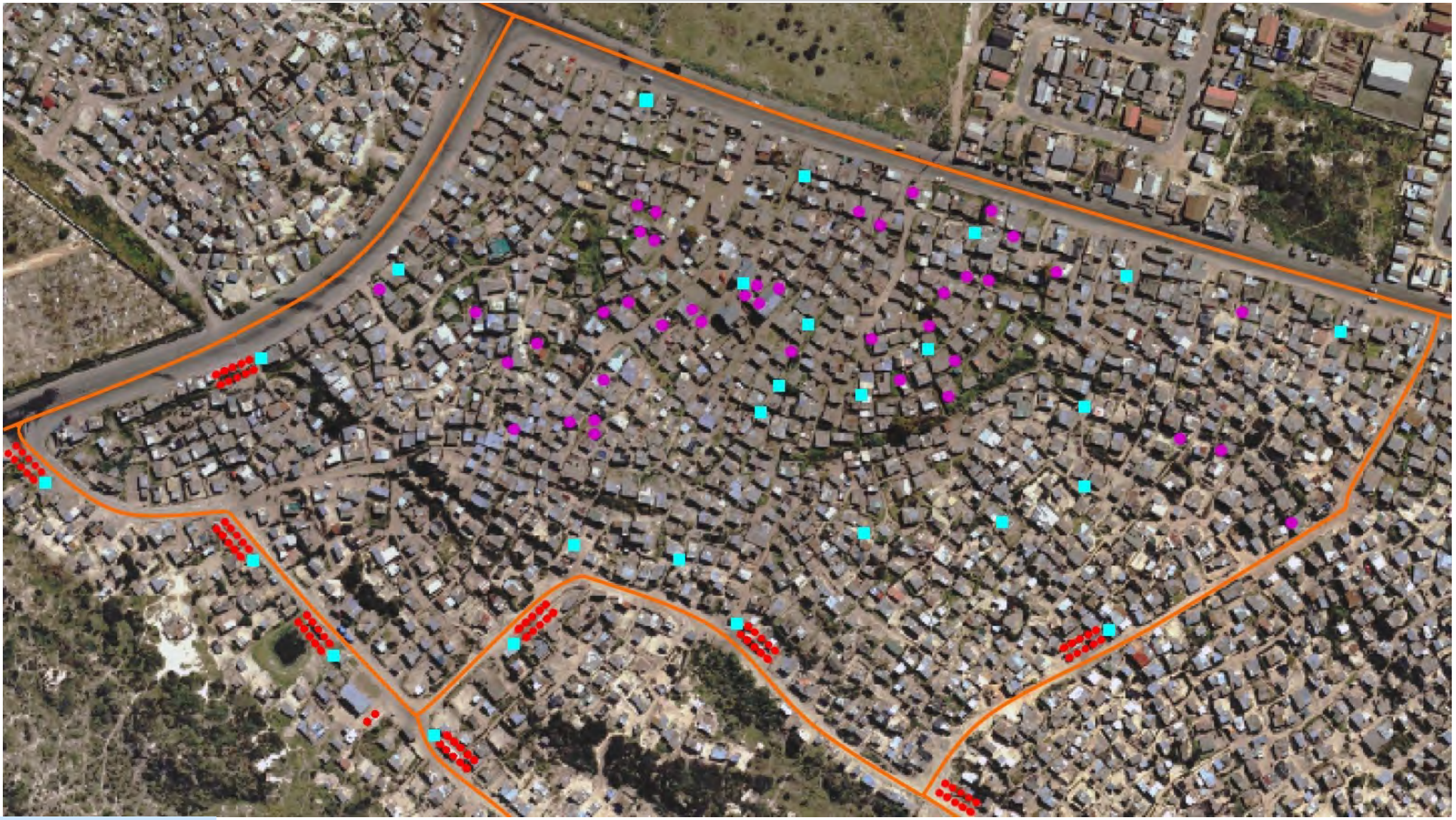
The taps, toilets, and health issues regarding each of the aforementioned are discussed in the following chapter.

Water and Sanitation In Monwabisi C Section

Pour/Flush Toilets

Water Taps

Pit Latrines



Water Taps Overview

The City of Cape Town is fully charged with the maintenance and provisioning of clean water and sanitary systems in all of its informal settlements. This is an almost impossible task due to the vast population of people in the informal settlements and the limited resources that the city can dedicate to serving these people.

Water Availability

The National Water Act in the South African Constitution states that every person has a right to a sufficient amount of water in order to live. Every citizen has these rights and must be accommodated to such conditions despite race, location or class.

In accordance with the law, the City of Cape Town provides water for use by the city through a series of water mains in all regions, developed and informal. The water that is provided to Monwabisi Park is drawn from the main line that runs along Mew Way and is of the same origin that provides for the entire city.

From the main line that is provided by the city, piping is run throughout the settlement to provide water to the residents for personal usage as well as higher capacity lines to supply the multiple fire hydrants in the region. Easily installed and workable underground plastic tubing is used to direct potable water to standpipes located throughout the park.

The taps themselves are standalone systems that are individually monitored, but not governed, by a flow meter. These standpipes are used free of charge and are not limited by the amount of water that can be dispensed. According to current regulations, there must be at least one tap provided for every 25 families. This tap must also be within 200 meters of said families. The taps consist of a metal pipe that protrudes from the ground approximately 4 to 5 feet and terminates in a horizontal pipe that splits the flow towards faucets on both sides where water can be dispensed. The upright pipe is surrounded by a cylinder of concrete with a plastic outer covering to prevent breakage and theft. Often there is a cement retaining ring in the ground surrounding the base of the tap. The ring is filled with 19mm stone at varying depths for each tap aiding in the drainage of standing water into the ground, under the faucets after usage. The city of Cape Town is responsible for the upkeep and installation of such taps in Monwabisi as well as in all 222 informal settlements around Cape Town.

How Water is Used

Water usage in homes includes: drinking, cooking, flushing toilets, cleaning, laundry, and other essential life activities. Many of these practices are accomplished with the aid of a 20L bucket to transport water from the pipe into the home. These buckets are carried by hand from the tap to the house where they are stored and used over the course of the day. It is not uncommon for a resident to make multiple trips in a day to a tap in order to obtain enough water for the household. It is traditionally the woman of the house to complete this task. As it takes a substantial amount of water to clean laundry, the task is usually done directly at the faucets.

How Much?

On average, a resident of Monwabisi uses 660L of water a week for all tasks:

Laundry: 6 buckets twice a week

Bathing: 1 bucket daily

Cooking: 1 bucket daily

Drinking: 1 bucket daily

Total: 33 buckets per week = 660L

Resident collecting water in a typical 20L bucket

Summary of The Law

National Water Act:

- *Every person has the right to 'enough water and a clean environment in order to have a healthy standard of living.*

Standards:

- *25 liters of water per day per person*
- *Flow rate of 10 liters per minute*
- *Taps must be no more than 200m from any household*
- *One tap for every 25 households*

Laundry being done at the tap

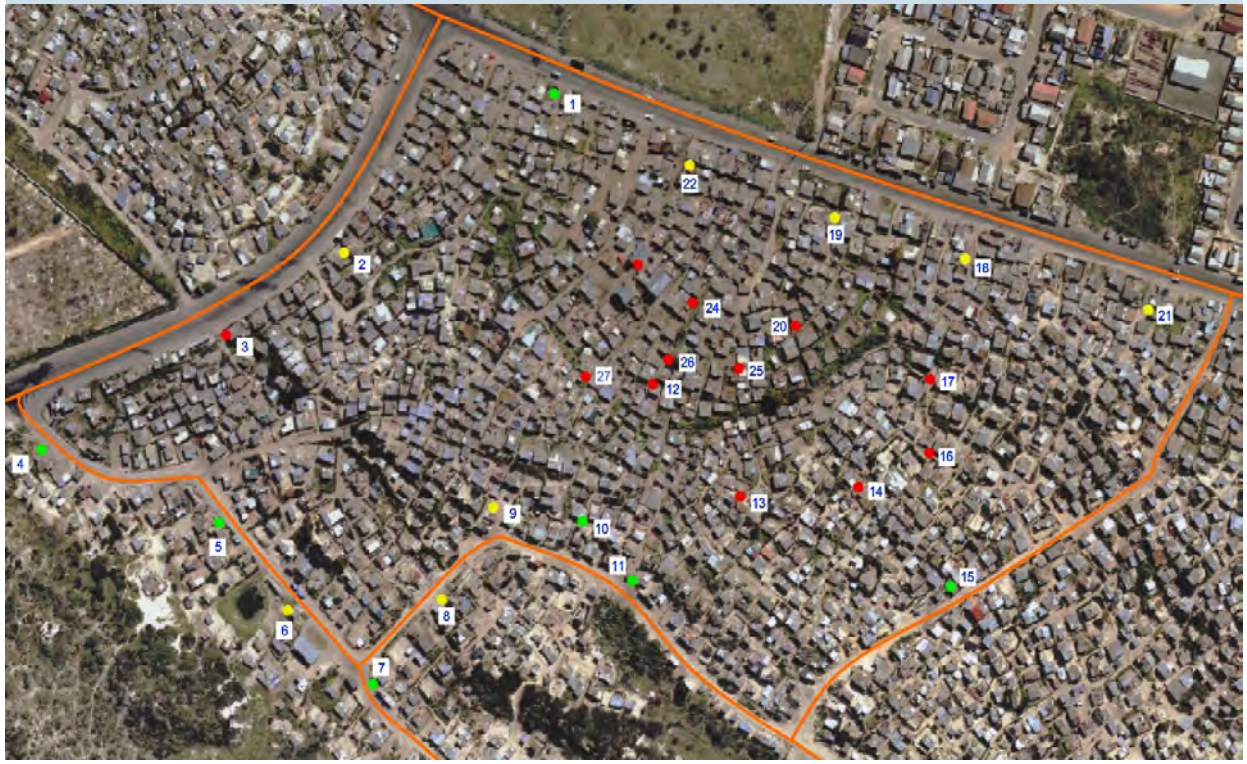
THE MAP

The following map depicts the distribution and current conditions of water taps across C-section in Monwabisi Park.[4] Standpipes are shown as colored squares overlaying the aerial view of the region. From this color coded map trends can be recognized in regards to placement of the taps as well as to which devices are better cared for and maintained. Each tap is analyzed and is represented by a colored square, with the each color signifying its condition. The judgment of the taps is based on multiple factors ranging from water pressure to the physical condition of the components. Each tap is numbered and matched with the tap numbers as noted in the appendix. In the appendix is a list of all taps in C section and their respective conditions (see appendix).

TRENDS

There is no apparent method of organization of the taps in the interior of Monwabisi because standpipes that are not associated with other sanitation systems were installed on a needs basis as the population grew in size. However, since pour flush toilets require an external source of water to flush, a standpipe is located outside of every toilet pod. Since the pods are generally placed next to roads, this increases the number of taps that are located alongside a main road. Also along the perimeter of the section are taps that are not next to a toilet position, which are easier to maintain and observe by city workers.

Standpipe Map



Taps In Good Condition

Taps In Fair Condition

Taps In Bad Condition

Subsequently, the taps that are alongside major throughways are commonly in better condition than those in the interior of the region. There is a high concentration of nonfunctional taps in the interior of C-section that are labeled in red. The more functional and working taps are commonly located along the roads and next to pour flush toilets. Having more exposure to the general public, the taps along Mew Way, Steve Biko Road and the interior dirt roads are seen and watched by many passersby. This constant surveillance prevents people from vandalizing or stealing standpipe components serving as a community watch.

When touring the communities, city contractors have little time to examine every station and as a result, it is often the case that the taps visible from the road will be checked more often and thoroughly than those located within the borders of the park. Without the public eye looking after the inner taps, theft and vandalism are common problems with the "hidden" standpipes. Metallic components of the taps are frequent targets for thieves as they can be easily resold. The standpipes next to pour flush toilet pods are in a better state than most others. The nature of a pour flush toilet requires a dedicated external water supply to be present in order to flush the toilet bowl after each use. After using the toilet, the occupant gathers water with a bucket and then proceeds to dump water into the bowl to force any remaining excretory matter down to the conservancy tank below. Since this is a water dependent activity, the standpipes in close proximity to the pods need to be in good working condition, otherwise the toilets will become clogged and nonfunctional. This integration of toilets and taps creates a symbiosis between the two with the state of one directly affecting the other. By requiring water after each use, residents are generally more mindful of the taps nearby. The toilets are also in high volume areas where people frequently congregate and walk, preventing unseen theft and vandalism.

Ideal vs. Reality: Taps

The city installed taps as a way for residents to obtain water to use in their daily lives. By installing taps water was intended to be delivered and available to every person in Monwabisi Park. This section details the conditions of the standpipes in their current state.

CURRENT STATE

In Monwabisi Park there were a total of 117 taps installed to cater to the water needs of the local residents. An unlimited supply of water is thus provided to the community free of charge. Over the course of time since their establishment, the standpipes' functionality has dwindled due to misuse and theft.

THE INITIAL PROBLEM

When Monwabisi was first settled, there was a smaller population than there is today (see Chapter 2). As the population grew, so did its needs for space, housing, and water. The initial supply of water for the occupants was quickly overtaxed and the existing number of taps was no longer sufficient. As the community blossomed, other needs arose and new roads were built where groups of toilets were built to provide proper sanitation. With the toilets came new taps. This measure proved to be inadequate as the community continued to boom in size until the new taps were overused and forced into disrepair.

As the number of working taps decreased, numbers of available water sources plummeted. This had a direct effect on the population of Monwabisi as people soon had to start travelling to distant stand pipes to fulfill their water based needs. By reducing the number of available sources, the remaining taps became more crowded and used, causing more damage of their components. The ideal ratio of taps to users is 1 tap for every 25 households, however, in C-section alone there is a ratio of almost double the recommended amount. By overloading taps, their life spans become dramatically shortened and their successive failure becomes an inevitability. When these taps fail, the burden is then shifted to other taps which undergo the same cycle of overuse.

MISUSE

Many of the problems associated with water taps in Monwabisi Park can be traced to their misuse due to both carelessness and misunderstanding. A major inconvenience in using the taps is their height. When filling a bucket, the faucet is at a significant distance above the rim. To prevent water spillage and to reduce effort needed to raise the filled bucket, it is a common practice for people to hang the bucket from the horizontal piping so that it is closer to the nozzle. As the buckets become filled with water, their weight significantly increases to a point where there is a substantial force being applied to the tap where weight was not designed to be placed. This can cause many problems ranging from leaks at the joints to the deformation and ultimate failure of the piping. Another method that people employ to raise the bucket to a more manageable height is to fill the cement ring under the faucets with sand and refuse. This causes many problems concerning the improper storage of garbage, food scraps and

	Monwabisi Park			C-Section		
	Number	*Legally Required Ratio*	*Actual Ratio*	*Number*	*Legally Required Ratio*	*Actual Ratio*
Population	20000	1:125	1:171	6629	1:125	1:246
# Households	5785	1:25	1:49	1510	1:25	1:56
# of taps	117			27		
Ideal figures if all taps worked as installed						

Figure 1 Ratio of Installed Taps: People/Households

	C-Section			
	Number	*Legally Required Ratio*	*Actual Ratio*	# of Taps Needed for Ideal
Population	6629	1:125	1:442	53
# Households	1510	1:25	1:101	61
# of taps	15			
Actual figures accounting for current tap conditions				

Figure 2 Ratio of Currently Working Taps: People/Households

Buckets are commonly hung on piping for easier access

as a main consequence, drainage is severely hampered.

The city has also made an effort in installing irrigation systems next to standpipes in other settlements. These irrigation systems recycle water that is wasted next to the standpipes by draining it in a leech field where plants could be grown. However, these structures soon malfunctioned.

Stacking rocks to raise the bucket

Many people wash their dishes out near the standpipes where water is easy to access. The fats that are washed away quickly clog the irrigation pipes and back up the system rendering the drainage system useless.

DRAINAGE

An issue that concerns both the health and safety of the community is the improper drainage through the provided retaining rings. The cement cylinder at the bottom of the tap is filled with stone to allow for more efficient drainage of spilled water into the ground below the standpipe. Since the porosity of the stone layer is much larger than that of sand, water is able to flow faster through to the bottom of the layer where it can be dispersed into the sandy ground underneath. However, many things can hinder this drainage process such as the makeup of the land, which is mostly sand.

With the generally windy environment that Monwabisi Park is located in, the sand collects in the retaining rings. This buildup defeats the purpose of the 19mm stone as it fills in the pores that facilitate water flow into the ground beneath. When the sand and gravel mix they create an impermeable layer in the retainer and any leak or water waste that occurs from above collects and does not drain anywhere. After time, this water accumulates and becomes a standing pool, which is the perfect medium for breeding disease and flies. Overtime the constant overflow, associated with poor drainage and water buildup, erodes a layer of the surrounding land and can cause expensive damage especially when the tap is situated in close proximity to a road. Each winter the potholes in the roads due to this erosion need to be filled either by the labor of the community or at the expense of the city.

Further aggravating the erosion problem is the improper disposal of laundry wastewater into the roads. With nowhere to drain and dispose of water, and without knowledge of proper grey water recycling, it is a common practice for used laundry water to be thrown into the roads. Coupled with blockages in the road drains along Mew Way, erosion proves to be a hazard to local drivers.

In multiple instances, the residents have attempted to implement their own techniques to facilitate drainage in order to prevent standing water in the cement rings. Holes have been punched in the side of the container and entire portions have been broken away to allow for water to drain in a certain direction. However such implementations only serve to direct the water in a different direction, causing erosion along the path the flow follows. In these streams it is common that residents will dispense of food in the water further making the water a dangerous breeding ground for health concerns. Along with the bacterium that is present because of such practices, the food attracts flies, notably malaria carrying mosquitoes, and creates a foul odor.

Improper disposal of wastewater often causes extensive erosion problems

Standing Water Due to Overflow

Resident Made Drainage Hole

THEFT AND VANDALISM

Theft and destruction of standpipe components is a major concern that greatly affects the availability of water. Having numerous components such as faucets, piping, drainage devices, and others, many complications can arise that would hinder the taps' ultimate functionality.

Of the originally installed 27 water taps in C Section, only 7 remain fully functional. These seven still have both faucets with handles and all pipe elements still in place. The other 20 taps have various problems like missing handles or piping/faucets.

When piping is missing, the tap must be shut off immediately to prevent water being wasted. As this is not always possible and the breakages are not always reported in time, leaks are common.

Another problem is the disappearance of handles used to toggle the faucets open or closed. When these go missing, it is necessary for residents to find other means of opening the nozzles. Pliers are used to open the faucets or a special handle is made by residents with materials on site, such as wire coat hangers.

A reason explaining the frequency of missing piping and handles is that metal can be resold for money. When residents thieve the parts, the tap is no longer fully functioning and often will leak until the side is either plugged or the entire tap is shut off. For multiple cases where the entire upper assembly was missing, a concrete stopper was casted on top and the structure becomes hardly recognizable as a water tap.

An example of a tap with a broken pipe and a missing handle. Residents have to use pliers or a makeshift wire device when handles go missing

C-Section	Number
Taps originally installed:	27
Taps Missing Handles (1 or 2):	8
Taps Missing Piping/Nozzle:	14
Taps With Constant Visible Leaks:	3
Taps Completely Non-functioning:	11
Taps Fully Functional:	7

Results of vandalism, theft, and misuse in Monwabisi

A homemade handle on a tap

LEAKS

Further aggravating the water waste problem is the prevalence of leaks in the individual tap faucets and in the underground lines diverting water from the main line to the standpipes throughout the settlement. External leaks can be easily seen and fixed with minimal effort and knowledge. However, when leaks occur in the tubing and main line, the methods of finding the problem areas and fixing them can be extremely expensive and labor intensive. Private contractors and city workers are needed for such repairs. The symptoms of an underground leak are notably more difficult to recognize as the biggest indicator of a problem is the presence of standing water on the ground. Such a collection can also be caused by underground aquifers, the high water table under Monwabisi Park, rain accumulating, improper wastewater disposal and a number of other reasons. Underground leaks lessen the water pressure of the entire water system in the park and can resultantly reduce the effectiveness of taps. The aged and cracked underground piping is a notable cause of wasted water within the community, costing both money and marring system reliability.

The conditions of faucets deteriorate over time and with prolonged usage tend to leak and break without regular maintenance.

WATER WASTE

In South Africa, as well as in many parts of both the developed and undeveloped world, there is a serious problem with shortages in the water supply. As a result it is of paramount interest that water is not wasted and that every drop is used to its fullest extent.

The main reason for squandered water is the residents themselves. Since there is little regulation to the amount of water that a person can use, there is a little incentive for people to recycle water or use it sparingly. Often taps are left open and water is allowed to continually pour out onto the ground, harming both the water system and causing problems such as erosion and standing water.

"The City of Cape Town has committed itself to a comprehensive and sustainable Water Conservation and Water Demand Management Strategy that has been revised and intensified during 2005." [k]

Though it is known that water waste is a major concern in the informal settlements around South Africa there is little in the way of statistics proving how much is actually wasted. At each water tap there is a flow meter that records usage data, although they are not integrated into a system to record data for the whole region. To determine how much water has been used at a tap the inline meters need to be checked by hand and data can be thus hand recorded. However, since these gauges are seldom, if ever, checked there is currently no data as to the usage of each tap. There are also future plans to install mass flow meters into the mainline to determine the net water flow into Monwabisi and other informal settlements, but no devices exist as of yet. By installing and checking meters on the mainline and individual taps, water waste can be better monitored and observed.

Wasted water flowing down a street causing erosion and creating stagnant pools.

Individual tap water meters are buried next to each tap. Gauges are seldom checked and tap usage is generally unknown

As an initial step the city has made an effort to eliminate this waste by installing a pressure release valve system into its pump stations. When taps are not opened the system can sense that there is a high amount of pressure in the pipes leading to the settlement because none of the taps are using the water. Therefore, the pump station will pump less water to regulate its pressure. On the other hand, the pump can provide more water when the water pressure in the system is low, usually during the day. Also, the station decreases the amount of water that it provides at night since very few people access water at night. This is essential in limiting the amount of wasted water because many of the water lines in the informal settlements leak. Decreasing the amount of pressure in the system decreases the amount of water that is forced through the cracks in the water pipes, thus saving water.

Water conservation projects will prove to be an integral part of the sustainability movement that is sweeping Cape Town. The Integrated Water Leaks Repair Project that recently took place in the Mfulen area was a training program to teach locals about the importance of saving and conserving water. Also part of the program was teaching residents how to repair basic leaks on their own to better the conditions of the local taps and water stations. (see appendix).

Water waste and associated problems are common throughout South Africa as evidenced by this leaking toilet in a settlement outside of Khayelitsha

Even on the taps in arguably better condition, issues with leakage and waste are still prevalent and troublesome

Possible Water Options

Foot Pedal Taps

The taps in Monwabisi Park are operated by handles that control valves to turn the water on and off. As discussed earlier, the taps break easily and are vehicles for the spread of germs. In order to improve the method of water access and prevent damage, a foot pedal operated tap with an elevated concrete stand for buckets would be a better solution. The pedal would prevent people from twisting off the handles and eliminate the possibility of turning the taps on indefinitely by installing a spring mechanism that would shut the water off as soon as a person's foot was lifted off the pedal. The concrete stand would prevent people from hanging the heavy water containers on the nozzles of the taps and reduce breakage.

Installing such a tap system would increase the sanitary level in the surrounding area and reduce vandalism.

Pros	Cons
Reduced need to touch taps with hands	Bare feet can spread disease
Reduced likelihood of taps left running	Pedal can be depressed with a rock to keep running
Provides a stand to place heavy buckets	

Hand Washing Stations

Another important hygienic practice that must occur in Monwabisi Park is hand washing. However, the availability of a convenient hand washing area is nonexistent. The implementation of a soap station at every toilet facility is one way to encourage better hygienic practices. Rainwater collection tanks can provide water to the sinks. Soap dispensers installed by the city would need to be replaced periodically.

Pros	Cons
Hand washing after toilet use reduces spread of germs and disease	Many have no concept of hygiene and will not use, even if available
Encourages good hygiene	Must come with public health education
Vicinity to toilets makes it easy for the people to use	Maintenance of soap dispensers

An existing (but broken) sink available for washing on the side of a pour/flush group

Rainwater Collection Tank

The availability of water in Cape Town is dependent on the amount of rain that is gathered in the reservoirs during the winter months. In the case of a dry winter, the availability of water for the entire city is limited and can be scarce in informal settlements. Thus, rainwater collection tanks are a good way to supplement the municipal water supply. Tanks can be installed to the sides of buildings or in open areas. It would be more beneficial for Monwabisi Park to have tanks connected to house gutters, due to spatial limitations. These tanks can be used to supply non-potable water for laundry and toilets.

A Water Collection Tank in a Local Settlement

Pros	Cons
Gather and store clean water	Dependent on rain
Collected water can be used in various ways	If elevated, a stable foundation must be made
Tanks can be painted black for solar heating of water	All water in that tank would be warmed, no cool water

Fire Hydrants

One of the most troublesome aspects of water supply is installing fire hydrants. In informal settlements, fires are common and hydrants essential. Often times they are built but cannot be marked clearly. When hydrants are marked by wooden or steel poles, people steal the materials to either burn, resell, or build onto their homes. In the event of a fire, the fire brigade is unable to locate the hydrants and must put out the fire by alternative means. Thus, they must be clearly marked and distributed throughout the settlement. It may be useful to have the electricity poles located near these hydrants with street lights that aim down to the hydrants location. A special marker could be put on top of the pole to distinguish between poles located near fire hydrants and those that are not.

Another issue with the fire hydrants is that people cut the lightweight tubing that brings water to the area and reroute it with splitters. This decreases the water pressure that the hydrant can provide and renders it useless in fighting a fire. In this case, garden hoses are attached to taps to attempt to put out fires.[3]

Pros	Cons
Provide stronger water pressure to put out fires	Locations unclear because they need markings

Fire Hydrant in C Section

Types and Conditions of Toilets

On the map, each group of ten municipal pour-flush toilets is denoted by two rows of five circles and are mapped in relation to where the toilets are located. Purple denotes a self made pit latrine constructed by the residents. In general, the pit latrines are one of the most dangerous sanitation types to use. They are improperly ventilated and attract pests and insects that promote the spread of disease.

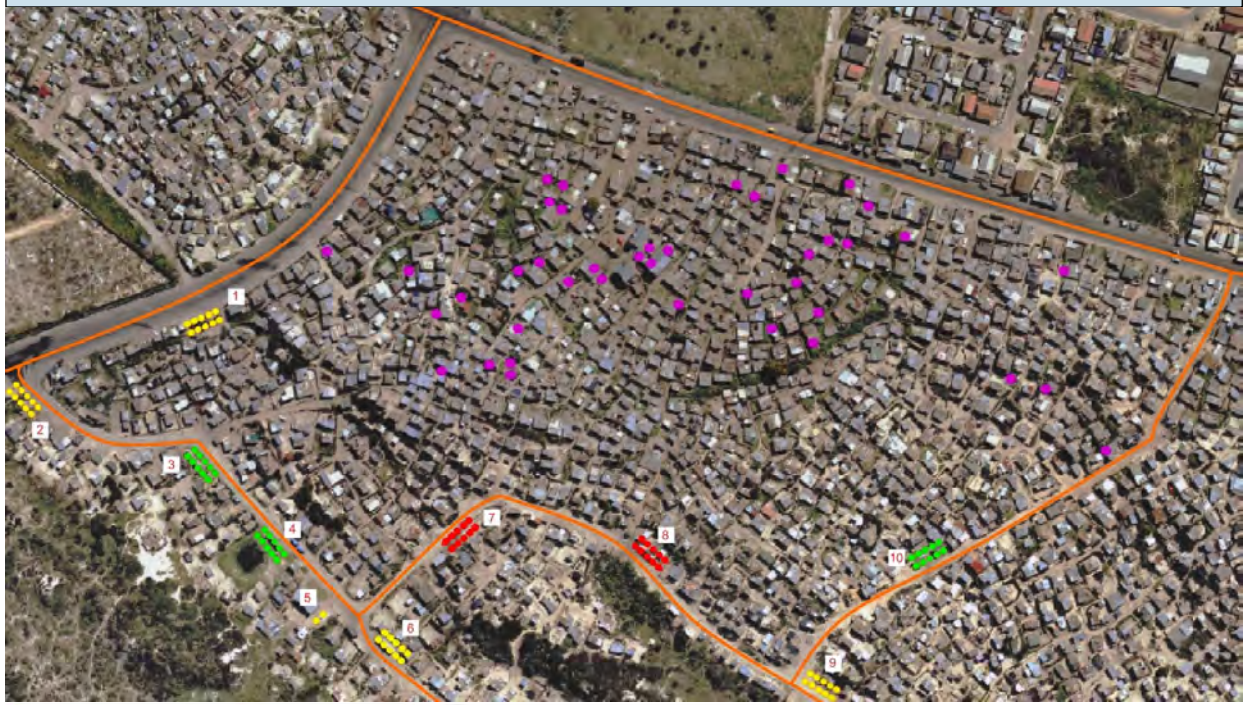
Determining which category a toilet group falls into is based on numerous factors that detract or add to its rating. Aspects such as number of locked stalls, number of broken locks, amount of vandalism or theft, and number of blockages and clogs are all taken into account and the pods are thusly judged.[4]

Toilet Placement Findings

Unlike the taps where there is a definite pattern in the condition of the devices, there is little in the way of trends for the pour/flush toilet systems. All are located on the sides of roads and each are maintained by the city. The 8 green and yellow pods are spread along the dirt roads with no pattern apparent in their conditions and locations. However, both toilet clusters that fall under the red category are located next to each other and are in close proximity to a section of C2 where living conditions are generally poorer (e.g., residents are upset at the lack of formal electricity provision).

Sanitation Services

The City of Cape Town is hard at work maintaining facilities in informal settlements and searching for new options to improve conditions. The number of people to service and the area in which this provisioning must be done presents a daunting task.

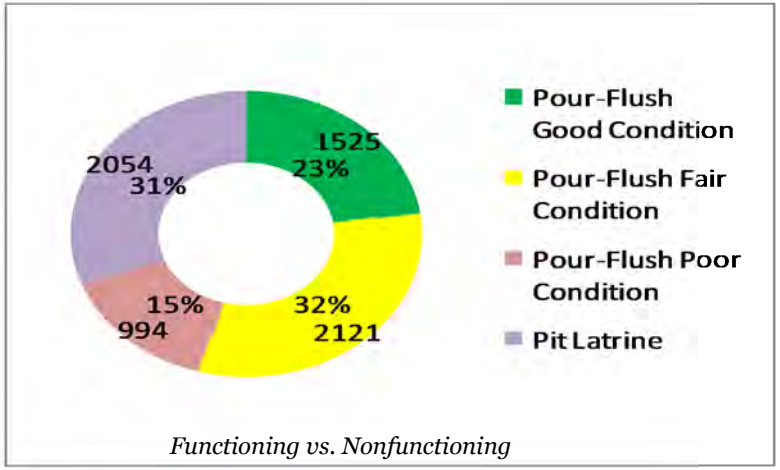


Toilets in Good Condition

Toilets in Fair Condition

Toilets in Bad Condition

Pit Latrines



Functioning vs. Nonfunctioning

Macro level trends are apparent with the placement of the pit latrines within Monwabisi. Since the city installed pour/flush latrines along the roads, the nearest toilets for the interior residents are a sizeable distance away. This along with the dangers of using public facilities at night influence many residents to build their own pit latrines in their backyards. From the map, it is obvious that this is the case as there are very few homemade latrines near the pour/flush systems. Most are located close to Mew Way and the Indlovu Center where there are no formal bathrooms available.

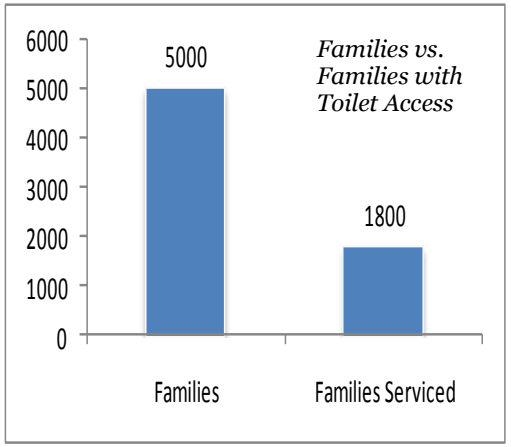
A systematic approach was followed when installing these toilets. The underground conservancy tanks that store the human waste must be emptied periodically and in order to do so, large pumping vehicles must be allowed to park in close proximity to the access ports. The easiest and most efficient means of allowing maintenance is to build the structures along a main road, as has been done in Monwabisi Park. However the high volume of people using these main roads also causes problems for the upkeep and quality of the toilets. As they are semi-private facilities, with five families having access to a locked stall.

Attempts to Facilitate Sewerage

Initial attempts to accommodate the installation of toilets were met by high installation and maintenance costs. Efforts are being made to bring sanitation systems in Monwabisi Park up to higher standards, but traditional flush systems are impractical.

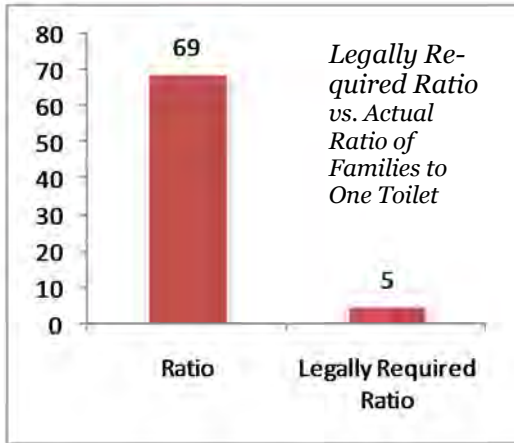
Current Systems in Monwabisi Park

A road follows the circumference of the park permitting the installation of 92 pour flush toilets. These toilets are separated into divisions of ten units per septic tank which makes a total of ten toilet clusters that are spaced roughly 400 meters apart. These tanks are constructed with a baffle in the center and a series of parallel pipes that allows the liquid waste to separate from the solid waste in separate chambers.



Families vs. Families with Toilet Access

The purpose of this is to enable separate pumping cycles to remove the waste. Liquid is much cheaper to remove from the tank than solids, and the amount of liquids greatly exceeds the amount of feces. Thus, the liquid partition is pumped more frequently. The end result is a system that is emptied into a service container truck once every two months for a total of 260 kL. The price of disposing of this material is R75.00/kL for a total of R9 750/month. In the course of one year, it costs R117 000 to drain the sewage in Monwabisi Park's C Section excluding maintenance and upkeep.[1]

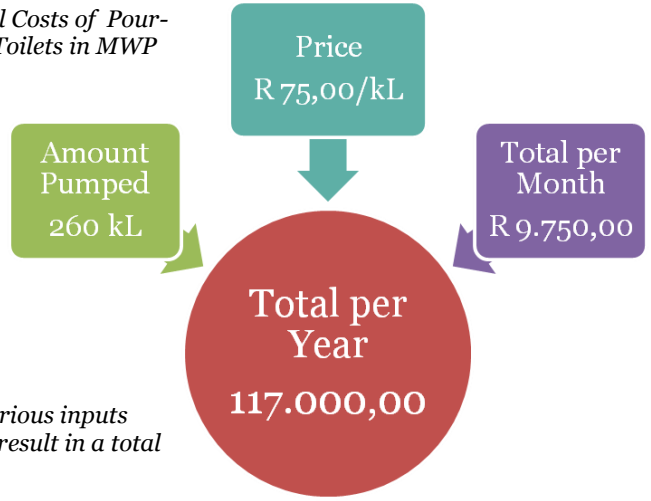


Legally Required Ratio vs. Actual Ratio of Families to One Toilet

The benefits of having these pour flush toilets include easy operation, little to no user maintenance since the city provides for maintenance of these systems via private contractors, and easily accessible installation areas near the roadside. Since the operation of these toilets requires a water to flush, they are built next to standpipes for users to fill a bucket to pour into the system. Though, only eight of the ten standpipes next to the toilets are working. Only feces should be flushed, thus saving an additional amount of water.

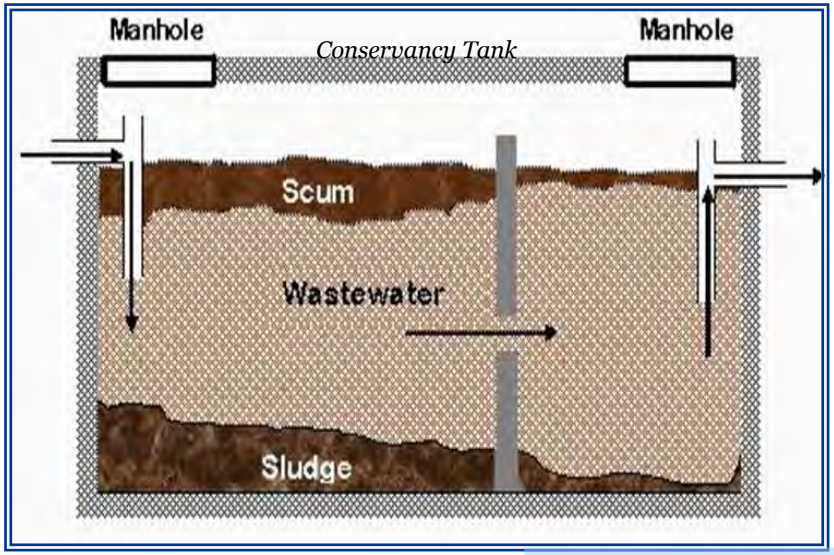
The way the toilets are partitioned to the community is through a lock being fastened to the door of each unit with five keys that are distributed to different families near the toilet. This ensures the 1:5 ratios of toilets to people in the area. However, since these toilets are located in public areas, a passerby sometimes breaks the lock off of the door to use the facility. When this happens, many people use the toilet before the family can acquire a new lock and their toilet is clogged or destroyed. It often takes the contractors weeks to service a facility after a complaint is filed in which time the family must resort to other methods of waste disposal such as buckets or pit latrines.

Annual Costs of Pour-Flush Toilets in MWP



The various inputs above result in a total in red.

A key issue in the area is that there is a lack of proper toilet paper. People use newspapers, ads, paper bags, and other such objects to clean themselves. This should place a big restriction on what types of toilet facilities can be used to prevent clogging drains and system failures. If a new type of disposal system were to be introduced, widespread education must be conducted to prevent people from misusing and breaking more delicate systems.[3]



Private Toilets

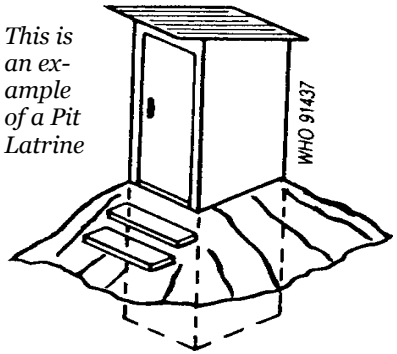
The City of Cape Town can not install a toilet for every family as of yet. Due to this limited amount of facilities, some local residents have built their own toilets. These self constructed facilities are convenient to their owners, but are hazardous to them and their environment.

PIT LATRINES

One such method of alternative waste disposal is a pit latrine. In this system, a hole is dug two to three meters into the ground. A box is then constructed around this pit with a hole cut into the top. A small structure is then built around this site to facilitate privacy. A system like this one is easily made, but leaves a negative impact on the environment. The water table in Monwabisi Park is high and there is an aquifer that runs beneath the settlement. When a pit latrine is built, human waste seeps directly into the water table which contaminates the ground water.

Also, flies are abundant and users are directly exposed to pathogens beneath the system. Once the pit is filled, it is covered with sand and the structure is moved to a clean plot. Waste is left beneath the ground and prevents future building in the area unless the ground is cleaned out [i]. However, those who own these pit latrines are extremely proud of having their own facility to use and keep private. Users usually keep their toilets well maintained and as clean as possible, indicating the strong desire that families in Monwabisi Park want a 1:1 toilet to house ratio.

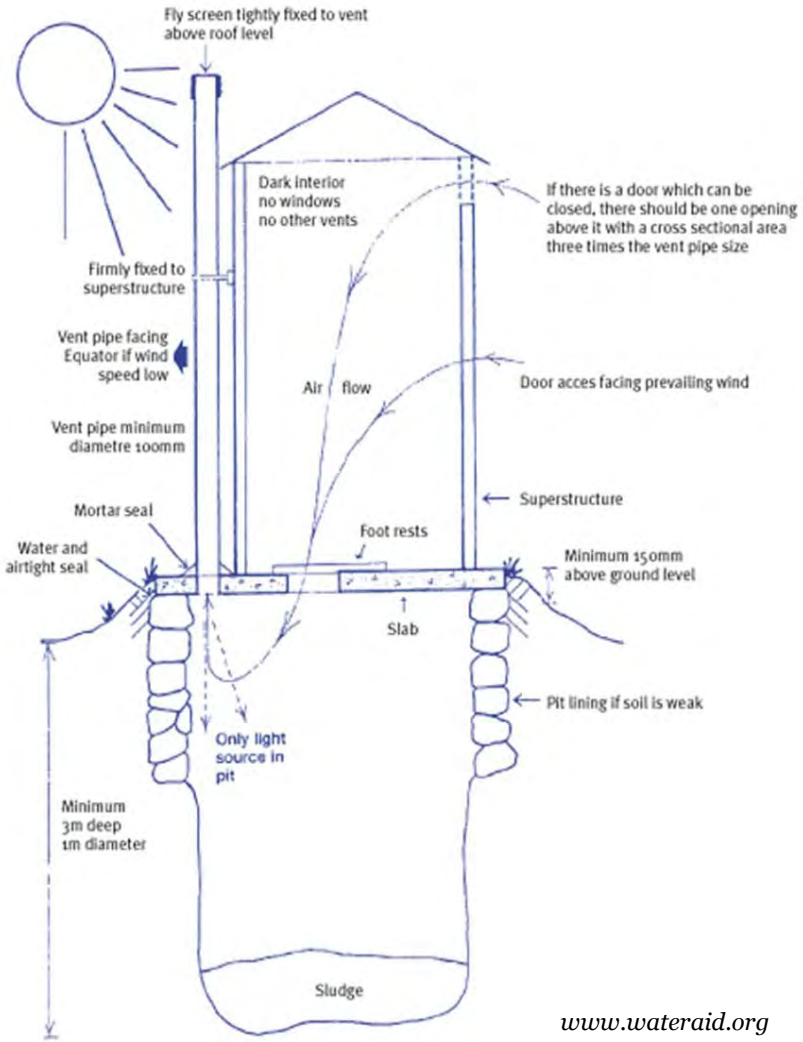
It is apparent that all city installed toilets are located on the roads that traverse the inside of the park. Conversely, all self-dug pit latrines are located far from the city systems on the corner of Mew Way and Steve Biko Road. Thus, it can be concluded that if facilities were installed by the intersection of Mew Way and Steve Biko road, it would lessen the amount of pit latrines in that area. In turn, the amount of flies would decrease and the amount of groundwater contamination would drop.



This is an example of a Pit Latrine

www.lboro.ac.uk

This is one example of a pit latrine found in Monwabisi Park's C Section. It was constructed out of found scraps such as plywood, sticks, and old board slats. The roof is constructed of corrugated metal and provides little resistance to rain. Sandbags are placed around the structure as a foundation and help to keep the system insulated. The edifice surrounding the structure is not very well sealed and allows rainfall to enter, thus filling the pit with sludge that takes a considerable amount of time to evaporate. While the pit is moist it attracts the most flies and has the greatest risk for users. It is at this time when the soil is filled with water that most groundwater contamination happens as well. These toilet systems are therefore hazardous to environment and humans. Most pit latrines constructed looked similar to the one analyzed and share the same problems.



www.wateraid.org

Above is an example of a properly constructed pit latrine. The base is constructed using a stone lining and a cement slab as a foundation to prevent the building from collapsing into the pit. The building on top is made with the entrance facing the direction of prevailing winds to help push air into the pit to aid in ventilation. A pipe is built on the opposite side of the building to help draw air out of the pit and into the environment in a safe way for humans. Screens and seals are applied to all cracks and openings in the building to deter pests and flies.

Traditional Sewage Systems: Poorly Suited to MWP

Traditional sewage networks will not work in Monwabisi Park due to its geographical properties. Monwabisi is located in a topographical low spot which interferes with gravitational fed water systems to surrounding areas. It is possible to feed water in through sewage pipes and water lines, but it is impossible to drain it out without a vacuum station.

Problems with Gravitational Water Systems in Monwabisi Park

One of the most difficult aspects that arise from providing toilets to the informal settlements is that one solution will not work in every area. The most popular type of toilet is a full flushing toilet. This type of facility must be connected to the city's sewage system. However, Monwabisi Park is a very low-lying area where waste cannot be drained out by gravity to the local sanitation stations. Thus, a network of vacuum stations must be installed to suck the wastes away from the area. These vacuum stations are extremely expensive to install, maintain, and operate.

In a vacuum station, pumps are alternated as the lead pump to promote even wear to the system. The others pumps are used as lag pumps. When one pump cannot keep enough vacuum on the system during intense loading times, other pumps activate to provide additional suction. However, this usually only happens when something in the system is malfunctioning. An example of this could be a stuck valve or a cracked pipe. This type of failure is something to pay special attention to in a place such as Monwabisi. As people make illegal modifications to the system or vandalize toilets, it could cause leakages in the pipes. A result of this would be extra pumps activating unnecessarily. Additional wear would be inflicted on the pumps causing high maintenance costs. Operational costs would skyrocket and the entire system's expenses would exceed expectations.

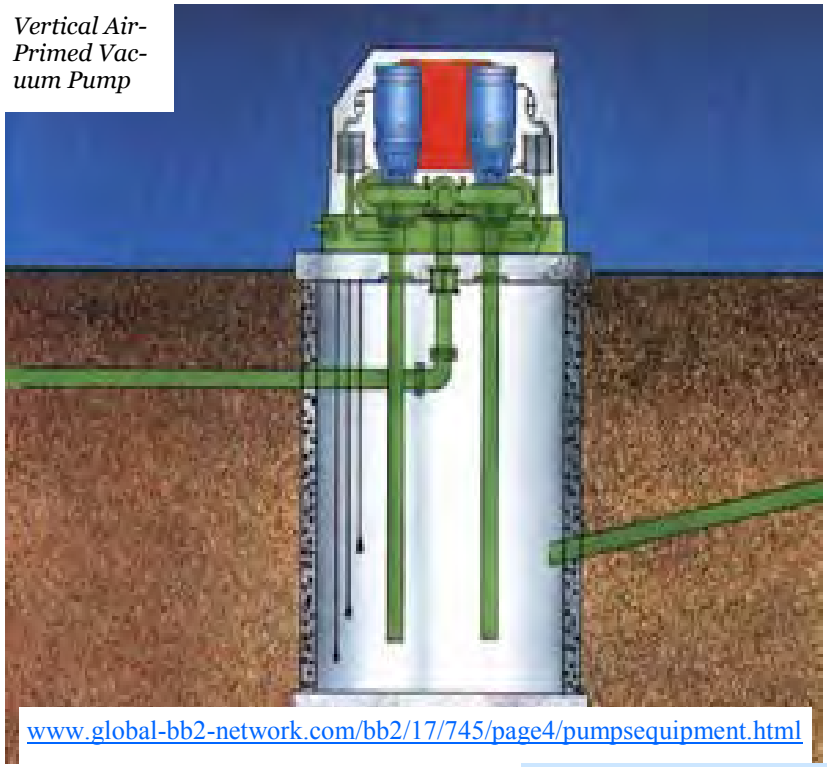
Vacuum Station

http://www.co.chautauqua.ny.us/sewer/stationtour3.htm

The way the system works is by vacuum pumps evacuating air in the lines causing a vacuum, also called a negative air pressure. A common misconception to this is that vacuum sewers suck out sewage by directly drawing on solid matter. Instead, vacuum sewers operate on a pressure differential within sewer lines. A higher air pressure on one side of the sewage wants to equalize with the lower negative air pressure on the other side. In turn, the air moves uphill through a network of pipes and ends up pushing sewage out of its way. Sewage, even in a vacuum sewer line, still flows using gravity. The air just moves it from high pressures. The vacuum pumps do not actually suck any sewage and would be damaged if they did. Pumps only remove air in the sewer lines to keep a negative pressure on the system. For the Vertical Air-Primed Vacuum Pump, there must be between 16 and 20 inches of mercury vacuum to facilitate normal operating conditions [r].

Another simple problem with this solution is that a full flush toilet cannot be installed in every individual's home. The amount of piping and excavation required to do this would amount to astronomical costs. Thus, the system would have to be installed under the assumption that multiple families would be willing to share these toilets at a communal facility. There is evidence in several areas where this has been done that the facilities have been mistreated and vandalized, creating an area that is both hazardous and dangerous. Therefore, many different alternative systems must be considered for Monwabisi Park.

Vertical Air-Primed Vacuum Pump



www.global-bb2-network.com/bb2/17/745/page4/pumpsequipment.html

Possible Toilet Options

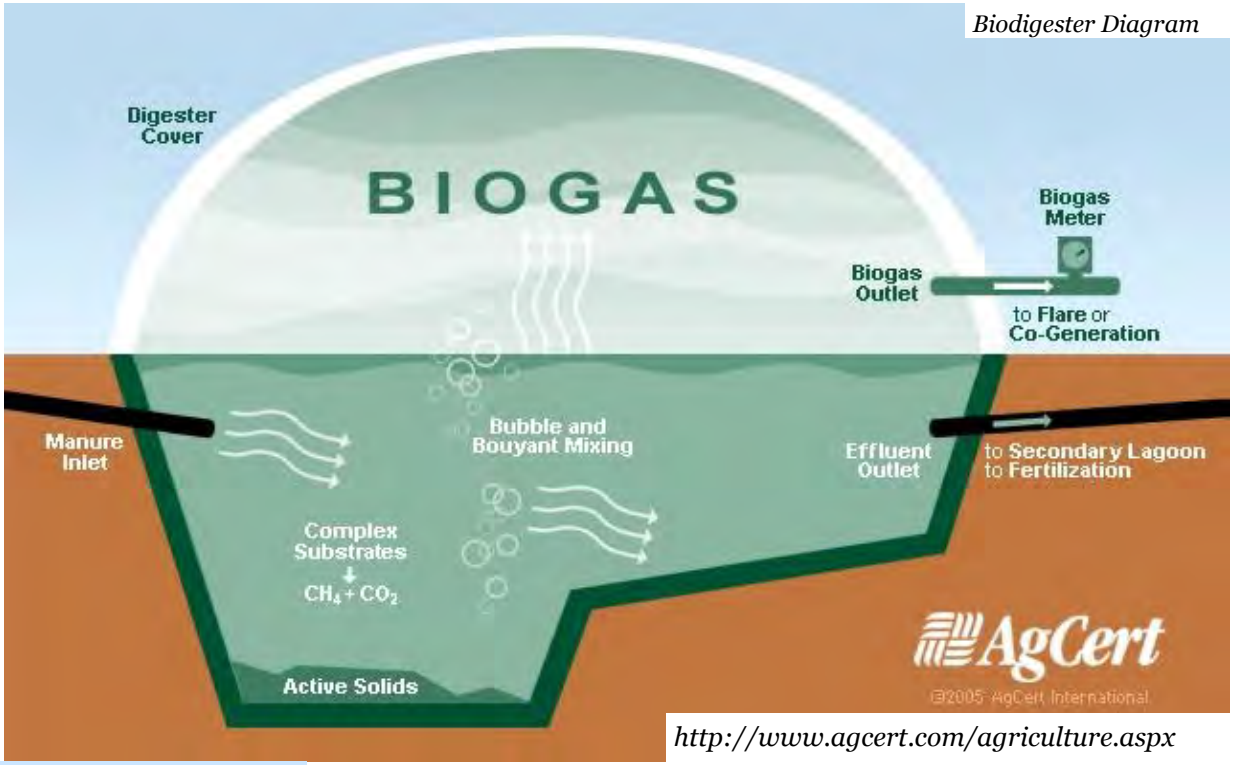
Different toilet options must be explored in light of issues that arise in Monwabisi Park. No one system with solve every sanitation need in every area. Thus, an open mind must be kept when choosing appropriate toilets for different areas.

BIODIGESTER

The biodigester is a methane producing, water filtration system. If it were implemented in Monwabisi Park, then it would be connected to a toilet, so that the waste could enter the biodigester. The biodigester is a pressurized system that can destroy pathogens on site. The built up pressure is released in the form of methane gas, which can power a stove for cooking. The effluent is water that can be used for irrigation.

In Monwabisi Park, the biodigester must be utilized in a communal facility because a system for each household would be too expensive. After speaking with the community, it was determined that a communal water facility is acceptable, but a communal kitchen is not. Therefore, the methane would need to be used alternatively. The biodigesters range in cost from simple ones that are R3000 to more complicated ones costing upward of R50,000. Human waste is usually not enough to produce methane from the biodigester. Organic material should also be added such as grass clippings or table scraps to ensure proper functioning of the system.

This system would be excellent in Monwabisi Park if it were not for the lack of pig manure and table scraps. It appears that this type of system is more suited for a rural area such as a farm where such wastes can be utilized. Maintaining the system to ensure that it functions properly is also fairly complicated and adds to the difficulty of success.



Biodigester Diagram

http://www.agcert.com/agriculture.aspx

Functioning Biodigester in Costa Rica

http://www.ruralcostarica.com/biogas.html

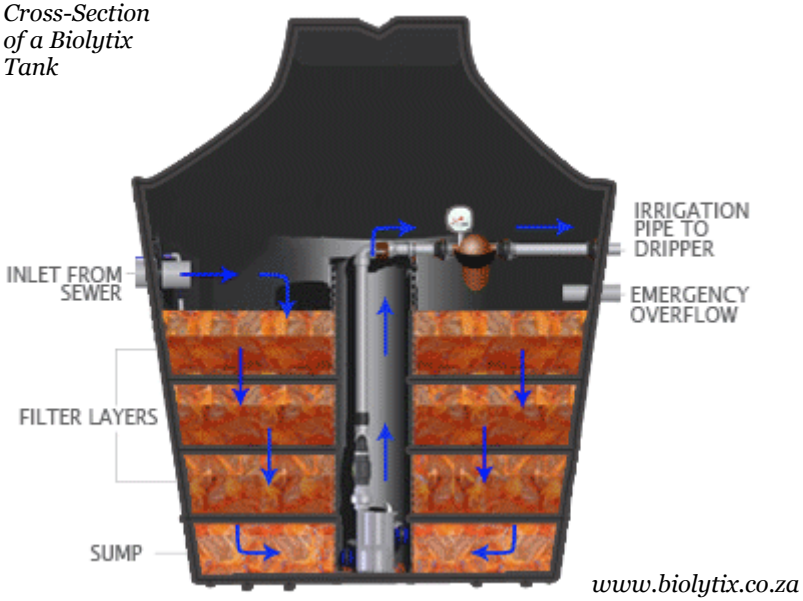
Pros	Cons
On site waste disposal	Not guaranteed to destroy pathogens 100%
Methane production	Cannot be used in a communal facility because people unwilling to share kitchens
Produce fertilizer	Human waste has few nutrients. Need pig/chicken manure
Recycled water	Requires area for leech field

BIOLYTIX

Biolytix filters use natural processes to digest human waste and recycle water. The filter contains multiple layers of earthworms, microorganisms, and tiny porous holes. The filter will most likely be connected to flushing or pour flush toilets while a sump pump is used to pump the material into the filter. The solids and liquids are then separated by the layers where solid waste is converted to compost and liquid is pumped out as effluent. The effluent requires a leech field or garden to empty its effluent byproduct. The filters kill 85% of pathogens that may be in the waste [f]. The remainder is naturally destroyed by plant life absorbing the liquids. The maintenance requirements are only maintenance on the pumps every few years. Overall, this is a self sustaining system.

In Monwabisi Park, the biolytix filter can be very beneficial, especially near gardens. The disposal of waste on site and the lack of user maintenance are two reasons why the biolytix filter is a good option. The implementation cost is high, but the maintenance is nearly nonexistent. This system could be installed deep in the center of the settlement because there is no need for trucks to operate on the system. Excavation would be required and a leech field would be necessary to drain the effluent. Thus, a few houses might need to be relocated to accommodate the installation, but the benefits would be very high.[8]

Cross-Section of a Biolytix Tank



www.biolytix.co.za

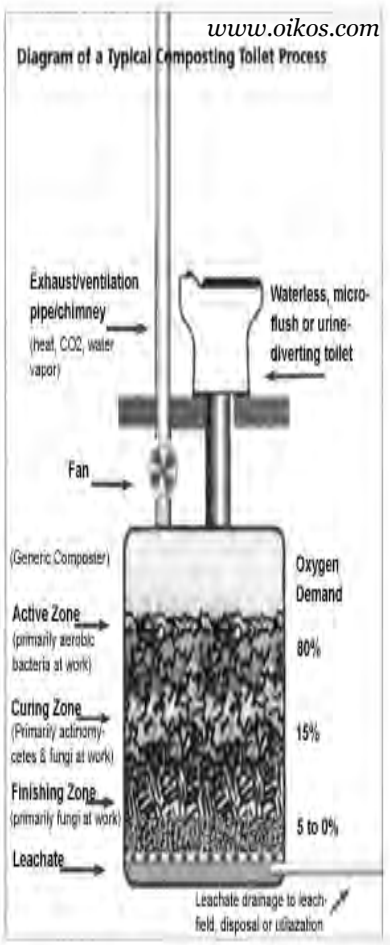
Pros	Cons
On site waste disposal	Spatial requirements
Produces fertilizer	High initial cost
Recycled water	
Minimal maintenance	

COMPOSTING TOILET

Composting toilets turn human feces into fertilizer that can be used in gardens. The composting design uses a sealed tank to store excretory matter to be later removed. The main appeal of the composting toilet is that the storage vaults are closed to the outer environment so air cannot escape or enter. This allows for the anaerobic decomposition of feces. One downfall of this type of process is that moisture must be kept at a minimum for efficient composting, so liquid waste should be collected separately and disposed of elsewhere. As this is not always possible, a drainage pit can be built underneath to seep liquids from the solids. Organic material must be added to compost to produce more nutrients. The basin that gathers the waste must be cleaned every 5 weeks and placed into a closed container. After one year, the compost is safe to use in the garden [h]. The system requires a significant amount of user maintenance in order to be successful.

The installation cost of dry sanitation is R6,800 per toilet per annum which is high in comparison to most other toilet options. The maintenance costs for the city is R72/year. The composting toilets are a good option for sustainability because of the extremely low maintenance costs [n].

For Monwabisi Park, the compost toilet can provide a 1:1 ratio of toilets per family. However, once they are installed in a 1:1 ratio, the city cannot take responsibility for the maintenance. The family using the toilet will need to maintain cleanliness and proper functionality. The toilets can be installed on individual properties or as a communal facility, maintaining the 1:1 ratio.



Pros	Cons
Produces compost	User must handle/clean waste
Individual rather than communal	Urine and feces must be separate
Low maintenance cost	Organic materials must be added
	Frequent user maintenance
	High installation cost

URINE DIVERGENT TOILET

Urine divergent toilets are a form of dry sanitation. The toilet separates urine from feces, proceeding to decompose both separately. A typical urine divergent toilet will have one compartment for urine and another for feces. The user must be conscientious about the different compartments. The urine and fecal composts should be ready for distribution in a garden after one year of decomposing.

The urine divergent toilets are similar in installation and maintenance costs to the conventional dry sanitation. Although the installation costs are high, the maintenance costs are low, which will save money over time. The urine divergent toilet can be used in the same way as the conventional dry sanitation option in Monwabisi Park. The maintenance is dependent on the user and the 1:1 ratio can be individual or communal.[6]

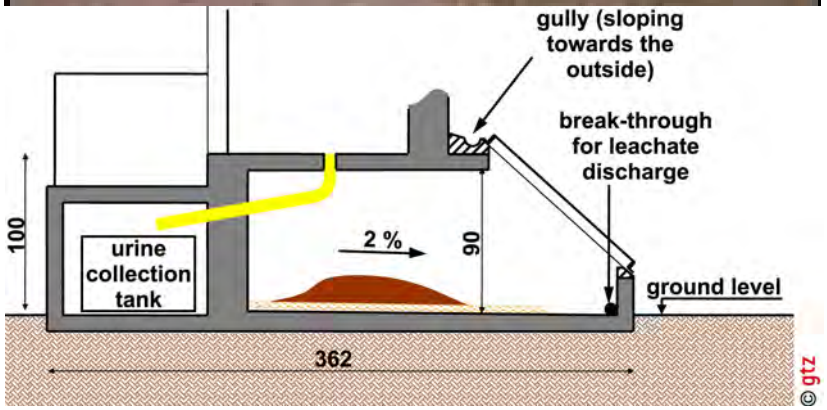
Urine Divergent Toilets

AFRISAN TOILET

The Afrisan toilet is a urine divergent toilet where the urine is removed from the system by solar powered evaporation technology. The feces can be decomposed alone. The base must be scraped every 5 weeks and placed into a closed container for composting. The difference is that the urine is completely removed from the system, and cannot provide composted urine.

The Afrisan toilet costs R3,900 per toilet to install. The maintenance and cleaning costs are R120. The Afrisan toilet is a better option than conventional dry sanitation because the cost is much lower.

The Afrisan toilet can be used similarly to the other dry sanitation options. It can be implemented for individuals or communally in the 1:1 toilet to family ratio. There is an emphasis on personal maintenance because organic materials must be added frequently and the lower bin must be raked every 5 weeks [n].



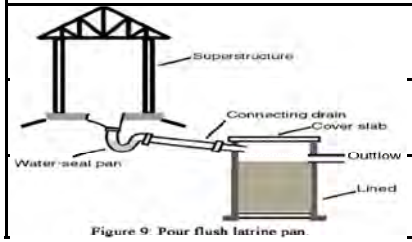
Pros	Cons
Produces compost	User must handle/clean waste
Individual rather than communal	May be difficult for children to use
low maintenance cost	Organic materials must be added
	Frequent user maintenance

Pros	Cons
Produces compost	User must handle/clean waste
Can be individual rather than communal	No urine compost
More user friendly than typical urine divergent toilets	Organic materials must be added
	Frequent user maintenance
	Dependent on solar power

POUR/FLUSH TOILET

The pour flush toilets are currently the most common in Monwabisi Park. They require a septic tank and a water supply. A superstructure is constructed over an excavated ditch into which excreted matter is deposited. Unlike simple pit latrines where the seat is directly above the storage area, in a pour/flush system, there is a pipe leading from the seat to the pit with a water seal in the middle to prevent the backflow of air. The water seal acts like a trap in a common household sink. After defecation, the pan on top of which the user sits can be cleaned by pouring/throwing water on it to progress the matter through the seal and into the pit below. By having a constant seal of water, air cannot escape from the pit into the structure. Without a foul odor to attract them, and lacking an open route to the feces, flies and mosquitoes will not be a concern around pour/flush latrines [i]. An added advantage is that any water, clean or dirty, can be used to clean the pan. This flexibility allows the latrines to be used as a convenient site to deposit wastewater from the surrounding community. The toilets must be placed near the roads because trucks need adequate passage into the settlement to pump out the conservancy tank once every two months. The toilet to family ratio is 1:5.

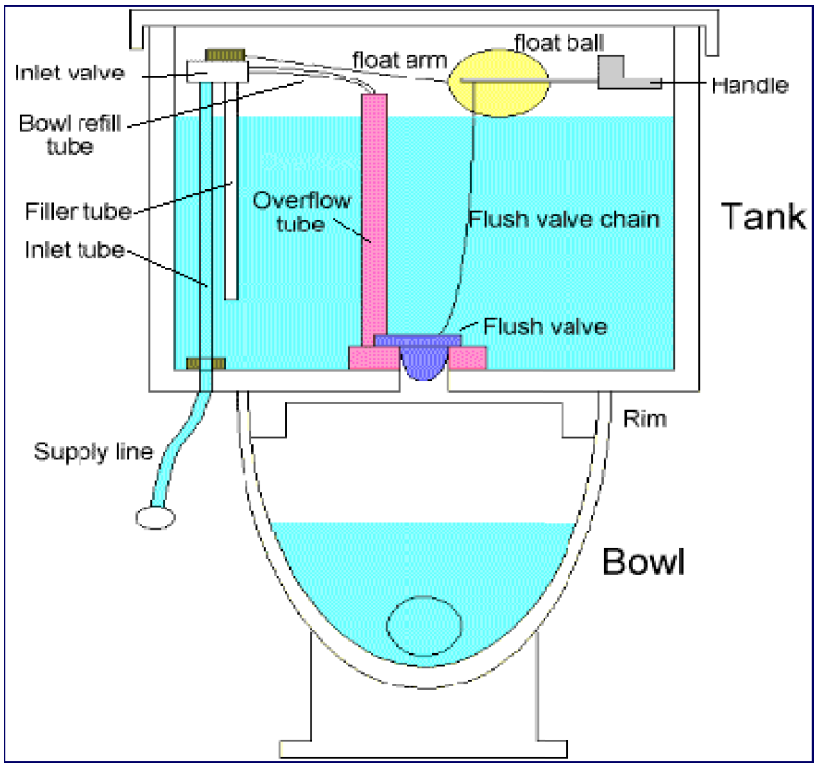
The cost of installing the conservancy tanks for the city is R8500 per toilet per annum, which is the most expensive facility. The cost of maintenance of the conservancy tanks is R1176, which is a moderate price. In Monwabisi Park the pour flush toilets can be used as a communal facility. However, the pour flush toilets connected to the conservancy tanks are very expensive and the ideal ratio based on city policies is 1:5. However, for a more sustainable system, the pour flush toilets can be used in connection with a biolytix filter or a biodigester to significantly reduce maintenance costs. By combining systems, the waste can be disposed on site and there will be no maintenance for the users. By using recycled water from rainwater tanks, the cost of water consumption will be reduced.

Pros	Cons
Flushing toilet preferred by community	Easily broken/vandalized
Minimal user maintenance	Water not recycled
 Figure 9: Pour flush latrine pan	Expensive city maintenance
	Implementation expensive
	Many must travel distance to use

FULL FLUSH TOILET

Full flushing toilets are connected to a municipal water supply and the waste is deposited into a septic tank. After someone uses the toilet, they only need to flush the contents. There is minimal user maintenance, other than basic hygiene, and the city is responsible for maintenance. In the informal settlements they are mostly used as communal facilities. In some cases a 1:1 ratio is achieved. However, the toilets can not be located inside the shacks due to infrastructural constraints, forcing them to be arranged in a row near sewer lines.

The installation cost for full flushing toilets is R5200 and the maintenance cost is R72.83 per toilet per year, not counting the cost of the sewer pipes and the added cost at the treatment plant. The reason that the flushing toilets are much cheaper than the pour flush toilets is because the conservancy tanks need to be pumped periodically, while the flushing toilets connect to sewage lines. The flushing toilets also have the potential to connect to a biodigester or biolytix filter to destroy pathogens on site. Recycled water could be used to flush the toilets if there was a type of tank above the toilets that used rainwater to flush the toilets.

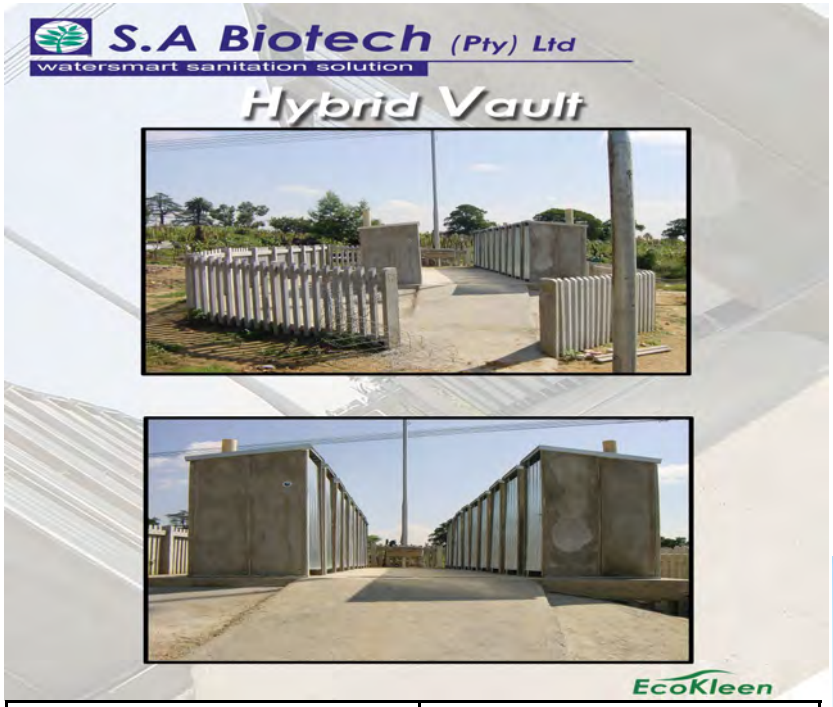


Pros	Cons
Flushing toilet preferred by community	Easily broken/vandalized
Minimal user maintenance	Clean municipal water used and not recycled
	Expensive city maintenance
	Implementation expensive
	Many must travel distance to use
	Many moving parts

HYBRID TOILET SYSTEM

The hybrid toilet system is a fairly new concept that uses displacement technologies coupled with micro-organisms to break down waste. The hybrid system can include multiple toilets connected to a water filled tank. The tank is initially filled with water, but does not require additional water after implementation. The tank has 2 compartments. The first compartment catches the waste and breaks it down before it enters the second compartment as a liquid. The liquid is purified further in the second compartment and is then expelled into a leech field or a garden. The tank must be maintained every 5 to 7 years. This is a preferred system for Monwabisi Park as further explained.[9]

The hybrid toilet system could be very beneficial in Monwabisi Park, especially for a communal toilet facility. For example, if the study area included 40 people, the EP 25 or 50 model would be the appropriate size. For the EP 50, the people would need to be using the bathroom 24 hours per day, but for the EP 25 they could only be using the toilets for 8-10 hours per day. This is a concern because the amount of waste entering the system determines the size of the conservancy tanks. The size of the EP 25 septic tank is 1,6 m diameter and 1,6 height. The clarifier tank is 1,2 m diameter and 1,5 m high. The space required is 1,6 m wide and 2 m long. The leach field is a 75 mm pipe that carries the effluent to a slotted pipe placed in the ground next to the clarifier tank above some stones. The stones are used to backfill after the 2 tanks are placed in position into the ground.



Pros	Cons
On site waste disposal	Spatial requirements
Recycles water	No compost produced
Minimal maintenance	

The cost of the EP 25 is R14.150 and the EP 50 is R22.400. These costs do not include the toilet cubicles, installation, transport and VAT. The excavation cost is R2.700,00 for the 40 person system. The sludge is pumped out every 5-7 years and requires minimal user maintenance. Although the cost of implementation is high, the minimal maintenance provides sustainability for the system [l].

ENVIRO LOO

The Enviro Loo toilet is a waterless sanitation system that turns human waste into compost through dehydration mechanisms. The system separates solid and liquid waste through ventilation and heat. Through bacterial decomposition, the waste is converted into a dried compost material that is 5-10% of the original mass. The liquid is completely evaporated from the system. Maintenance involves raking the composted material from the drying plate and placing in a drying bag inside the unit, where it is exposed to more heat and ventilation. Servicing can occur from every 6 months to every 3 years, depending on use levels.

The BP1040 model, which is the preferred model for the integrated plan, accommodates 40 people and costs R4034 per unit [i].

Pros	Cons
Individual or Communal	Frequent maintenance
Waste elimination on site	If not used correctly, environmental and health risks
Low installation cost	Frequent maintenance by company
Production of fertilizer	
Waterless	

Enviro Loo in Kruger Park in South Africa

Working Toward Sustainability

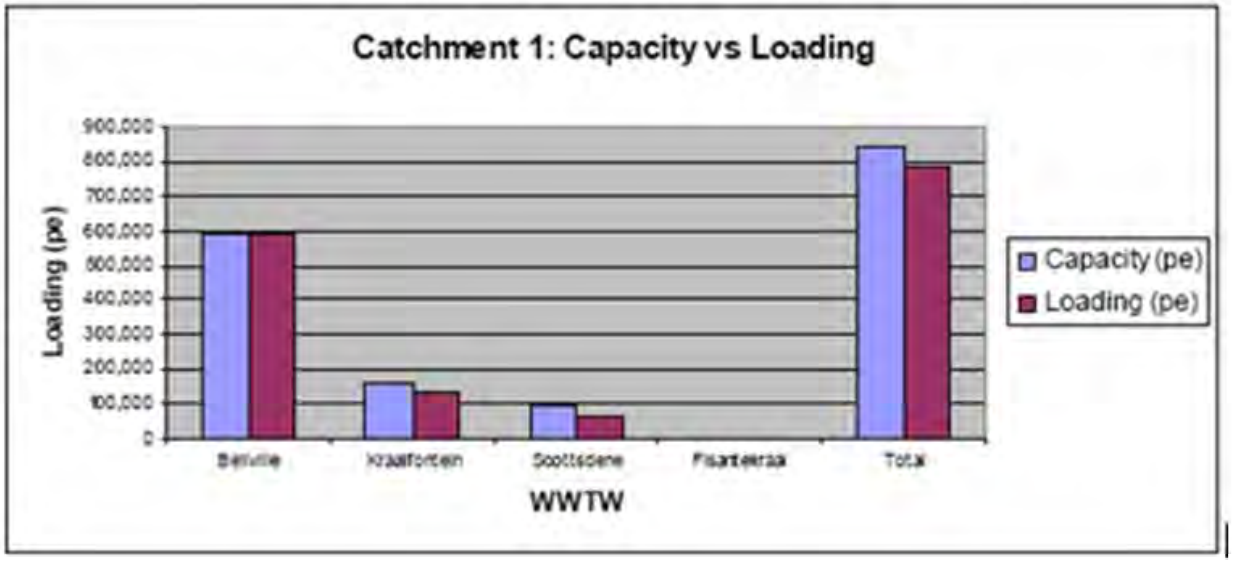
A key factor in redeveloping Monwabisi Park is self sustainability. There is no main sewage line leading out to the city from this area as of now. If it is possible to prevent any from being built in the future, it would save large amounts of capital and water waste. Less than 1% of the earth's water is drinkable, so saving as much as possible is essential.

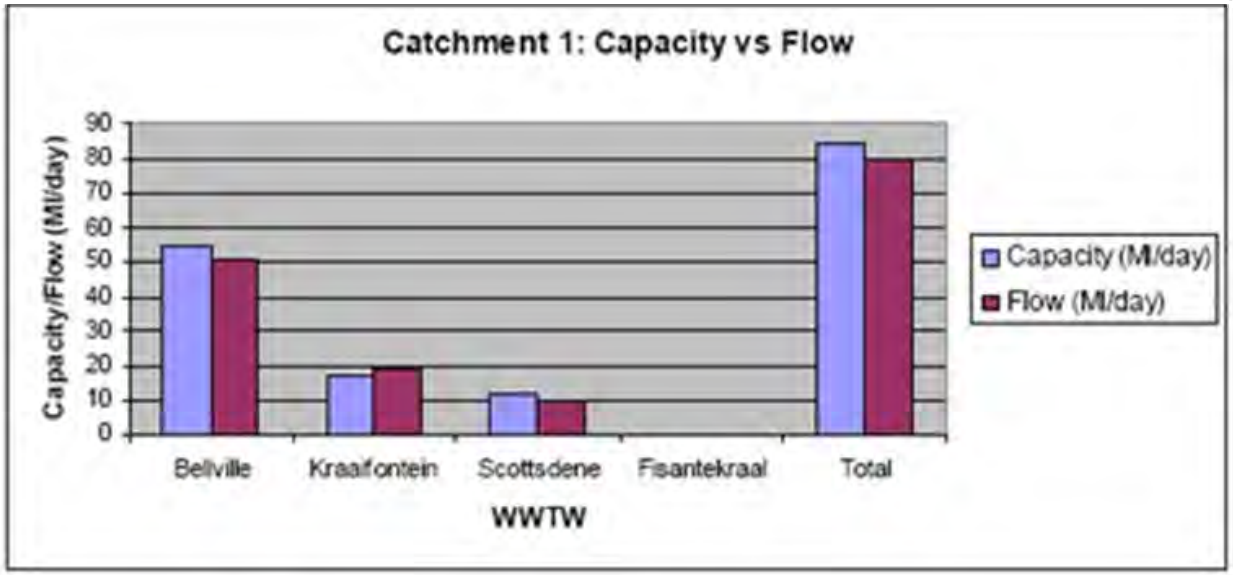
Effects of New Sewage to Existing Infrastructure

An important factor to consider when installing a toilet system is how it will impact the sewage infrastructure that is already in place. Standard sanitation systems are not sustainable and have substantial operating costs associated with them. This is a particular problem when a large percentage of people are unemployed. Thus, creating a self-sufficient sewage network with only an installation cost would be more efficient than installing and maintaining a traditional network.

A major challenge for the city has been to maintain the existing water facilities in the city as well as build new infrastructure to connect to new developments. The amount of flow and loading on the current sanitation systems is overwhelming. Aging systems have caused pipe collapses and many more are on the verge of the failure if major renovation or replacement is not done. Charts showing the capabilities and loads on the current infrastructures are shown on the right. The sewage treatment plants can not handle any more sewage without the expansion and upgrading of the facility.

The challenge for the City of Cape Town's Water and Sanitation Department is not only to assist the informal settlements, but to maintain and expand the current infrastructure that exists in formal Cape Town. Money is the major issue in accomplishing this task, so it would be beneficial to devise a method of providing sanitation to the informal settlements that is both cost effective and efficient. The best direction for this would be to focus on eco-village principles.





The Bennefits of Permaculture

The sustainability of ecovillage approach depends on the ability to utilize resources to their maximum potential and the community's involvement in maintenance. Water is a limited resource in Cape Town due to the generally dry climate. 5% of used water is recycled. The wealthy obtain 60% of the water supply while approximately 20% of the population has limited access to contaminated and vandalized water taps. Water is mostly wasted by flushing toilets and sewerage which could be purified and reused and water purification plants are very expensive. Studies show that if the people of Cape Town continue to live without change, the water supply will be depleted in 2015 [9]. To ensure sustainability for a new water facility, systems must be implemented that are easy to maintain and can endure population growth over time.

PERMACULTURE

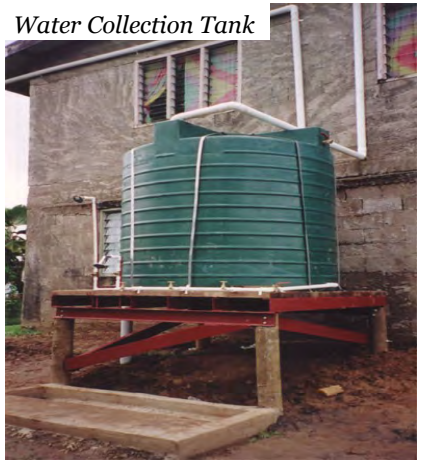
The best ways to ensure longevity are to use methods that are based on natural biological processes, such as composting waste as a form of sanitation and conservation [o]. It is important to take practical limits into consideration when creating a design such as cost, landscape, and the community's ability to utilize the facilities.

It is necessary to spend money to build reliable systems, rather than inexpensive ones that will break fairly quickly. If reliable systems are implemented, then the long term health hazards and environmental effects will be greatly reduced. Less expensive or unreliable systems that need more maintenance can breed new health hazards which are extremely harmful side effects when handling wastes [m].

An example of a low capital toilet received poorly by locals.

Building an appropriate water and sanitation facility in an area such as Monwabisi Park requires careful analysis of the landscape and climate.

Water Collection Tank

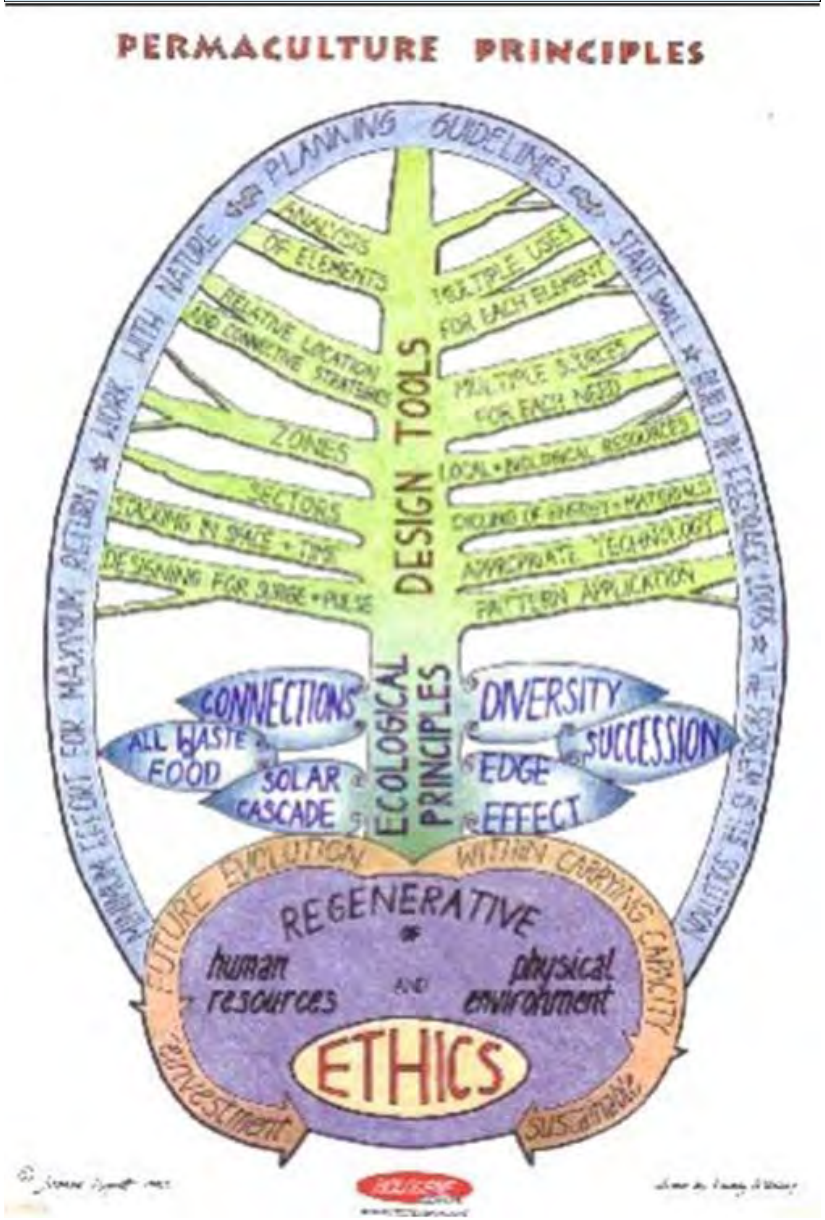


Since the area is fairly hilly, a septic system would need to be aimed downhill to drain effluent away from residents. The soil is all sand so choosing vegetation for gardens must be done accordingly. As long as the sand is irrigated properly and fertilized, plants will grow as seen at the nearby Lynendoch Sustainability Institute. The amount of rainfall in this region also makes a great difference in planning for a water system. Most of the rain falls during the winter months, so it is illogical to depend on rainfall as a water source year round. It is possible to conserve an amount in tanks, but it will be depleted shortly. Thus, it is important to design a type of system that is compatible with multiple water input systems. A significant part of sustainability is the ability to utilize the resources available to their fullest extent, so recycling renewable resources is one way to create a system of longevity. Rationing limited resources is necessary in most cases; therefore the people must work together to ensure the survival of the community [q].

The most important aspect of sustainability is the role of the community in maintaining the eco-village structure. Careful maintenance of the water facilities will reduce health risks and government spending on sanitation services. Along with the design for eco-facilities, there is a need for education and awareness in areas where poor sanitation exists. Educating the population about healthier sanitation practices, recycling, and reducing waste is essential in encouraging sustainability. If the society does not maintain the water systems, it will be unsuccessful. In the most impoverished areas, there is very little opportunity for education and as a result, the people are lacking in many skills. In such conditions general maintenance education proves to be beneficial to the survival of the eco village and in the creation of jobs. In an ideal situation, government health organizations will periodically maintain the sewerage systems. Whether or not government support is available, the residents need education regarding the harmful effects on the environment to create their eco-village and have the best chance of a clean and sustainable environment [a].

Permaculture

Developing permaculture in Monwabisi will ensure continued success of the settlement.



Public Health

As a result of poor sanitation and standing water, Monwabisi Park suffers from water borne diseases that impact public health in the area. The Department of Environmental Health and the clinic at Monwabisi Park are trying to teach preventative measures to stop the spread of such diseases.

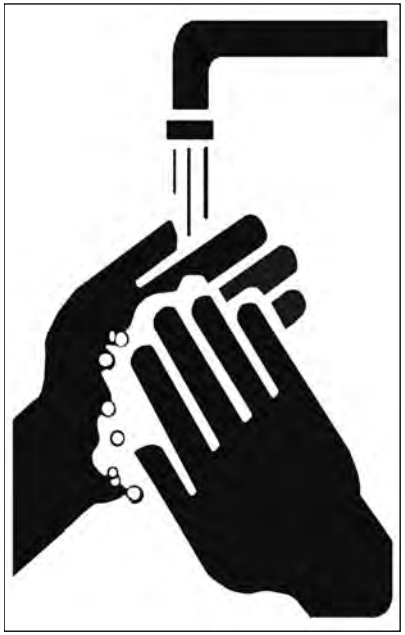
INDLOVU CLINIC

Public health is a major concern in Monwabisi Park because there is a lack of knowledge in terms of sanitation and hygiene. According to Glenn Vondo, the nurse who runs the Indlovu Centre clinic, most patients he sees suffer from preventable diseases.[5] The clinic at the Indlovu Centre is constantly overcrowded with sick men, women, and children, many coming from other regions to receive basic medical care and diagnoses. Those that cannot be treated at the clinic are sent to other hospitals in the area that are better equipped in treating more complicated cases. Some of the most prevalent diseases seen at the clinic are tuberculosis, diarrhea, malaria, Giardia, worms, e.coli, skin conditions, malnutrition, cholera, arthritis, hypertension, diabetes, and HIV/AIDS. Many diseases are more common in the winter, the rainy season when standing water in the settlement is common. Waterborne diseases can breed in standing water, where many children play. Worms and diarrhea are common in children. Glenn spends every morning deworming the children that come to the crèche by handing out pills. Many of the children suffer malnutrition. However, it is not necessarily from a lack of food, it results from the lack of a balanced diet. He says that there is an over consumption of fatty foods, animal products, and proteins. Diabetes and hypertension are results of such an unbalanced diet. Cases of malaria and HIV cannot be treated at the clinic. Of the aforementioned medical problems, diarrhea, worms, e.coli, and cholera are directly related to poor sanitation.

HEALTH EDUCATION

The issues with sanitation partly stem from a lack of funds, facilities, and education in the population. Basic hygiene is not always practiced and many do not wash frequently. Washing hands is not considered necessary. Much of the time, people cannot afford soap. According to Glenn, hand sanitizers and sterilizers were attempted, but it was not nearly enough. Even if the soap and washing stations are made available, they will not be utilized without education about hygiene.

There is some controversy in public health education. Many resent being told how to wash or that their current methods may be hazardous to their health. The people in Monwabisi Park trust Glenn because he respects each individual and never scolds them for poor hygienic practices. There is sensitivity related to one's personal hygiene and it is difficult to educate without offending. He has tried sanitation education during appointments, pamphlets, and handing out soap. Overall, his efforts failed because he does not have the time or resources to provide formal and consistent educational programs. Education is one of the answers to prevention.

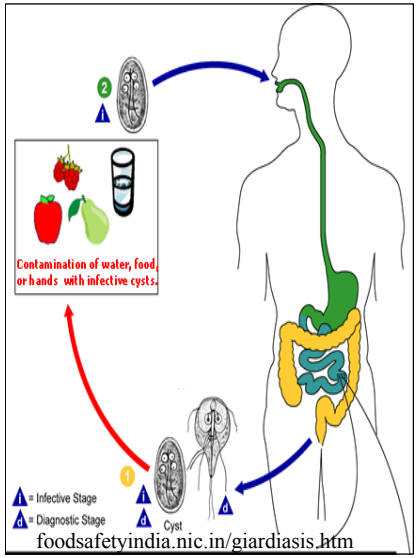


The importance of washing hands between activities is an essential concept

FECAL ORAL TRANSMISSION

The waterborne diseases are spread by the fecal oral route, resulting from contaminated buckets and standpipes.

Much of the time, children will collect water for their parents using dirty buckets. From the field observations with the co-researchers,[3] it was noted that many standpipes were broken, filthy, and contained standing water in the basin. The buckets used for collecting water were used for multiple purposes, causing more contamination. Many of the buckets were recycled from previous machinery that may have been exposed to automotive fumes or chemicals. Most are unaware of the dangers and simple explanation is not enough for sanitation education. All ages are affected by poor sanitation, but children are more likely to die from dehydration caused by diarrhea. Diarrhea is the most prevalent result of waterborne diseases. It is easily treatable, but many do not receive medical attention. According to Glenn, the clinic alone has reduced the death rate in the area by approximately 80%, which is a remarkable achievement.

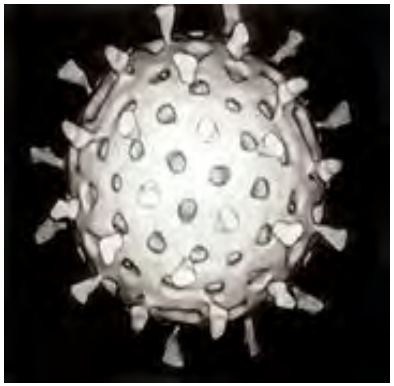


Fecal-Oral Transmission: The Lifecycle of Giardia

GOVERNMENT RESPONSE

After interviewing Elroy Plaatjies, Senior Environmental Health Practitioner of the Environmental Health department of Khayelisha, he discussed details about the health conditions in Khayelitsha and the government's response.[6] According to Elroy, 90% of the population has no concept of hygiene. Diseases are spread by people using toilets that are already contaminated or broken, not washing after, and

then touching standpipes to obtain water. The water supply in Monwabisi Park is provided by the city and is very clean. However, when the water emerges from contaminated standpipes, it becomes contaminated. Lack of proper toilet paper contributes to poor hygiene and broken toilets. Unknowledgeable of proper usage of the newly installed municipal sanitation systems, residents will inadvertently clog toilets and create sites of poor hygiene. 80 children per year in Khayelitsha die from diarrhea related diseases. Thse statistics are shown in figures 3 and 4.



Microscopic View of Rotavirus
http://www.rotaviruscenter.com/

The leading cause of diarrhea is the rotavirus, affecting mostly children. The virus is caused by poor sanitation and hygienic practices. Much of the focus has been on treatment of diseases, which are preventable, rather than prevention. One way the department has been focusing on prevention is by incorporating monthly vaccines into the clinics. However, many do not go to clinics and there are many medical issues that are not addressed and undocumented.

The environmental health department of Cape Town receives statistics from the local clinics.[6] The notable waterborne diseases are recorded in the system and an officer will investigate the case and write a report. Unfortunately, the problem is vast and the department is comprised of 120 members responsible for 20 million people in all of South Africa. The department tries to provide education and awareness with community interventions, workshops, and meetings. Many NGO's help raise awareness by targeting women and children. It is much more difficult to educate adult males because of cultural pride. Teachers are potential health educators, as are staff at other institutions involving children. All preschools are funded by the government, receiving 6R per day per child to provide food. Teachers must go through training to receive this funding, which includes sanitation practices. In many cases there is corruption in the institution and the money is spent on personal use. Overall education is a problem because many children drop out of school early. The people are not grasping the concepts the way they are currently being presented, and there must be a more visual method of teaching and showing the dangers of improper hygiene.

Figure 3: **Diarrheal and Gastro Enteritis Deaths in 2004**
As shown in figure 3, in 2004, Khayelitsha has the highest death count and March is the month that the deaths were most common.

	Mitchell's Plain	Tygerberg	Khayelitsha	Eastern	METRO
Jan 04	0	0	0	0	4
Feb 04	0	1	6	4	15
March 04	5	0	13	7	32
April 04	2	1	7	4	23
May 04	1	0	5	2	13
June 04	0	1	7	2	12
July 04	2	0	3	0	12
Aug 04	1	0	4	2	12
Sept 04	2	0	5	2	12
Oct 04	1	2	1	1	8
Nov 04	1	1	2	0	8
Dec 04	0	0	7	3	17
TOTAL	**15**	**6**	**60**	**27**	**168**

ENVIRONMENTAL HEALTH

A functioning eco-village, or even eco-systems, depends on community involvement, commitment, and funding. Elroy said that ecovillages are a great option for people who can afford them. The focus of ecovillages is to benefit people and environment, not necessarily in terms of cost effectiveness. Elroy feels that some of the best options for sanitation are to create a 1:1 toilet to family ratio to create a sense of ownership and prevent vandalism.

Elroy introduced the idea of urine divergent toilets as a good option because of their eco-friendly process and availability to install on a one to one basis. In this system, urine and feces must be decomposed separately to maximize the nutrients in the resulting composts. They cannot decompose together because the pathogens in the feces will feed off the nutrients in the urine, rather than dying out. As a result, there are breeding pathogens and foul odors. However, these toilets require user maintenance in order to be sustainable.

Figure 4: **Top 10 Causes of Death-Under 1– in Cape Metro**
Figure 4 attached shows two tables that rank the top 10 causes of death in the Cape Metro region, one for 2003 and one for 2004. Diarrhea and gastroenteritis are ranked as the fourth leading cause of death for 2003 and 2004.

	2004	DEATHS	%
1	Ill defined and unknown causes	282	20.8
2	short gestation and low birthweight	256	18.88
3	HIV/AIDS	155	11.43
4	Diarrhea and gastro-enteritis	139	10.25
	total for Cape Metro	**1356**	**100**
	2003	**DEATHS**	**%**
1	Ill defined and unknown causes	288	21.54
2	short gestation and low birthweight	214	16.01
3	HIV/AIDS	197	14.73
4	Diarrhea and gastro-enteritis	99	7.4
	Total for Cape Metro	**1337**	**100**

Figure 5: **Infant Mortality Rate: 2003 to 2005**

Figure 5 shows the infant mortality rates from 2003 to 2005. The region of Khayelitsha has the highest infant mortality rates for the three consecutive years.

District	<1 Year Deaths	Live Births	IMR
KHAYELITSHA			
2003	290	6886	42.11
2004	286	7812	36.61
2005	275	7920	34.72
METRO			
2003	1330	53735	25.16
2004	1400	58961	23.74
2005	1335	59276	22.28

Potable Water Source: Rainwater Collection Tanks used at the farm in Khayelitsha

The photo below shows the vegetable gardens at the sustainable farm in Khayelitsha. The canopies are used to protect against wind and UV exposure.

While with Elroy, a nearby farm was studied through field observation. The farm uses sustainable practices and supports twenty two farmers. It began as a small garden created by women in an informal settlement. Their dedication has brought them on the verge of success. Nearby restaurants and markets purchase their vegetables. The water used is metered and supplemented by rainwater collection tanks. In addition, they use well water to irrigate crops. They installed a solar powered motor for the water. The farm is a good example of how sustainable development can be successful with a proactive community.

City Decisions

The City of Cape Town Water and Sanitation Department works to upgrade the quality of services in informal areas, conserve water, and maintain healthy sanitation conditions.

THE DECISION PROCESS

An interview was conducted with Jaco Muller, a city planner from the Cape Town Water and Sanitation Department, to learn more about the decision making process for implementing new toilet systems.[3] Full flushing toilets are considered the ideal option, but monetary, social, and spatial constraints limit the ability to distribute these toilets in every informal settlement. When there are constraints, alternative sanitation options are considered. The second option considered is pour flush toilets with easily accessible conservancy tanks for servicing. The third option considered, if there is no road access for the servicing of flush toilets, is the implementation of porta potties or Afrisan toilets that can be installed directly into a person's home. This is the most expensive option because there is the highest capital cost as well as the cost of trucking out the waste from the porta potties.

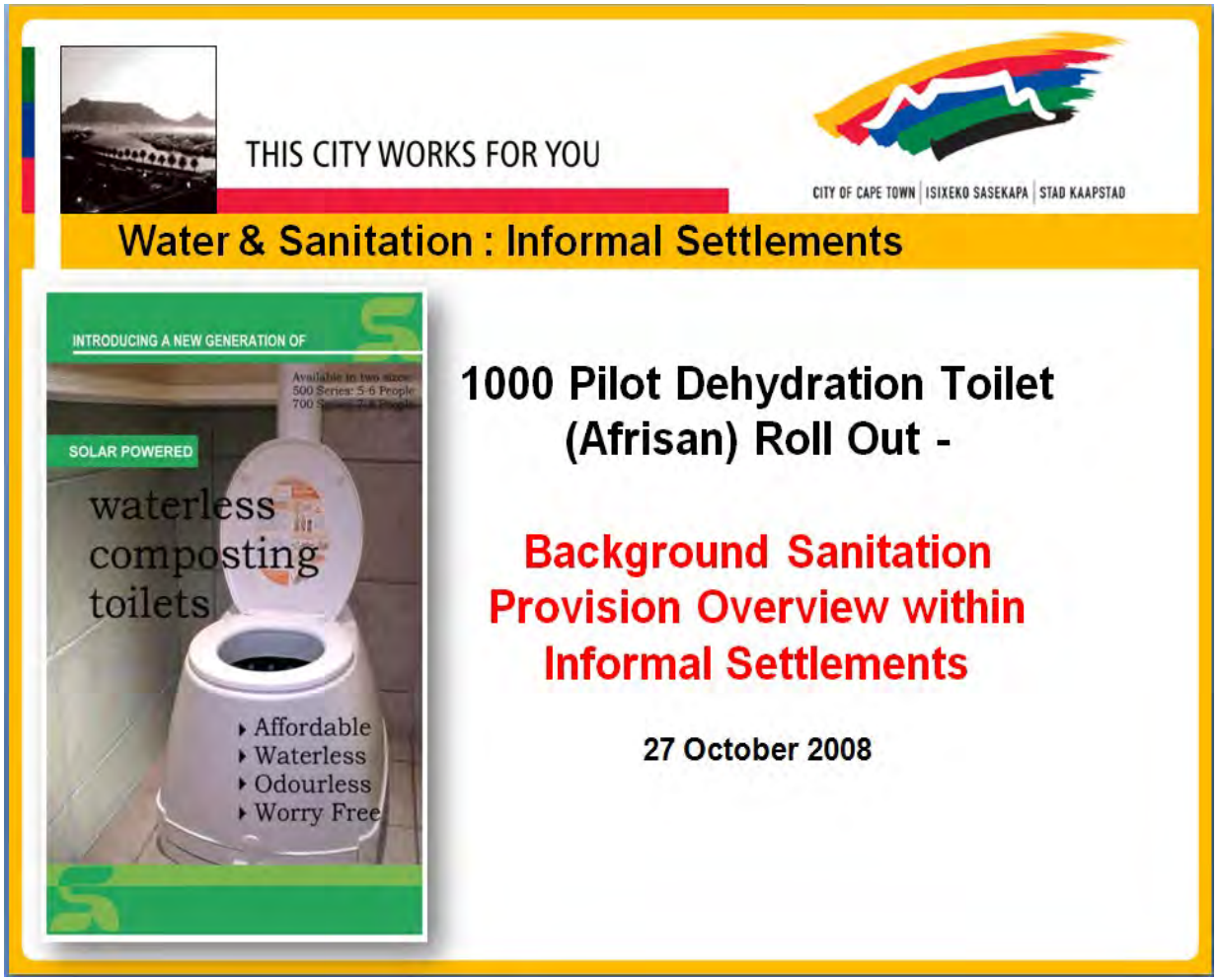
ALTERNATIVE SANITATION

When considering alternative sanitation types, companies either advertise to the city department or the department searches for current successful technologies via internet. The city officials will listen to sales pitches from various companies and a project manager will choose a system for each settlement. Once the project manager has made a decision, he or she will contact the CLO or councilor for the community to receive approval. The councilor finds the most suitable sites for installation.

COMMUNITY INVOLVEMENT

More recently, the mayor has employed Community Stakeholder Coordinators who are dedicated to liaising with communities. The community workers speak both English and Xhosa. They come from the settlement and therefore identify the most pressing needs. Their job is to report infrastructure needs, contractor violations, and clean the communal toilets. They were provided radios to report their findings, which is a fast and effective method of communication. Initially there were 100 community members paid to document the conditions and needs in the settlements. However, due to financial restraints the number has been reduced to 36 members. As a result, the program is understaffed and the responsibility becomes too vast. The city tried a job rotation where a new person was chosen every 6 months. An issue with this program is that the community workers prefer permanent jobs, not ones that will be terminated when redevelopment has been achieved in their area. In conclusion, the problems the city encounters result from the large backlog of services in the informal settlements. Community involvement would be a good way to supplement the services provided. The city is always updated on new technologies and is continuing to find the best solution for informal settlements in Cape Town.

An example of a presentation given by the Cape Town Water and Sanitation Department to promote the Afrisan toilet as an option in informal settlements.



Cost Analysis

The costs of installing and maintaining water and sanitation options is a large factor in systems decision-making. It is important for systems implemented in informal areas to be cost efficient, because funds and resources are limited.

CURRENT COSTS

In Monwabisi Park, the pour flush toilets have conservancy tanks that are pumped out regularly by contractors hired by the city. The pour flush toilets are difficult to service because the small roads in the settlements do not accommodate large trucks. They are expensive to install and maintain, and municipal water is usually used for flushing. The time and effort needed to service these toilets can be reduced significantly by using alternative systems.

The Cape Town Water and Sanitation Department compiled a cost analysis of all the current systems being used in the informal settlements. As shown in the graphs, the conservancy tanks for the pour flush toilets are most expensive to install, and the maintenance cost is high. Some sanitation options, such as the chemical toilets, are inexpensive to install, but the maintenance costs are high. The flushing toilets almost achieve the ideal situation of having low maintenance costs, but the potable water wasted is not considered in this graph.

FUTURE OPTIONS

The cost analysis table was created based on previous research of installation and maintenance of various systems. The systems analyzed are possibilities being considered for Monwabisi Park. In order to calculate the final cost, the systems were analyzed over a 20 year period. The systems are built to last forever so they are analyzed over a 20 year period.

In reality, they need replacing after 3-5 years. There are some new technologies being considered, such as the Biolytix filter, where the cost of installation and maintenance are unknown. The costs of the taps, sinks, hydrants, and rainwater tanks are unknown, but are still compared in the chart because they are valuable options for the water facility that will be created in Monwabisi Park.

After analyzing the final known costs, the Afrisan toilet is the least expensive over a 20 year period. Pour flush toilets are the most expensive over a 20 year period. However, many considerations must be made for each situation. The dry sanitation options are less expensive but could be more problematic to the health of the people and environment if used incorrectly. Systems such as the hybrid toilet system eliminate waste without involvement from the user. If the pour flush toilets are implemented with a Biolytix filter instead of a conservancy tank, then the cost would be greatly reduced.

In each design, the focus will be on spending more initially to ensure low maintenance costs for the future. Recycling water is an important theme that will reduce water usage costs for the city. Whether a dry sanitation or a flushing option is decided, a focus on maintenance education is necessary to avoid destruction and ensure sustainability of the facilities.

	System	Users	Install	Effective Lifespan	Capital Cost Annually	Maintenance Cost Annually	Attendant's Salary	Total Cost Annually
Unattended	Composting Toilet	25	6800	4	1700	72	0	1772
	Urine Divergent Toilet	25	6800	4	1700	72	0	1772
	Afrisan	5	3900	4	975	120	0	1095
	Pour Flush	25	8500	4	2125	1176	0	3301
	Full Flush	25	5200	4	1300	73	0	1373
	Hybrid Toilet System	40	25100	4	6275	1176	0	7451
	Enviro Loo	40	5000	4	1250	0	0	1250
	System	Users	Install	Effective Lifespan	Capital Cost Annually	Maintenance Cost Annually	Attendant's Salary	Total Cost Annually
Attended	Composting Toilet	25	6800	20	340	72	18000	412
	Urine Divergent Toilet	25	6800	20	340	72	18000	412
	Afrisan	5	3900	20	195	120	18000	315
	Pour Flush	25	8500	20	425	1176	18000	1601
	Full Flush	25	5200	20	260	73	18000	333
	Hybrid Toilet System	40	25100	20	1255	1176	18000	2431
	Enviro Loo	40	5000	20	250	0	18000	250

A New Vision for Water and Sanitation Provision

water and sanitation facilities in Monwabisi Park are inadequate and poorly maintained. New toilets are vandalized and become areas of high crime and rape. Stand pipes are broken and drains are blocked causing standing water to flood local areas. A new strategy must be implemented in redevelopment.

Conditions are Dire

The infrastructure of water and sanitation in Monwabisi Park is failing. Considering taps alone, 74% of them are malfunctioning. This leaves only one fully functional tap for every 246 residents in C section. There are accounts of people walking nearly two kilometers to reach a working tap, and due to disrepair and vandalism, thousands of kilolitres of water are wasted. Standing water gathers around the taps breeding diseases such as malarya, cholera, hookworm, and rota virus. Insects breed in the puddles, contracting the illness and spreading it to the community.

77% of toilets are either nonfunctioning or unmaintained. Within the first six months of installation, 30% of facilities fail. There are only enough provided toilets for 69 families to share a single unit under the assumption that they all work. Crime rates skyrocket at places where new toilet facilities are installed, promoting residents to use "black buckets" at night rather than walking to toilets. The location of implementation has been limited to the areas in which service vehicles can access the toilet pods. This leads to unsafe placement and in essence, crime is being installed with facilities.

An inexpensive light pole that could be installed nearby toilets

Disease is Rampant

The convenience and accessibility of hand washing stations is nonexistent. Health education is also taught, but not enforced. People use toilets and neglect washing their hands. Frequently, these same people will then use a tap and contaminate the faucet for anyone who uses it after. Bottles are filled for infants from the same taps thus contaminating them with the disease. Children are at a much higher risk for illness and are more apt to develop diarrhea from the taps, a serious illness that can easily lead to their deaths. The simple fact that diarrhea is the number one killer of children under the age of two in informal settlements makes this enforced sanitation that much more essential.

Taps located near toilets can be easily contaminated and aid in the spread of

Clean and sanitary toilet systems

Five Key Principles

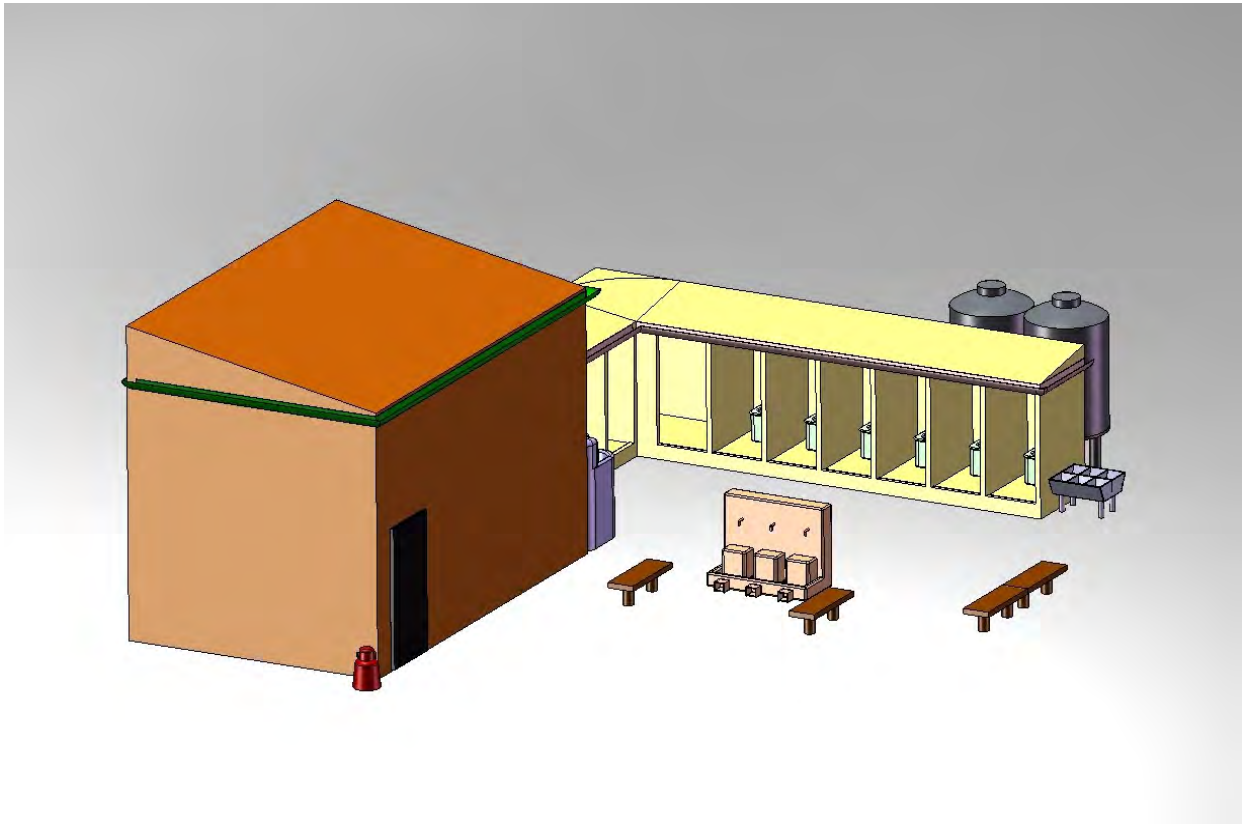
From these core problems a list of principles was developed to aid in the future building of facilities. It would be ideal for a facility to be constructed with these concepts in mind. These principles are to promote: water conservation to provide "green" services, hygienic benefits and services and positive byproducts to increase health and sanitation, safety to ensure that people are able to use the facility without potential harm, and replicability for the ease of implementation and sustainment of the complex no matter where it was located. All of these ideals can be incorporated in a master design that is both flexible and effective.

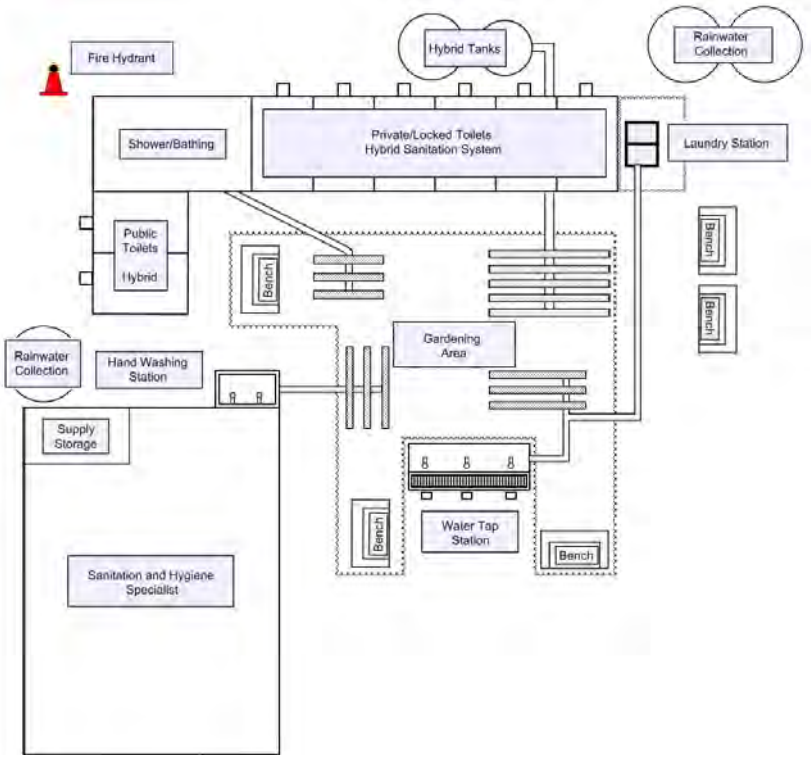
Centralized Water and Sanitation Facility

A facility has been designed that attempts to accommodate solutions to every problem discussed by the water team. The conceptualization of the complex is directed toward a shared communal and private audience to facilitate their daily activities relating to water.

OVERVIEW

The facility will be semi enclosed by an L-shaped structure that allows access from only one direction to the facility. This opening will be directed toward a public area where many people have a constant view of the area. This will help deter crime as well as promote a communal area to perform daily tasks in an enjoyable environment. A garden is located in the middle of the grounds to provide place for drainage from various parts of the complex. Benches are incorporated into the design to provide a comfortable area to wait for a particular service or act as a communal gathering area. Taps are conveniently built at the entrance to the facility for residents of the community to gather their water for cooking, drinking, and all other daily needs. A building is placed at the corner of the complex to house an on site specialist who cares for the facility and monitors the area. A sink for hand washing is built onto this house to promote healthy practices. Rainwater collection tanks are incorporated into the design to allow for the gathering of additional water from rain to aid the water supply for laundry and hand washing. Toilets and wash areas are installed in the L-shaped building with entrances facing the main courtyard. Finally, a fire hydrant is added for the safety of the community. Specific details of the facility will be discussed in the following sections as well as explanations to how the different aspect of the facility were designed.





PRIVATE AND COMMUNAL

One effective way to deter jealousy amongst community members is to create a facility that is accessible to everyone. A predetermined number of toilets are assigned to two houses each. People can choose who they share the toilets with out of a given set of houses. Public toilets are also present to accommodate passersby who may need to use the facility. The laundry facility and taps are also included in this area to influence a sense of communal sharing as well as a sense of ubuntu.

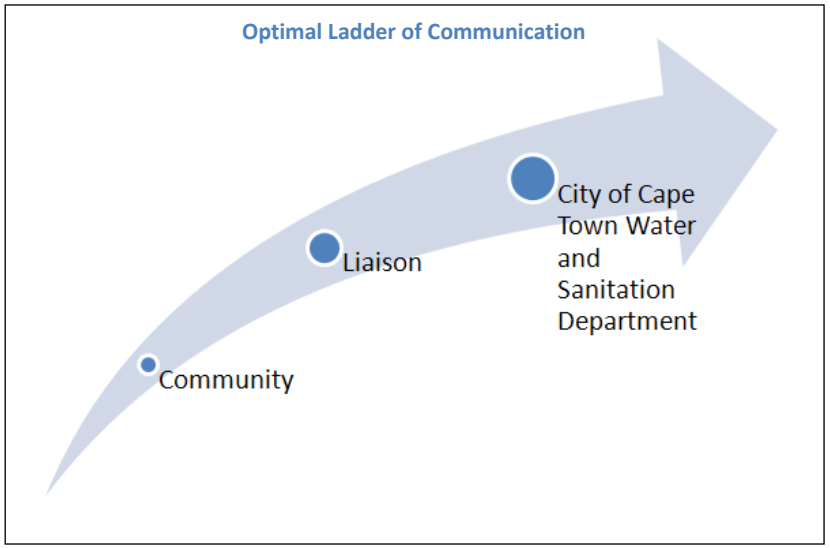
Water and Hygiene Specialist

The water and sanitation specialist will be created to manage the centralized water facility. The responsibilities include health and sanitation education, maintenance, and providing supplies.

Presently, the City of Cape Town Water and Sanitation Department has established facilities throughout Monwabisi Park; however, these systems are often misused or vandalized as a result of the lack of instruction and education. It is necessary that the community has someone to contact when the water facilities break down. The creation of a water and hygiene official will maintain the water facility being designed.

The official will be responsible for all aspects of the communal water facility. They will live onsite at the facility and will have a supply closet located within their house. By living at the facility, the official can observe the activity at the taps, toilets, and sinks at all times. This person could inform users to wash their hands frequently since they would be located close by the sinks More duties include: simple maintenance of the taps and toilets, such as fixing leaks or repairing blocked toilets. Preventative maintenance on municipally installed systems is equally as important. In this regard, it would not be necessary to involve the CCTWSD with small problems within Monwabisi Park. However, if the official encounters more serious problems with the systems, it will be his or her job to act as a liaison and contact the city department to repair it. The added benefit to this is that the amount of money that this person is paid to maintain the facility will total less than the amount that the city must pay contractors to fix and overhaul facilities.

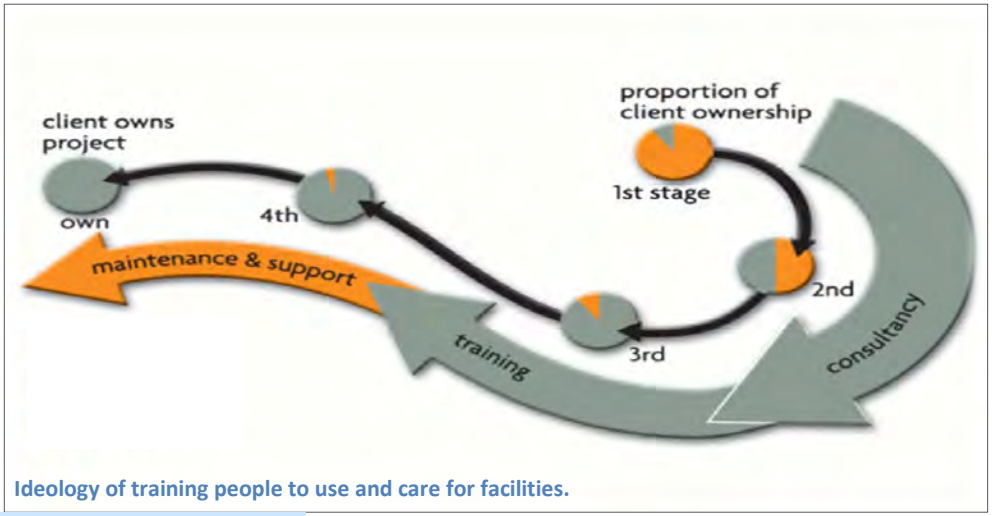
The other aspect of the official's job involves sanitation and hygiene. There is a need for health education within Monwabisi Park. The official will act as a specialist and will educate the community on proper sanitation, such as bathing daily and washing hands frequently. Disease transmission will be made clear and will be directly correlated to poor hygiene. Premixed medication for diarrhoea will be distributed by the specialist but more serious cases will be sent to the clinic. In order to prevent disease transmission, the water official will fill water containers for the community to prevent people from touching the taps. The containers will have sealed covers to isolate the water from possible contamination. Every house will have one container and the facility will have one container for every house. Therefore, residents can only get a newly filled container when they bring their previous one back for decontamination.



The official's authority involves taking privileges away from those who do not follow rules or vandalize the facilities. The position of the water and hygiene official is vital to the survival and maintenance of the communal water facility.

The selection process for the liaison must be controlled by the local leaders and the Street Committee. The Street Committee and Buyiswa will receive a job description and application and distribute them to select individuals capable of the specialist's responsibility. After the Street Team has made a selection, interviews will be conducted and the specialist will be selected. The selected individual will need maintenance training by the CTWSD, which will depend on the systems implemented. The payment of the specialist will be determined by the Shaster foundation. The creation of such a job would provide employment and create a viable job market in the field of maintenance.

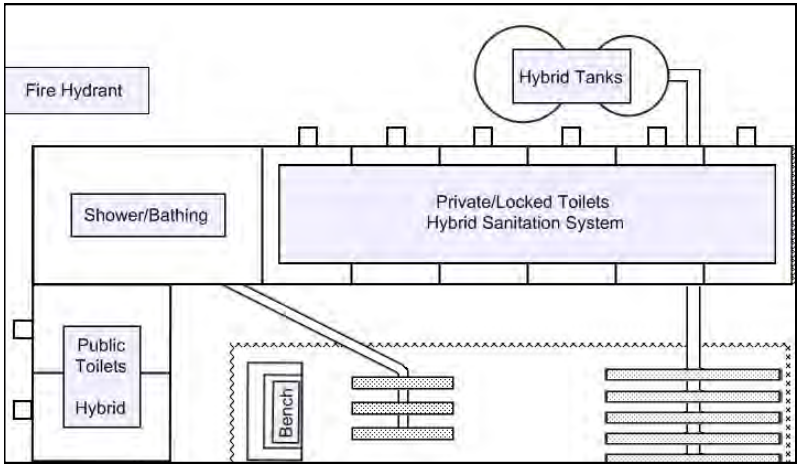
The training program for the specialist can be drawn from the Leaks Project. The city sponsored Leaks Project was a training program for community members in informal settlements. Unfortunately it was discontinued, but the concept can be applied to Monwabisi Park. The Leaks Booklet can be found in the appendix. It gives detailed instructions on how to repair taps and toilets, how to read meters, and other responsibilities of the water specialist. The leaks booklet is a valuable resource that can be left behind for community use.



Ideology of training people to use and care for facilities.

Toilet Accommodations

Toilet designs have been chosen to promote cleanliness, water conservation, and ease of maintenance. A simple design and calculated placement add to the principles of safety and increasing hygiene.



PLACEMENT

The toilets are placed at the rear of the facility where they are under total visibility of the entire complex. As aforementioned, this will help deter criminals from striking where community members would be witnesses.

SIDEWALK PATH CONTROL

A sidewalk is paved around the garden past a sink and also past the sanitation specialist . This will enable the official to keep track of who enters and exits the facility. Also, this will help promote the use of the hand washing station located right alongside the sidewalk. Another added benefit is the fact that the public toilets can be kept separate from the private toilets that are assigned to the local residents. A low gate could be installed that is approximately waist high that remains unlocked to turn away people that are not residents.

TOILET TYPES

HYBRID TOILET STSYEM

The hybrid toilet system is the first suggestion as a toilet system because of its extremely low required maintenance. It is a non-flushing toilet that can be cleaned with organic chemicals and treated the same as any traditional flushing toilet. The hybrid system includes multiple toilets connected to a water filled tank. This tank catches the waste and breaks it down over about 140 days before it dispels it into a leech field or a garden as irrigation. The only maintenance that the tank requires is the pumping of sludge that gathers at the bottom of the tank once every 5 to 7 years.

The hybrid toilet system is very practical for a communal toilet facility because it can be easily built for over 40 people. The size of the required septic tank would only be 1,6 m in diameter and 1,6 in height. The clarifier tank would only be 1,2 m in diameter and 1,5 m high. The leach field required is

The hybrid toilet system is a modern

a 75 mm pipe that carries the effluent to a slotted pipe placed in the ground next to the clarifier tank above some stones. This will assist in the irrigation of the garden that occupies that center of the complex.

The cost of the EP 50 is R 22.400,00. These costs do not include the toilet superstructures, installation, transport and VAT. The excavation cost is R 2.700,00 per day. Although the cost of implementation is high, the minimal maintenance provides future sustainability for the system and saves a high amount of money over time.

ENVIRO LOO

The Enviro Loo toilet is the second consideration for this arrangement. It is a waterless sanitation system that turns human waste into compost through dehydration. The system involves separating solid and liquid waste through ventilation and heat. Basically, the occupant uses the facility to deposit their waste in a container. This container has a glass panel on the side that absorbs heat to evaporate the liquids through a ventilation tube and dries solid waste to about 5 -10% of its original mass. The only maintenance the system needs consists of raking the composted material from the drying plate and placing it in a drying bag inside the unit once every year.

This toilet produces compost that can be used in a variety of ways. It can be spread in the communal garden to fertilize the land for better planting ability and will thus benefit the entire community. Another option is to bag and sell the compost, providing money that can be used to pay for upkeep of utilities or the specialist's salary.

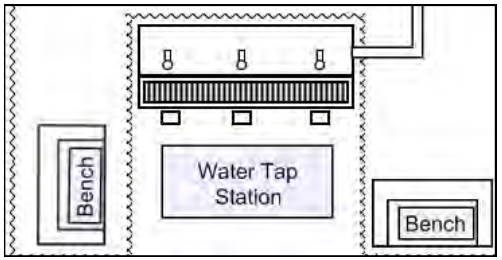
The Enviro Loo toilet system uses dehydration and composting technology to provide and hygienic method

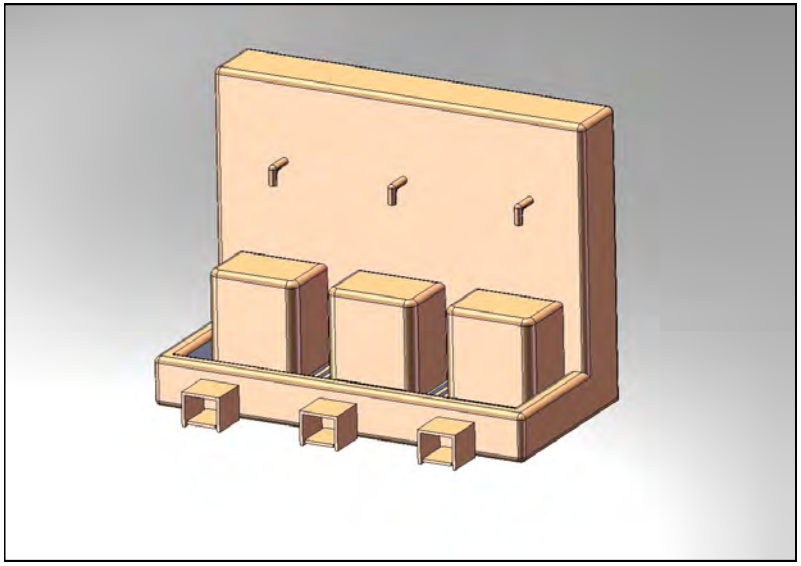
Taps, Sinks, and the Laundry Facility

The communal water facility will have new taps, public sinks, and a laundry facility. The combined facilities will contribute to the cleanliness and hygiene being promoted in the community.

Water Taps

The water taps are central to the design of the new water and sanitation facility. Taps are the only source of water for the people in Monwabisi Park, and the current ones are insufficient because they are broken, dirty, and distant from many residents. At the central facility, the residents will have convenient access to taps. In order to avoid long lines, there will be three taps in a row. If there are lines, then people can sit on the benches at the facility or enjoy the central gardens. Rather than designing hand operated taps, the new taps will have foot pedals. The pedals both conserve water and increase cleanliness. Many diseases are spread by contaminated taps, therefore if touching taps can be avoided, the spread of diseases via taps will be prevented. Many taps in Monwabisi Park were found leaking or left on. A foot pedal will require constant pressure for the tap to be on, which reduces wasted water. Another aspect of the tap design will be a concrete step to place the heavy water containers. A hook at the top of the tap will also be necessary for hanging the containers while they fill with water. If the taps are built to support the containers, they will not break. The improved taps will be successful because they are easy to use, conserve water, and prevent disease transmission through the municipal water supply.



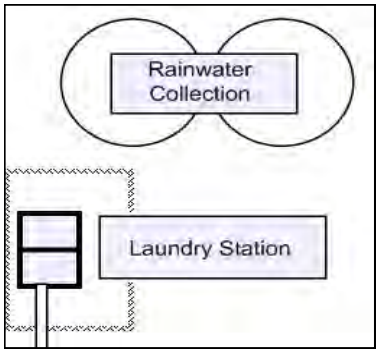


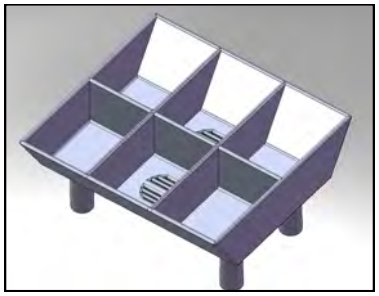
Sink Station

In order to promote hand washing, a sink will be incorporated into the design. The water will originate from the rainwater collection tanks. Soap dispensers will be used rather than soap bars so that it can be more evenly distributed. To prevent vandalism, the soap dispenser will be securely attached to the sink. The sink will be operated by foot pedals to maintain cleanliness. By avoiding hand to sink contact, the path of fecal oral transmission will be reduced. The location of the sink will be on the side of the water and sanitation specialist's house and the footpath. As a result, when people leave the facility by the footpath, they must stop at the sink to wash their hands. The proximity to the specialist's house will allow him/her to instruct those who leave to wash their hands.

Laundry Facility

The laundry facility that will be implemented in the communal water area will be modeled after the previous one that was built at the Indlovu Centre. Because the previous laundry services were such a success, the new ones will be expanded to include six laundry stations. The reason it was successful is because people did not need to carry heavy buckets of water home from the taps to do laundry. The water used for the laundry will come from the rainwater collection tanks. The laundry facility was a safe place for people to congregate, and the new water facility will be a larger version of that idea. The water facility will help recycle water, because it will drain into the leach field rather than being disposed of in the road. In this laundry station, water consumption is reduced because people will use less water. The long lines will be avoided by adding more stations. In the case where there is a long wait, the facility will include benches, waiting areas, and the communal garden for people to congregate. The laundry will be located beside the toilets, near the tanks, and the effluent will drain to the leach field in the garden. As a result no water is wasted in this system.





Fire Hydrants

Fire is a common and devastating problem that plagues the informal settlements of Cape Town. With thousands of homes being destroyed by fires each year, the necessity for a better fire suppression infrastructure is obvious. In order to better facilitate the needs of the fire brigades, it is essential to provide hydrants within easy access to fire trucks.

THE NEED

Fire hydrants in Monwabisi Park are sparse and inadequate. The present hydrants are hard to see and blend in well with the road and foliage. No markers exist to help find them since such markers are frequent targets of thievery. By not having clear indicators, it is difficult to find hydrants in the panic of a fire.

Fire hydrants that were installed and continue to work are few and far between; with locations and working conditions unknown even to the city's departments. When they cannot be found, water taps are used as hydrants. A hose can be attached to the nozzle and water is then sprayed on the fire. Since this is not the intended use of the tap there is not enough pressure to sufficiently extinguish the fire. Often, a single device is expected to provide for hundreds of houses. Since fire trucks have a limited reach with their hoses, this deficiency greatly affects the effectiveness of fire fighters. As a result, lives and property are lost due to fire every year. When fire trucks cannot reach the flames with the hoses, there s little that can be done to stop the spread of the fire.

Water piped into the settlement flows through plastic tubing that is easy to cut and redirect, as is often done by local residents to aid in their water needs. These informal alterations greatly tax the existing water infrastructure and create a drop in water pressure as water directed into Monwabisi Park has to follow an intricate and much larger piping scheme than it was designed to handle. Pressure releasing systems, installed to reduce water pressure in the water lines during times of low usage, also hinder the efficiency of existing fire hydrants. The need for water dwindles in the nighttime hours as people tend not to leave their houses as often to gather water or use the taps in the dark. Since the demand for water is less after nightfall, the city reduces pressure in the system. Unfortunately it is during the night that

A Fire Hydrant in Monwabisi Park

A maintained and visible fire hydrant in Kruger Park

fires are more apt to begin since it is when candles and heating apparatuses are most commonly used. With reduced pressure the hydrants are less able to provide adequate water to quench the flames. An improved hydrant system with better pressure capabilities and with more hydrants would save both lives and money.

INTEGRATING HYDRANTS

In the centralized water facility there will be a high pressure fire hydrant that will be maintained and easily accessible in the case of an emergency. As with other systems implemented in the facility, the hydrant will be the responsibility of the water and hygiene official. He/she will keep it in good working condition and periodically check if it provides adequate water pressure for fire suppression. Knowledge of the working condition of hydrants is crucial in the ire prone settlements and is currently nonexistent in Monwabisi Park.

Since the area intended to serve as a water center will be a construction project on its own, it would be possible to run an underground and impermeable metal pipe from the main line to the hydrant so as to reduce the possibility of tampering by community members. By having its own dedicated line, the hydrant would be guaranteed to always be functional in case of a fire. To counter the effects of the pressure reduction system on the hydrants, the water and hygiene official would be provided with a radio that would always be in contact with the city in case of emergencies such as a fire. If a fire were to occur, the official would be able to radio the PRV stations to increase pressure to the settlement temporarily to aid the fire brigade's needs.

By installing a hydrant in the facility, its location will always be known to fire fighters and city departments. The need to search for a working hydrant will be eliminated and the fire can be easily and quickly extinguished. Vandalism of hydrants will also be reduced as the facility promotes visibility and subsequently care for the systems is increased.

Fire hydrants will be placed up front and in clear view of residents and the fire brigade as represented by the red hydrant in the integrated plan diagram. It is the hope that by providing easy access to hydrants they can be used more effectively to suppress fires in the informal settlements and eventually lower the instances of shacks burning and to save money and lives.

A fire hydrant as represented in the integrated plan diagram

Methodology and References

The methods for gathering information in Monwabisi Park are outlined below. Through various interviews, visits with sponsors, and field observations, the integrated plan was engineered.

1. INTERVIEW WITH DI WOMERSELY

Upon arriving in Monwabisi Park, the first day was spent with Di Womersely, the creator of the Shaster Foundation and the Indlovu Centre. On this first day, and throughout the time spent, several informal interviews were conducted with Di. She was a good resource for background information on Monwabisi Park and was able to give warning regarding the condition of the taps, toilets, and public health of the population.

Di discussed the community dynamic and sentiments of ownership. She helped in understanding why the current toilets and taps were not working. She identified vandalism as a problem, and the desire for 1:1 ratios for toilets. Ownership of facilities is important in maintaining them, therefore the 5:1 ratio has not been successful.

Initial research was verified with Di and ideas were brainstormed. Di mentioned several alternative options that were tried and failed, such as the biodigester. Exchanging ideas was a good starting point for the project because the area of focus was determined. Di offered support , answered questions, and listened to ideas for the entire time spent in Monwabisi Park.

2. TOUR OF MONWABISI PARK WITH YOLISILE, LUZUKO, AND ANELE

After speaking with Di, the co-researchers were introduced, who would be working in conjunction with the integrated project for the duration of the seven weeks. The co-researchers are members of the community who speak English and can act as guides through the settlements while to assist in gathering data. The co-researchers themselves were great sources of information in terms of how the water and sanitation facilities affect their daily lives.

The tour was focused on C1 section and included the other IQP teams. Basic questions were asked, such as distance of the water taps, conditions of the toilets, and whether drainage is a problem. The tour was documented with initial photos of the area. It was discovered that the distance of the taps and the toilets is a safety issue. The toilets and taps were easy to find because many were located on the main road.

Working with the co-researchers for the first time was a good way to communicate the project objectives and help them to understand the goals. After the initial meetings, they had a good understanding of the ways in which they could assist in gathering data.

3. THE CAPE TOWN WATER AND SANITATION DEPARTMENT

Garnett Jefferies, head of the Cape Town Water and Sanitation Department of Informal Settlements sponsored the water project. Through the department many useful contacts were made and new toilet technologies were investigated. Nashietah Leukes, Jaco Muller, and Luzuko Gangtele were helpful and informative members of the department. Nashietah is a civil engineer, Jaco is a city planner, and Luzuko works in the GIS office.

The first meetings with sponsors involved explaining project goals and how they could help achieve them. The first objective was easily accomplished with the help of Luzuko. A GIS map of Monwabisi Park was obtained, outlining the taps and various toilets. several copies of the maps were used for field observations.

The process of decision making in the city and the conflicts involved in selecting toilet options was discussed extensively. Information about the facilities in Monwabisi Park were received from Nashietah, such as how they are serviced and how complaints are documented. Cost analysis data was received from Jaco for each toilet implemented in the informal settlements. This data consisted of two graphs that showed the installation costs and the maintenance costs per unit per year.

the first day working with the department was spent listening to an Afrisan presentation to the city officials. The presentation was a good insight into the decision making process. Other informal areas were toured, such as Delf, to compare findings in Monwabisi Park with others. Some new attempts at sanitation facilities were found and some that had failed were documented. The city provided large amounts of information about why previous sanitation attempts have not worked.

4. DOCUMENTATION OF TAPS AND TOILETS WITH YOLISILE , LUZUKO, NODUMO, AND THOBISA

The first three weeks of the project were spent gathering data in Monwabisi Park. The mission was to locate every tap and toilet pod in the study area and document their conditions. This would provide a way to analyze general conditions in the settlement.

In order to locate the taps and toilets, the city-provided maps were used as guides. The co-researchers were very helpful in locating the taps and toilets. Most of the toilets were located on main roads, but the taps were scattered throughout the area.

Methods for documenting the conditions were to have one member taking notes, one taking photos, and one to help locate the facilities and mark them on the map. The taps were numbered directly on the map using a simple marker. In the notebook, the numbers were written to correspond with the numbers on the map. The notes that were taken described whether or not the tap handles were both in working conditions, drainage, if there was standing water nearby, if there were leaks and garbage. Most taps were contained in a concrete basin, but some were different and the differences were noted. Two to three photos were taken for each tap.

For the toilets, each pod contained 10 stalls. Documentation included which of the toilets were fully functioning, were locked, whether the nearby tap was functioning, if there was standing water, odors, drainage, and the material used for toilet paper in the blocked stalls. The information gathered was documented electronically.

5. INTERVIEW WITH GLENN AT CLINIC

During one of the visits to Monwabisi Park, Glenn Vondo, the doctor that runs the Indlovu Center Clinic was interviewed. The discussion began with the clinic and his responsibilities. The introduction of the clinic in Monwabisi Park reduced the death rate by 80%. Glenn runs the clinic everyday, alone and sees 50 patients per day on average. The clinic opens early every morning and closes in the afternoons. People from other areas travel to the clinic to visit Glenn.

In the interview, Glenn talked about the prevalence of waterborne diseases, diarrhea being the most dire side effect. Glenn gave a background of all the diseases he encounters, the treatments he distributes, and the educational pamphlets he has tried to use. Glenn agreed to fill in data for the project, documenting the patient number, disease, transmission, and residence of the patient. Unfortunately, the data that Glenn had been collecting was destroyed in the Indlovu Centre fire. Any data that was gathered was lost and cannot be gathered without the clinic facility. However, before the fire occurred, from the six patients Glenn recorded, one suffered from a waterborne disease. Although the statistic is on a small scale, it shows the impact of poor sanitation on the health of the population.

6. INTERVIEW WITH ELROY PLAATJES

Nashietah Leukes provided Elroy Plaatjes, Senior Environmental Health officer for Khayelitsha, as a useful contact. Elroy was able to give the city's perspective and attempts at resolving the public health issues in the area.

Plans for Monwabisi Park were discussed with Elroy and he gave us many of his own opinions regarding the integrated plan. The idea of eco villages and the various pros and cons associated with them were discussed. Elroy was enlightening because of his personal experiences, having worked in the field for 10 years.

After visiting the Environmental Health office, a nearby farm that was run by local women was visited. The farm was an example of sustainability in the informal settlement setting. The farm is completely sustainable and sells its products to local businesses, restaurants, and markets. The day was documented by writing notes based on the interview and taking photos of the farm.

7. CHARRETTES

Through the use of charrettes, findings were presented to the Street Team. Each small grous consisted of a water team representative, community members, sponsors, and other members from the various teams. The teams were able to collaborate with each other and the community to produce four different designs for a water and sanitation facility. The designs were presented to the Street Team and there were discussions about which design was most practical and popular. The charrette was successful because efforts were focused on the community's preferences thereafter.

8. SUSTAINABILITY INSTITUTE

The Sustainability Institute was visited as a large group to see a working eco village in the Western Cape. The gardens and facilities were toured with a guide. The day was documented by writing descriptive notes and taking pictures. Many questions about the facilities and the maintenance involved were discussed. At the Institute, there was a working Biolytix Filter which was considered an option for the water facility in Monwabisi Park. The institute provided with many ideas to use in the communal facility. Options were eliminated based on the landscape characteristics of Khayelitsha. The idea of having a garden became more important after considering the filtration aspect of the Biolytix Filter. The visit contributed to expanding the research on water systems.

9. EMAILS WITH FORGREEN COMPANY

The Forgreen Company is responsible for creating the hybrid sanitation system. The company was emailed regarding more details about the new technology. The company did respond to the emails and answered detailed questions, gave costs, and was helpful in learning about the various situations in which the toilet system could be used.

The details that were learned from the emails included specifics about the EP 25 and EP 50 tanks. The EP 25 tank accommodates 40 people using the toilets for 8-10 hours per day and the EP 50 tank accommodates the same number of people but they use the toilet for 24 hours per day. The details about the EP 25 tank are:

The septic Tank is 1,6m diameter and 1,6m high. The clarifier tank is 1,2m diameter and 1,5m high. Space required would be 1,6m wide and 2m long. The leach field is a 75mm pipe which carries the effluent to a slotted pipe which is placed in the ground next to the clarifier tank above the stones which are used to backfill after the two tanks are placed in position in the ground. The cost of the EP25 is R 14150.00 Ea. The cost of the EP50 is R 22480.00 Ea. The costs do not include the excavation fees which are R2700.00 per day. The sludge removal is once in 5 -7 years dependant on frequency of use.

10. EMAIL WITH AIDG

The AIDG (The Appropriate Infrastructure Development Group) company has implemented biodigesters worldwide. In order to gain more information about biodigesters, the company was emailed. The response discussed the effects, both positive and negative. The response from the company confirmed that an inexpensive biodigester make of polytube cannot work for human waste. The company suggested using a water jacket digester, which can cost as much as a few thousand US dollars.

11. INTERVIEW WITH BUYISWA

In our interview with Buyiswa, we discussed creating the water services specialist. She agreed that a liaison is much needed in Monwabisi Park. We presented our job description to her and we discussed improvements to the form. We drafted a simple application with her help and later expanded upon it. Buyiswa was excited to undertake the sanitation specialist initializ

ation as soon as possible.

12. THE LEAKS PROJECT

In discussions with Nashietah about the water services specialist, she referenced the Leaks Project. The Leaks Project was a training program for community members who were interested in learning plumbing and maintenance of current facilities. The Leaks Project occurred once, but the concepts are essential in creating the water services specialist in Monwabisi Park. The Leaks Booklet is a valuable resource for maintenance education and can be found in the Appendix of the atlas.

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Energy Services

CHAPTER FIVE CONTENTS:

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Energy Services: Introduction

Residents of informal settlements often struggle to get all of the energy services —electricity, heating and cooking fuels—they need to live. Developed with little structure or organization, Monwabisi Park has many of the same energy problems common to informal settlements across the globe. Fuel for heating and cooking can be expensive, and electricity is often unreliable and expensive to maintain. And because scrap materials are regularly used to build shacks, and insulation is too expensive for most residents, heating efficiency is typically poor. This state of affairs directly affects the resident's safety, health and economic status by making them vulnerable to the cold, fires and expensive energy services.

Traditionally the approach to upgrading in informal settlements has been extremely harsh on the community itself. The community is often displaced on large scales in order for large areas to be redeveloped. This approach requires extensive infrastructure utilities development. This restructuring would be a very drastic change for the people of Monwabisi Park, who have grown accustomed to their current living arrangement. Redevelopment has not occurred in Monwabisi Park due to the extensiveness of the problem and the lack of materials, manpower and capital of the government.

We have established many goals for ourselves in our approach to the problem. We would like to determine alternatives that would benefit the community while keeping in mind their preferences and lifestyle. We would like these alternatives to provide less dangerous and more cost effective energy practices. Lastly, we want to suggest ways these goals could be realized in the future redevelopment of Monwabisi Park.

In order for us to accomplish these goals we had to first document the current conditions of Monwabisi Park. We found that the residents of Monwabisi Park currently use a few primary energy sources to provide the services they need. Burning paraffin fuel for cooking and home heating is common throughout the informal settlements. Paraffin as an energy source has notable disadvantages being that it is more expensive than electricity, it is extremely dangerous and it causes fires which do extensive damage in the congested settlements. Electricity is provided only to those residents who have an official address registered with the government. Although this electricity used for cooking and heating is fairly inexpensive, it is often unreliable. We found some interesting statistics of the study area one of which being 61% of residents rely on illegal and unreliable electrical connections. Another important statistic is the fact that 40% of residents use paraffin for heating, even though it is clearly dangerous. We also found that it is extremely rare for residents to conserve their electricity and thusly they seem to be spending more money than necessary on the service.

In what follows we propose a possible solution to the energy problems of Monwabisi Park. We first document the current energy practices and associated costs in the community to better understand the current challenges to upgrading. We then consider energy conservation possibilities, an energy education initiative, and, more broadly, an alternative energy plan for Monwabisi Park.

Figure 5-1: An Eskom worker repairs the power lines after the fire in Monwabisi Park.

Access to Electricity

In Monwabisi Park, access to electricity is limited by a number of factors, such as high costs, lack of reliability and limited connections to official power lines.

PURCHASING ELECTRICITY

As with other low-income areas in Khayelitsha, Monwabisi Park is characterized by multiple fuel uses for energy services. The majority of residents prefer electricity for cooking, lighting, and to power other appliances in the home. Electricity is provided by the public utility Eskom, which is responsible for distributing and maintaining the system of electricity prepayment. This was created to address the issue of poor infrastructure in many of the areas which Eskom delivers electricity.

Electricity is expensive for the residents of the community, costing about R0.60/unit (kWh). In order to help provide aid to low-income areas, Eskom allots 50kWh of free electricity every month for people buying electricity with a prepayment meter. Of the residents we polled, families pay between R50 and R200 each month for electricity. This is a significant portion of most families' monthly income.

ACCESS TO ELECTRICITY

A major concern of residents besides the high cost of electricity is direct access to the grid. Electricity is brought into the settlements via above ground wires on wooden poles. Each family with a box has a wire which runs directly to the top of a pole. In C section of Monwabisi Park, the southern section, C2, is made up of residents who do not have access to an electricity pole. The majority of residents in this area still use electricity, but must share a prepayment meter with someone in section C1. To do this, the homeowner must run his own wire, which costs him about R150 for 100 meters, to another home and pay the meter owner. Families without their own prepayment meter do not have access to the 50 kWh of free monthly electricity. Anywhere from 2 to 8 families share one prepayment meter in section C2.

ELECTRICITY DISPENSER

The Electricity Dispenser (ED) is how residents of Monwabisi receive their electricity. The meter is installed by an Eskom employee for a fee of R200. Boxes can only be installed on homes with official house numbers. The customer can then travel to a Credit Dispensing Unit (CDU) to buy credit for a finite amount of kilowatt hours to use from their box.

There is almost unanimous agreement among residents without direct access to the electricity grid that they would like to have their own prepayment meter and not have to share a single meter with multiple families. There is a desire of residents to be inde-

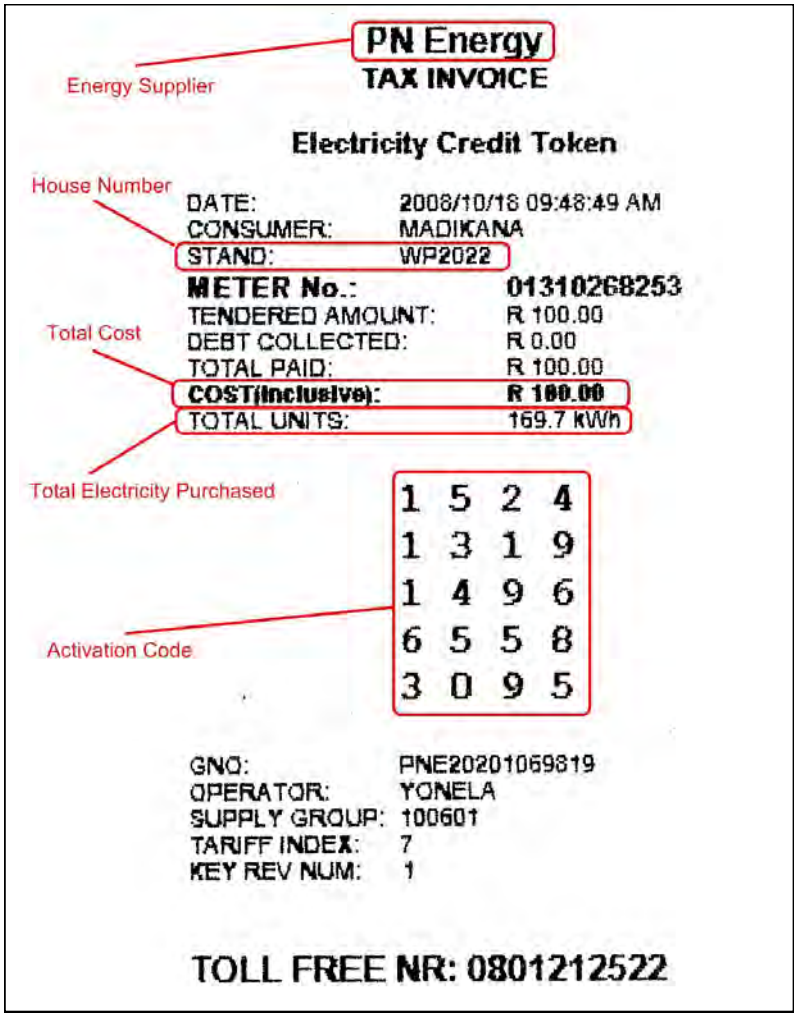


Figure 5-2: A breakdown of an electricity purchase slip from Monwabisi, showing the cost, how much was purchased, the activation code, etc.

Figure 4-3: Official connections fan out from power poles to boxes.

Figure 5-4: Those with informal connections must put up their own wires and poles.

Issues with Service

The homemade electrical connections used to share electricity have many problems associated with them. Long wires are often stolen by other residents. Connections which are deemed to be unsafe or illegal are taken down by city officials without warning. Many residents complain of electricity outages during rain or high wind due to exposed or weak connections. The electricity is also much less reliable when a family does not own their own prepayment meter. Most of the residents we polled said that they often experience electricity outages for long periods of time due to the fact that too many people share the same prepayment meter.

One woman interviewed said there are some months where her electricity is out for most of the month, but the owner of the prepayment meter she gets uses still expects her share of the bill at the end of the month. We were also told by two residents of times when power surges destroyed their home appliances. People without their own prepayment meter must often augment their cooking schedule to avoid using the electricity at the same time as other people using the box.

Electricity Usage

Within each household, energy use can be split into various services. These services include cooking, home heating, water heating, lighting, and powering various other appliances. Electricity is the only option for powering many of the appliances which residents of Monwabisi Park use. How electricity is used is important in order to determine how it can be better conserved and therefore cost less.

We found that many of the residents own a television, a stereo, and a refrigerator. During interviews with our co-researchers, we learned that many people leave stereos running for long periods of time, even when they are not at the home. It is clear that there are opportunities for energy conservation.

Energy Conservation

Some residents turn their refrigerator off during the night in an effort to use less electricity. Electricity is also used primarily for lighting people's homes. All homes we saw with any access to electricity had 1 or more electric light bulbs. A few of the homes we saw used compact fluorescent light bulbs (CFL) which use far less electricity than a standard incandescent bulb. The users of these bulbs were aware of the energy benefits of the CFLs. Homes without electricity mostly use paraffin lamps to light their homes.

While most of the electrical appliances don't use as much electricity as cooking or heating does, when combined they make up a significant portion of a household's monthly electricity expenditure.

Those with informal connections must put up their own wires and poles as shown in the bottom picture.

Appliance	Wattage	Hours Used / day	Monthly kWh	Monthly Cost
Electric Heater	1500	2.5	112.5	R 66.29
Electric Stove	1500	1	45	R 26.52
Electric Kettle	2000	0.5	30	R 17.68
Refrigerator	225	4	27	R 15.91
Microwave	1500	0.5	22.5	R 13.26
Stereo	110	6	19.8	R 11.67
Television	100	6	18	R 10.61
Radio	70	6	12.6	R 7.42
Fan	200	2	12	R 7.07
60 Watt Incandescent	60	5	9	R 5.30
VCR	40	2	2.4	R 1.41
15 Watt CFL	15	5	2.25	R 1.33
Cell Phone	5	3	0.45	R 0.27

Figure 5-5: Monthly home electricity usage by appliance. These numbers are based off of known appliance wattages and usage and cost estimates taken from our interviews.

Cooking in Monwabisi Park

Electricity is the preferred method of cooking by most residents because of its simplicity and low cost. When electricity is not available, residents use more expensive paraffin and LPG stoves.

Cooking Appliances

The appliances used to cook vary from home to home. Electric stoves are often the appliance of choice, however if electricity is unavailable other appliances must be used. Frequently paraffin stoves are chosen as replacements for electric stoves when there is no electricity. The paraffin for these stoves is more expensive than electricity and the stoves can be dangerous, causing them to be much less popular. There are two basic types of paraffin stoves, the flame stoves and primus stoves. The flame stoves, deemed illegal by the South African Bureau of Standards (SABS), are the most dangerous. 3 out of the 15 people we surveyed used a flame stove for either cooking or heating. Cooking with solar energy is hardly ever done. Hot boxes are insulated containers that let the food continue cooking without fuel after an initial stove heating. The only location that uses this is the community soup kitchen.

When electricity is used for cooking the costs are much less than if paraffin or LPG is used. If cooking takes 4 hours per day, it costs R3.54 on an electric stove. Paraffin costs R10 per liter and will be used in about two days. Gas is slightly less expensive than paraffin; however the initial cost of the stove is much more. The initial costs of all of the stoves are rather high, with electric stoves costing 100-150 rand, paraffin flame stoves costing 100 rand and primus costing 140-150 rand.

The people of Monwabisi Park usually cook 2-3 times per day. Depending on what they are cooking, it can take anywhere from 30 minutes to 3 hours. A common African meal, samp and beans, takes 3 hours to cook and is considered hearty and healthy. Another common meal, mealie pap, only takes around 30 minutes to cook, but is not considered to have as much nutrition.

Paraffin and LPG Usage

A common trend among informal settlements such as Monwabisi Park and many others in Khayelitsha is the use of electricity as the primary source of energy used for cooking. However, the electricity acquired by the residents of Monwabisi Park is not reliable enough to use it without any backup energy services. When there is bad weather such as rain the power tends to cutout thus leaving the residence without a source of power to cook with. As a result, most residents have a backup source of energy for the times that the electricity is not available. In section C2 this 'backup' source of electricity is their main form of energy used for cooking because they are not provided with electricity. 57% of the eighty-six people we interviewed use electricity as their primary cooking source and 23% use paraffin as their main cooking source. The cost of paraffin is too expensive for using it as the primary cooking source when compared to electricity because to cook food for three hours uses 2L of paraffin which is expensive if you are cooking multiple meals in one day. However, electricity only costs R10 for 17kW/h and that is more than enough to cook enough for a day and a homeowner usually pays between R50 to R200 a month for electricity which is much less than if paraffin was the primary energy service. LPG and other energy sources are used less frequently as a primary or backup cooking source because it costs R85 for LPG which will not last a month.

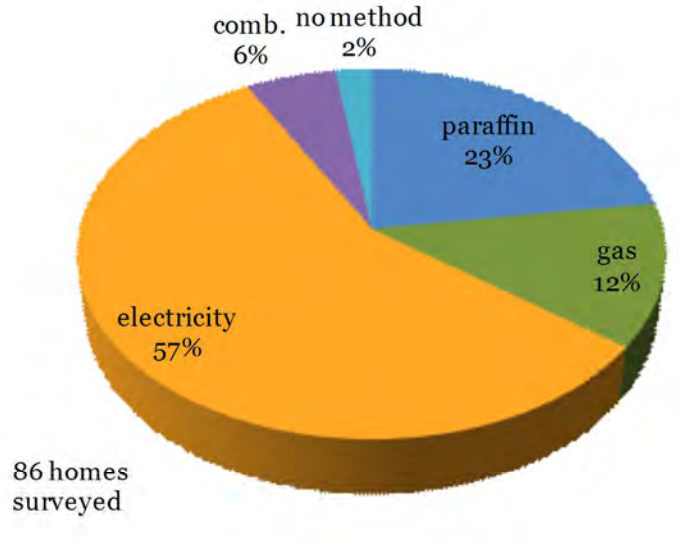
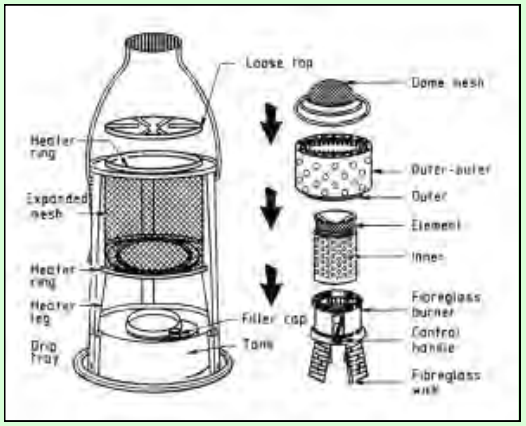


Figure 5-6: Breakdown of methods for cooking in C section of Monwabisi Park

Paraffin Stoves

Due to their affordability, the majority of paraffin stoves used in informal settlements are unpressurized units. However, the cheap nature of these stoves also makes them extremely prone to problems when in use. The point at which paraffin can catch fire is 43°C and when a standard paraffin stove is in use the entire unit heats up including the fuel. If the stove is knocked over the fuel will ignite instantaneously and potentially set fire to everything around it. However, with the paraffin maintained at a lower temperature with a unit such as the primus stove, there is a lower risk of ignition if the unit is knocked over.



Home Heating and Insulation

Residents need to heat their home and protect their houses from the cold temperatures and high winds of the Cape Town area.

HEATING HOMES

The winter in the Cape Town area can face low temperatures averaging 12.6º C (54.7º F) and often dropping to 7º C (44.6º F) during the evenings. The winter evenings are the coldest times faced by the people of this community. The informal construction of the homes in Monwabisi Park often uses corrugated metal, which is an extremely poor insulation material. The metal on the roofs often have nail holes or gaps between sheets which cause leaks during the incessant rain of the winter season. One woman we interviewed has to use blankets to keep her family warm during the winter. She told us how the leaks in the roof end up soaking the blankets, and then she must struggle to try to dry the blankets outside in the cold, rainy weather.

Figure 5-7: Typical shack roof which often leaks during the wet, winter season.

Paraffin is often used for home heating during the winter months. Through background research and interviews it was found that these heaters are very dangerous and often produce harmful toxins that can build up in the homes, especially if ventilation is limited. With a burning material in a home the build-up of toxic gases can form, which has killed people in the informal settlement. The danger of the device falling over is very high, and can often result in fire destroying many nearby houses. Electric heaters are not common, yet they are present in a few homes in Monwabisi Park. These electric heaters are much safer yet they do cause a rise in the electricity bill.

If paraffin is used to heat in the winter the costs are very high for the families in this community. The imbawula is popular because it is free; the fuel comes from gathered scraps and the can is recycled. While this is a very popular form of heating, it is often something the community members do not admit to unless asked directly. Electric heaters are less common, but after the initial cost of buying the heater the cost of the electricity is less.

Heating costs are often much higher because the heat escapes from the building at a very high rate. This forces the devices to constantly be running in order to replace lost heat on top of the cold coming in from outside.

IMBAWULA

The imbawula is a metal can with holes cut in for ventilation. They are commonly used for heating because the homeowner can collect firewood from the surrounding areas and burn it in the imbawula without having to pay for fuel, which is important to someone who needs to survive on a limited budget. However, residents do not like admitting that they use an imbawula for heating because it makes the homeowner appear poorer than others because they are not purchasing fuel. After burning wood in an imbawula to a point when only hot coals remain, the homeowner brings the imbawula indoors so that it can heat his or her home without having a direct flame present. There are many safety concerns when using an imbawula, such as setting fire to the home if knocked over or the release of toxins that poison the air in the closed home.

HOME INSULATION

Some steps have been taken to "insulate" in shacks. Often times, newspapers or other scraps are placed in holes in the walls in order to eliminate the wind from entering

Figure 5-8: Current shack insulation methods include cardboard on walls, newspaper and other random materials in gaps and boards on the exterior.

and the heat from leaving in the winter. On a few occasions we saw people who had covered their walls with cardboard. Often this was done for an aesthetic purpose, but they realized that it would help with heat loss in the winters. Overall, insulation is very limited in the shacks and improvements are needed to improve efficiency and cut heating costs.

PARAFFIN AND LPG USAGE

The winter months in South Africa can be extremely difficult to endure when living in informal settlements because of people's lifestyles. Monwabisi Park represents how people in informal settlements throughout Khayelitsha heat their homes throughout the harsh winter season. From our interviews we discovered that an astounding 27% of the eighty-six homes surveyed did not heat their homes in the winter as a direct result of lack of funds. Electricity is the primary source of cooking used in Monwabisi Park; however, it is not the primary source of heating used by the park's residents. Paraffin and Imbawulas are the main sources of heating during the winter season consisting of 56% of the eighty-six homes interviewed. LPG is not practical in heating a home because it expensive and is not efficient enough to provide a substantial amount of heat for a home. Imbawulas usage makes up 16% of the energy usage for heating because the homeowner can collect firewood from the surrounding areas and burn it in the imbawula without having to pay for fuel; which is important to someone who needs to survive on a limited budget. However residents do not like admitting that they use an imbawula for heating because it makes the homeowner appear poorer than others which is not the case for most residents. Paraffin makes up 40% of the energy usage in Monwabisi Park as a source of heat because it is quick and effective at heating a home throughout the day. However there are many problems with heating a home with paraffin because fires and health issues arise from their usage in informal shacks.

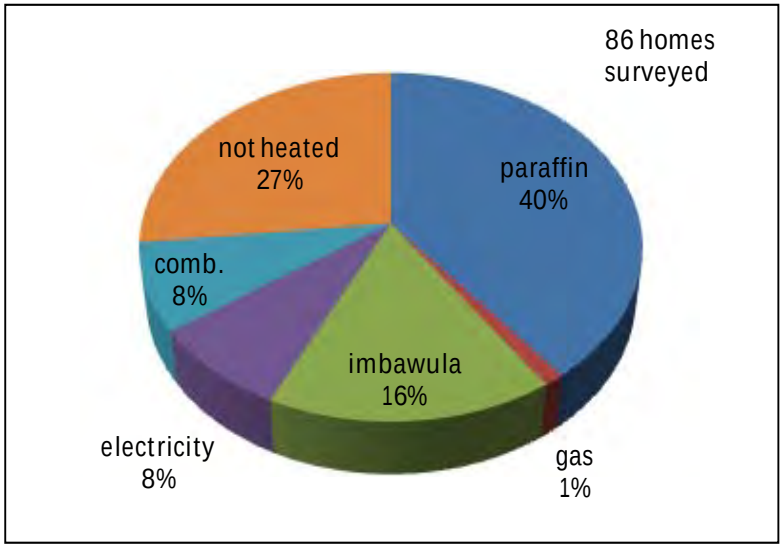


Figure 5-9: Breakdown of methods for home heating in C section of Monwabisi Park

As well as the fuel itself being toxic, the burning of paraffin also releases harmful fumes which have been shown to cause health complications in homes that use it. The combustion of paraffin is known to release carbon monoxide (CO), carbon dioxide (CO2), nitrogen dioxide (NO2), and particulate matter. Studies have shown that the inhabitants of homes using paraffin regularly can suffer from acute lower respiratory infections, most commonly pneumonia and bronchiolitis **(Muller, 2002).** The harmful effects of these fumes would be minimized if the fumes were properly ventilated, however the homes of informal settlements often have no windows and provide little ventilation. Even if these homes had windows and more ventilation, this airflow would cause much of the heat to go out as well. The residents are forced to choose between toxic fumes and cold houses. The people are limited to certain energy services because electricity and LPG are not effective sources of energy to heat a shack. Therefore, people are "forced" to use paraffin and imbawulas as a source of heat during the winter season.

LIQUID PETROLEUM GAS STOVE

Liquefied petroleum gas (known as LP Gas or LPG) is a fuel which has seen widespread use across the globe, and some successful use within South Africa. LPG is a varying blend of butane and propane. It is not renewable, but it is much cleaner, and much safer than paraffin. The stove itself consists of a steel cylinder, a simple pressure regulator, a burner, and a hose connecting the regulator to the burner. They tend to last as long as 10 years, with only the inexpensive rubber hosing needing to be replaced every few years (Bizzo and Calan et. al., 2004). Propane and butane in their regular forms are gases, and LPG only becomes a liquid when it is pressurized. Because of this, LPG comes in pressurized cylinders of varying size designed specifically to be able to withstand the pressure of the gas, and safely release the fuel into a stove without leakage. As LPG becomes depressurized, it turns back to a gas, so within the tank, the liquid stays at the bottom, while the vaporized LPG floats to the surface and is released. This leads to safety concerns, because LPG in its gas form is invisible, and can rapidly ignite if proper care is not taken.

Solar Water Heaters

Utilizing the solar radiation in the Cape Town area, Solar Water Heaters are a technology which can provide reliable hot water with no fuel cost and minimal maintenance. Because of the high up front costs, these devices would be best utilized in community buildings or in a centre where many residents could get hot water.

Solar water heaters are a popular energy saving measure in middle to upper class areas of South Africa. SWHs provide an effective hot water supply with no fuel costs, and minimal required maintenance. Available SWH designs have certain requirements that make them impractical for individual ownership in Monwabisi Park. Firstly, they require substantial initial capital to purchase and have installed. They must be safely secured and properly oriented, requiring professional installation. As seen in Figure ***, purchase and installation of a close-coupled unit can cost R15 000 or more. Residents of Monwabisi Park cannot afford such an investment.

The SWH must also be mounted on a roof, or some other raised area to properly function. They hold a 150-300 L tank, and therefore must have a secure roof to be mounted to. The construction of shacks in Monwabisi do not allow for such a structure to be attached to them. Attempting to mount a SWH to a roof of a shack would be very unsafe.

SWHs also require a constant piped water source to function properly. Currently no residents have water piped to their house, and the water provisions department of Cape Town currently has no means of expanding water piping or water taps in the area any time in the near future. Piping water to each home is unrealistic and is not considered in our plans for future redevelopment.

With an expensive piece of technology like a SWH, theft is a concern in Monwabisi Park. Copper piping is very valuable, and any system designed with copper has the potential to be a target of theft. When we interviewed city staff member Wouter Roggen about the Kuyasa Programme, he said that copper piping which is painted black is both more effective at absorbing thermal radiation, and disguises the metal making it less likely to be stolen. Along with theft, the issue of maintenance would be difficult for an individual owner to deal with. While Mr. Roggen informed us that there had been very few required repairs to the Kuyasa SWHs to date, some repairs are inevitable and would likely be very expensive.

These factors make the idea of having each home equipped with a solar water heater unrealistic. A more feasible idea would be to have a centralized facility that could provide hot water to a portion of the community. A single building with enough roof space to fit multiple heaters could generate a great deal of hot water. This water could be provided to people in insulated carrying containers. People could pay a minimal fee to have access to this water, helping somewhat offset the initial capital investment, or provide employment to someone working at the facility. The idea of centralized hot water was introduced to some members of the Street Committee during the first charette, and it was well received.

Participating Supplier	Active areas	Registered System	Indicative retail price	Expected installation	Qualifying rebate
Alt E Technologies Regional contact numbers: Gauteng: 086 111 6182 Western Cape: 021 511 9504	Eastern Cape Gauteng KwaZulu-Natal Western Cape	**Alte GH 150i** 150 Litre Flat Plate Indirect Thermosiphon	R13 000,00	R2500,00 – R3000,00	**R2211**
		Alte K 200-1i 200 Litre Flat Plate Indirect Thermosiphon	R13 140,00	R2500,00 – R3000,00	**R2084**

Figure 5-10: These, and many other SWHs are included in a list of Eskom-accredited suppliers. Eskom will provide a rebate for households who install one of these SWHs.

THE KUYASA PROGRAMME

Registered as a project of the Clean Development Mechanism of the Kyoto Protocal on 27 August 2005, the Kuyasa Programme seeks to improve the energy efficiency of homes in Kuyasa, Khayelitsha. It seeks to achieve this by outfitting 2300 homes with 3 energy improving additions:

1. Solar Water Heaters
2. Insulated Ceilings
3. Compact Flourescent Lighting

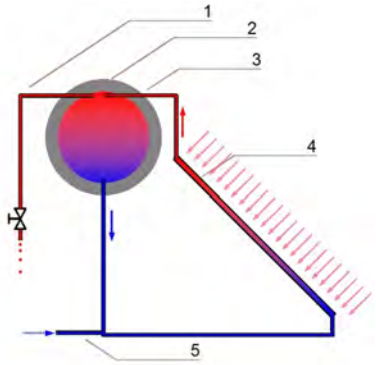
After starting with a testing group of 10 homes in 2003, the program is currently working on installing these additions in 2 300 homes in Kuyasa.

The Kuyasa project was the first project in South Africa to be registered as a CDM project, and the first in the world to be awared the UN's "Gold Standard" for CDM projects.

The carbon emission reductions caused by the implementations of the Kuyasa project are registered by the CDM and sold as partial funding for the project.

There are many different designs available for SWHs, but they fall into two main categories: close-coupled systems and integral systems. A close-coupled system consists of three parts: an absorbing plate, energy transfer loops, and a storage tank. The storage tank is mounted above the absorber, and cool water flows from the bottom of the tank through the transfer loops into the absorber. The water is then heated by the sun, and flows back into the storage tank in a process known as thermosiphoning. The integral unit consists of an absorber which is large enough to double as a storage tank. The close-coupled unit is approximately 4 times the initial cost, but is much more efficient than the integral system, achieving higher temperatures for longer periods of time. The testing phase of the Kuyasa Programme involved the installation of 8 close-coupled systems and 2 integral systems.

Integral SWH *diagram with input from a public water supply, and output into household faucet.*



Close-coupled SWH
1: water tap
2: isolated container
3: warm water inlet
4: solar thermal collector
5: fresh water supply

Water from a close-coupled SWH is heated to above 50˚C, but loses temperature as more water is required. There is a limit to the rate at which hot water is produced. According to Figure 5-11, the heater can only produce about 60 litres of water above 40˚C at once before it needs time to heat up again. Tests would need to be conducted to see how much time they would need to heat up before more water can be drawn.

A centralized facility would also need a source of backup heating ability. SWHs will not function well on overcast days and a system of LPG or electric water heating would be necessary. A system of extremely efficient kettle-like water heaters that heat water with exposed heating elements in insulated containers could be used in order to minimize the electricity drawn by the water facility.

Overall, the facility would require a building to house one or more employees to maintain the water heaters, and to store insulated water transporting vessels. The building would require adequate secure roof space to hold enough SWHs to provide hot water to the portion of the community the facility serves. A piped water source would need to be run from the city's water supply in order to provide the SWHs with a water source. Plumbing within the house would also need to run hot water from the SWHs down to a faucet for filling containers. The capital required to create such a facility would be substantial, but it would provide a necessary service to the people of Monwabisi Park in a sustainable way which promotes a sense of community.

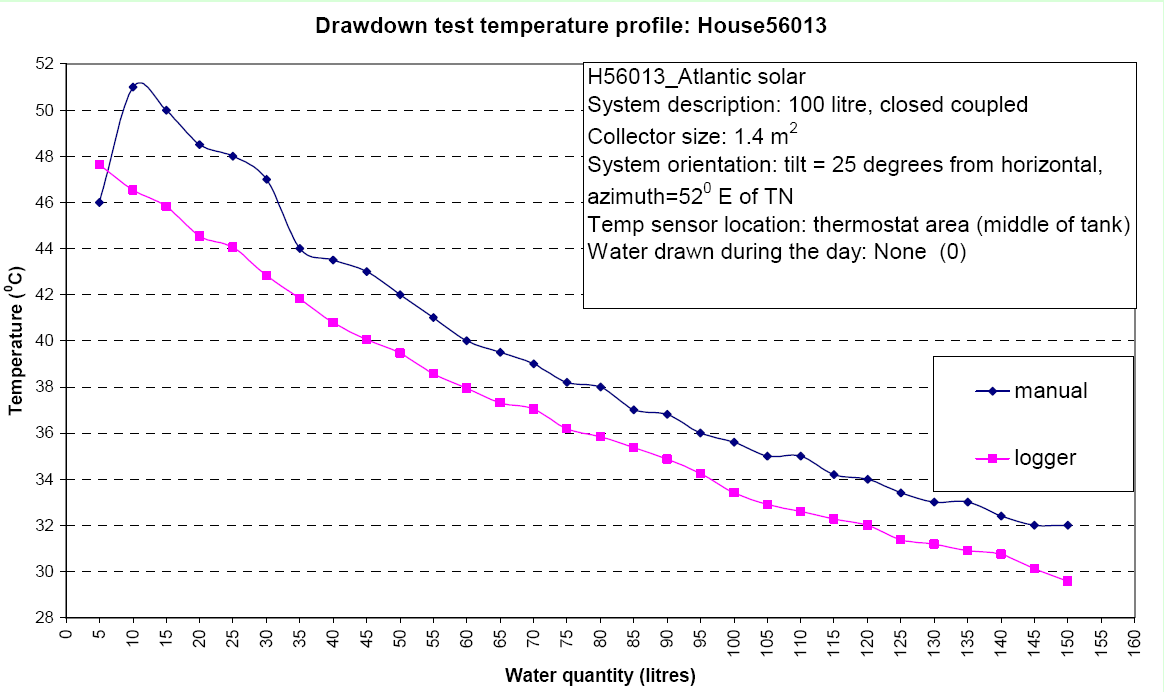


Figure 5-11: As part of the testing phase of the Kuyasa Project, a close-coupled SWH was tested for temperature output. The water was tested by a data logger inside the storage tank (pink) and manually at the faucet (blue). As more water is continuously drawn from the system, the temperature steadily declines.

Household Electricity Conservation

Steps toward a sustainable community must start with households learning how to reduce energy costs making efforts to conserve electricity.

Based on our research of existing conditions in Monwabisi Park, there are many opportunities for residents to conserve electricity. Electricity conservation can be achieved on a community-wide scale, or just by a single home monitoring its electricity use. We learned that many people in the community run appliances longer than they need to, without realizing how much electricity they are actually using. The City of Cape Town's Environmental Resource Management Department suggests in its SMART Living Handbook that every household create an "Electric Appliance Audit Sheet," which documents the same data as in Figure 5-5, but allows the resident to fill out the actual appliances and usage rates in their home. Making some simple calculations can show people exactly how much each appliance is costing them each month. It also allows people to see, for instance, how much money they could save each month if they turn off an appliance for a certain period of time each day.

Creating a complete electricity audit for a household will not be possible for many residents. Most residents of Monwabisi Park will not be able to perform the calculations necessary to accurately predict their monthly electricity usage. This task could instead be performed by an energy specialist. For people who need assistance with the calculations, they could simply fill out the type of appliance they use and the number of hours they use it each day. The wattage of the device could be either read off the device, or the Energy Specialist would be able to make an estimate based on the model of the appliance. The energy specialist would have data on typical appliance wattages, and be able to make an accurate estimate of the electricity used by each appliance. Running these figures through a simple spreadsheet could produce a complete electricity budget for the household. The Energy Specialist could also show potential energy savings by also showing the cost of appliances with slightly reduced usage times.

The exercise of performing this electricity audit is to inform people of exactly how much money they are spending with each individual appliance, as opposed to just seeing how much their total electricity is costing them. It creates a better awareness of costs, and show where there is opportunity to save. As shown in Figure E1, the majority of an average home's electricity usage goes into cooking, heating, and refrigeration. Therefore, people can focus on those services, where there is the most potential to save money.

The simplest way to save electricity is to just use appliances less. If residents used a 1500 Watt electric plate stove for just 30 minutes less each day, they would save R13 each month. Using awareness of the cost of different appliances, limiting the use of all appliances could turn into substantial energy savings. Refrigerators, however, are one appliance where limiting time that it is "turned on" is not necessarily helpful. We learned that some residents of Monwabisi Park turn their refrigerator off at night in an effort to save electricity. Turning the fridge off for a period of time every day will not actually save any electricity. The fridge only consumes electricity when the internal temperature drops below a certain level. They use very little electricity when they stay closed for long periods of time, and if it were allowed to heat up over the course of the night, it would run for a long time when it was turned on in the morning. A comparable amount of power is used, and food can spoil in a fridge that does not stay cold throughout the night. Keeping the condenser coils clean and making sure the rubber seal on the door is intact, however, are good ways to make sure your refrigerator is as efficient as possible. However, the best way to reduce electricity usage for refrigeration is to purchase a new refrigerator. Refrigerators today use as little as 200 Watts when running, which is many times less than refrigerators of the past.

GE® ENERGY STAR® 25.4 CU. FT. SIDE-BY-SIDE REFRIGERATOR

578 kWh
Estimated Yearly Electricity Use

Monthly Electricity Use:
48 kWh/month
Monthly Operation Cost:
R28/month

Power Ratings:
Volts: 120V
Hertz: 60Hz
Amps : 15A

ENERGY STAR

Electric lighting is essential to most residents of the community, and the majority of people we met use inefficient incandescent light bulbs. The use of Compact Fluorescent Light bulbs (CFLs) could greatly reduce energy usage. A 60 Watt incandescent bulb can be replaced with an 11 Watt CFL that provides the same amount of lighting. However, he upfront cost of purchasing a CFL is about 5 times greater than an incandescent bulb, costing about R12 for an 11 Watt CFL. It is difficult for low-income families to make the investment in a much more expensive bulb, even if it would save them money farther down the line.

In an effort to provide people who are not able or willing to pay the upfront costs with CFL replacement bulbs, Eskom has a "CFL Exchange" programme. They send Eskom employees house to house to install CFLs for free in exchange for the old incandescent light bulbs. The programme was started in response to rolling blackouts across South Africa due to insufficient energy supply. To date, Eskom has provided residents in South Africa with 22.2 million CFLs. According to Eskom, if every household in South Africa were able to switch to CFL lighting, it would save a total of 1,350 MW, which half the amount of electricity that can be produced by a coal-fired electricity plant. The Cape Town area had a roll-out of free CFLs in 2006, and we saw that one of the women we interviewed had a bulb that was labeled as part of a free Eskom roll-out. By the end of 2008, Eskom will have given out approximately 35 million CFLs, which they believe will just about saturate the market, making future roll-outs much smaller. Eskom intends to resume CFL roll-outs as this generation of free lamps starts to die out. The Department of Minerals and Energy, however, has started talks about banning incandescent bulbs, which would end the Eskom roll-outs.

To show the potential for a single household to reduce their electricity use, we have created an electricity audit that would describe an average household in Monwabisi Park. To save energy we suggest first of all running the electric stove just 30 minutes less each day. This can be achieved by either not cooking as often, or by using a hotbox to reduce cooking times. To reduce the cost of refrigeration, the 500 Watt fridge could be upgraded to a new unit which only runs at 250 Watts. The television and stereo could be turned off for a period of each day, and the incandescent bulb could be replaced with a CFL. All these energy conservation ideas would result in R39.60 being saved each month.

Without the expensive refrigerator upgrade, these energy saving measures would still save approximately R20, which is about 1.5% of a person's income who earns R1 500 a month. They are very simply measures, which would not require high initial capital, or practices that would be difficult for people to incorporate into their daily lives. With upgraded appliances, and stricter reduction of appliance usage, households could easily save much more.

CFLs come in a variety of wattages, shapes, and light qualities

Appliance	Old Wattage	New Wattage	Old Hours Used / Day	New Hours Used / Day	Old Monthly kWh	New Monthly kWh	Old Monthly Cost	New Monthly Cost	Savings
Electric Stove	1500	1500	3	2.5	135	112.5	R 79.55	R 66.29	R 13.26
Refrigerator (2008)	500	250	4	4	60	30	R 35.36	R 17.68	R 17.68
Electric Kettle	2000	2000	0.5	0.5	30	30	R 17.68	R 17.68	R -
Television	150	150	4	3	18	13.5	R 10.61	R 7.96	R 2.65
Stereo	50	50	6	4	9	6	R 5.30	R 3.54	R 1.77
11 Watt CFL	60	11	4	4	7.2	1.32	R 4.24	R 0.78	R 3.46
						Total:	**R 152.74**	**R 113.92**	**R 38.82**

Figure 5-12: Potential Energy Savings for a typical household in Monwabisi Park.

Redevelopment: Insulation

Benefits	Reduces amount of energy needed to keep home warm.
How it Works	Decreases heat lost through exterior surfaces.
Used in Community?	Was used in old community center buildings.
Ways of obtaining	Local hardware store.
Money Spent	Varies
Money Saved	25-75% of current energy costs
Problems to Be Considered	Fire, Leaking ceilings, Installation, Ventilation

A major waste of energy in Monwabisi Park comes from the loss of heat in the winter due to poorly insulated shacks. Roughly R300 is spent monthly to heat the homes in the winter and it is estimated that 25-75% of that cost could be saved by insulating various parts of the homes. Insulation is another example of a solution that has a higher initial cost which makes it difficult for community members to take advantage of it. Insulations that are available in the Cape Town are depicted in the figure to the right.

Insulation is used to reduce the amount of heat transfer through a home's outer surface. The amount a material can resist heat transfer is defined as its "R-Value." The greater the r-value the more effective the insulation is. The SI unit for r-value is Kelvin square meters per watt ($K*m^2/W$) but in the United States degrees Fahrenheit, square feet hours per Btu ($ft^2 \cdot °F \cdot h/Btu$) is used instead. Using insulation can reduce the amount of money needed to heat a home in the winter and keep it cold in the summer. Heating a home in the winter in Monwabisi Park is vital and often requires a decent amount of their monthly income. Money is a very important factor in the resident's lives and anything that they could save would be beneficial.

Insulation can be installed in the walls and ceiling of a home. The most critical areas are the outer walls and the ceiling. There are many different types of insulation available to the people in South Africa. Common insulation materials used are isotherms, isoboard, cellulose and sand. Basic information about these materials is shown in figure ##. Isotherms re an environmentally friendly material which is made from recycled plastic bottles. Isotherms are readily available in local hardware stores and sell for roughly 200 rand per roll. This is a huge initial cost for the people of Monwabisi Park whose average income is around 1500 rand/month. To decrease the amount of insulation needed to insulate a home it would be practical to insulate just the ceiling. A huge portion of heat is lost through the ceiling due to the fact that heat raises and often gathers in the top portion of the shack. Economically insulating just the ceiling would be most beneficial to people who lack significant funds to cover the initial cost of the material. Isoboards can accomplish this type of insulation easily and could eliminate the need for decorative 'ceiling boards' that a portion of the homes in Monwabisi Park have. Using sand as an insulation material is common in ecobeam construction. This construction fills the spaces between the ecobeams with bags filled with sand which act as an insulation to the home. This insulation is only possible in the walls of the building, however, and another type of insulation would be needed to insulate the ceiling.

Insulation is not a concept that is very common in Monwabisi Park. Currently no shack we toured had used any form of insulation. The closest concept we encountered was the fact that people placed balls of newspapers in the voids between their building materials to eliminate the effects of wind they could feel through these holes. In the old community center buildings, however, insulation was used in the walls. In the Guest House sand was used as insulation due to its ecobeam construction; in the youth center/soup kitchen/ health clinic isotherms were used in the walls; in the backpackers lodge sand was used, again because of its ecobeam construction. Buyiswa, a respected resident and community center employee, said she could often feel the effects of the insulation in these buildings compared to other buildings that lacked the insulation. She said that these buildings often were warmer in the winter and cooler in the summer and that the heating costs of the buildings were significantly less than what they would have been if the buildings lacked insulation. Another current use of insulation materials can be seen in the Kuyasa project. This project is located in another area of Khayelitsha and is implemented in government housing. These houses are more formalized than the shacks of Monwabisi Park; however the concept

	R Value ($K*m^2/W$)					
Insulation Type	**40mm**	**50mm**	**75mm**	**100mm**	**Ease of Access to Ceiling**	**Fire Proof**
Isotherm	0.88	1.10	1.65	2.20	Must Uninstall and Can Reuse	ASTM-E84
Isoboard	1.33	1.66	2.50	3.33	Can Remove Similar to Ceiling Board	B1 (difficult to ignite)
Cellulose Fibre	1.05	1.31	1.97	2.63	Must Remove and Cannot Reuse	Fire Resistant

Figure 5-13: Specifications of various alternative insulation materials.

of the insulation remains the same. Isoboards are used for insulation in these homes and is installed on just the ceilings. This project is city funded and is meant to help conserve energy in the area. It is still in its beginning stages but the city feels as if it is beneficial to the people of the community.

Current conditions in Monwabisi Park allow people to buy insulation at the local hardware store. The insulation would be more efficient if it were installed properly by a professional. This could open a job opportunity for someone in the community who could be trained on the most efficient installation method. If a professional is not available, however, it would still be beneficial for people to install the insulation on their own. An initial cost is needed to purchase the material. This initial cost is almost impossible for many people in the area. In order to help with this a 'payment plan' might be created for the residents to acquire the insulation or the government might help subsidize the cost. Either option would have to be assessed more. Another payment option for these materials is the Economy Team's idea of "complimentary currency." The insulation, hot boxes, and solar water bags could be goods the workers receive after they have completed a certain number of hours of work. This would also have to be investigated further.

Isoboard

www.i-w.co.za/isoboard.php

CONTACT INFO:

Isoboard: Western Cape
Tel: +27 21 983 1140
Fax: +27 21 981 6099
Address: 23 Kenwil Dr, Okavango Park, Brackenfell
Email: southsales@isoboard.com

Isotherm: Cape Office
Tel: +27 21 480 3140
Fax: +27 21 424 7710
Address: 10th Floor, South African Reserve Bank Building, Cnr Hout and St Georges Mall,
Cape Town

While insulation can be greatly beneficial to the community, many problems must be assessed. Fire, leaking ceilings, installation methods, and ventilation are all common problems in the homes of Monwabisi Park. The resistance to fire is a huge factor that should be evaluated when choosing an insulation material. The ability to resist fire is outlined in figure ___. According to this, isotherms, isoboards, cellulose and sand will not catch on fire. They will all melt or fail in a fire however they will not spread the flames.

Another problem to consider when insulating a ceiling is the fact that these shacks are often not constructed perfectly. Many of the shacks in Monwabisi Park have leaks in their ceilings and addressing these leaks is necessary. Covering the ceiling with insulation hinders the ability to check for leaks and also could cause the insulation to work less efficiently due to the moisture. Because of this cellulose and isotherms do not sound like a good form of insulation for the shacks' ceilings. The installation methods, addressed previously, would need to be addressed by either implementing an 'installation specialist' or by including a pamphlet on proper installation techniques. The isotherm company provides an 'Installation Guide' on their website that describes in detail how the product should be installed.

The last problem that must be considered is the need for ventilation in the buildings. The people of this area commonly burn paraffin or wood in order to heat their homes in the winter. Burning these materials releases toxic gases. These gases need to be ventilated to the outdoors in order to prevent injury to the people in side the building. The use of insulation could block many venting areas of the building and therefore these venting areas should be relocated to other areas of the building. This ventilation could be addressed in many ways including the installation of a chimney, airbrick, or vent. The installation of one of these ventilation devices would be more feasible in a new formal building rather than a shack. While it is possible to install in a shack it might be easier to simply cut a hole in the shack's upper wall. The design of the newer buildings should incorporate a ventilation device to eliminate the build up of toxic gases.

When redeveloping areas of Monwabisi Park, and other informal settlements, insulation should be highly considered. If the ecobeam structure is used the sand in the exterior walls is an acceptable insulation material. The ceilings of these buildings should be insulated as well, however, due to the large amount of heat lost through the top of the building. Isoboards, isotherms, and cellulose all would be beneficial to the community in the new buildings but some require more installation time and effort than the others. Cellulose, for example, must be blown in by a professional with professional machinery. The easiest building material to insulate the ceilings is isoboards, which require less installation time and energy. The Kuyasa project has proven that these isoboards are beneficial and do not require much time to install. A great deal of energy used for heating the new homes will be saved if an insulation material is utilized.

Isotherm www.google.com

Redevelopment: Hot Box

Benefits	Eliminates need to keep stove on for long periods of time.
How it Works	Adiabatic Cooking (insulated box keeps heat in cooking pot).
Used in Community?	Occasionally
Ways of obtaining	Cape Town stores or www.theHOTBOXco.co.za
Money Spent	195 rand-250 rand
Money Saved	2 rand/day
Problems to Be Considered	Meals must be planned in advanced

A hot box uses adiabatic cooking in order to eliminate the energy needed to fully cook a meal. Some of the meals in Monwabisi Park can take up to three hours to cook. The use of a hot box could decrease the stove time to only half an hour.

Hot boxes are currently used in the Monwabisi Park community occasionally. Hot box users notice that they use less electricity and that their food is cooked just as well as the conventional cooking method. In one of our interviews, a cook at the Indlovu Center's soup kitchen, said she used a large hot box when cooking for the community and it worked extremely well. Cooking samp and beans, vegetables, and mieliepap all worked extremely well and saved the soup kitchen a lot of money in fuel costs. The only 'inconvenience' found with the use of the hot box was the fact that meals would have to be planned in advance due to the fact that they took longer to cook. This was easy to get accustomed to, however, and the cook was very pleased with the device.

Using a hot box eliminates the need to use a stove for long periods of time. The stove is only required to get the water to a boiling point. This takes roughly 5-15 minutes, depending on the amount of water and the heat of the stove. For a meal that takes 1 hour to fully cook, 45 minutes of stove time would be saved using the hot box. This meal would take longer to cook in the hot box; however once it is placed in the hot box it requires no additional energy. If a hot box was used for two meals like this is one day, stove time would decrease by 1 hour and 30 minutes. According to our electricity usage chart, this would save the person roughly 1.30 rand daily. In one year a resident could save 485 rand which would double the initial cost of the hot box.

Overall, the current energy used for cooking in Monwabisi Park could be lessened greatly with the use of hot boxes. This would save the people of Monwabisi Park money as well as help the environment.

While hot boxes are easy to buy in the Cape Town area, sometimes it is difficult for informal settlement residents to purchase them. They are not very common and many residents who used them in the community said they got them as a gift from someone in the city. There are salespeople located around the city and a list of these people can be found on the hot box company's web site. Commonly the Hot Box Company sells a small for 195 rand and 250 rand for a large. These devices are simply made from fabric with insulating Styrofoam beads inside which help keep the heat inside. This design could be replicated using the sewing machines in the economy team's sandbag factory. Another way of purchasing is for someone to buy a book supply of the hot boxes and sell them to the community. Also a complimentary currency system could contain hot boxes as a form of payment for certain jobs. All of these methods would have to be investigated further.

Common questions about the Hot Box are answered in the information brochure on page 19.

www.thehotboxco.co.za

"I'm shocked that such a clever idea hasn't taken off sooner as it is the most innovative and convenient way to cook - and environmentally friendly. So many positives rolled into one clever idea: 'The Hotbox' "

(Madelein Wohler, Noordhoek, Cape Town.)

HOT BOX

www.theHOTBOXco.co.za

Redevelopment: Hot Water Bags

Benefits	Eliminates need to heat water on stove for bathing.
How it Works	Solar energy heats water in device.
Used in Community?	Not used
Ways of obtaining	Local camping store/Variety Store
Money Spent	200 rand or less
Money Saved	0.44 rand/day
Problems to Be Considered	Theft, cloudy days

A simple alternative method to heat water is a solar hot water bag. The most popular and obvious use of this method is a solar shower. These are marketed to backpackers and are cheap and simply constructed. The device is a synthetic waterproof and durable black material sewed into a bag with a shower spout on one end and a filling hole on the other. The bag is filled with available water during the day and laid out in the sun. The dark bag absorbs heat from the sunlight and transfers it to the water. After a few hours, the bag is hung in the air and a warm shower is available that required only a cold water source and a few hours in the sun. These solar showers can be purchased in stores for around R200. This simple device could be very easily adapted to life in informal settlements for free heated water.

The solar shower is actually just a solar water heater that can be used for any hot water needs. A thick black plastic bag would be just as efficient at heating water as a solar shower. The shower spout would be unnecessary if the water was only desired for a bath or for cooking with. Heating the bag in the sun, the water would be warm enough to bath e with.

Other measures could be taken to increase the efficiency and performance of the solar bag. The bag could be placed in a solar box or panel cooker to focus the sun's heat on the bag. It could also be placed in a hot box after the sun had gone down to insulate the heated water and store it for hot water after dark.

Social Considerations

When the solar water bag idea was introduced to members of the street committee at the first charette, people were interested and enthusiastic about the idea. It offers a very simple and inexpensive solution to the issue of creating hot water. The idea of a shower bag, however, would likely not be well received. According to studies done for the Kuyasa Project, residents of Kuyasa, which is also located in Khayelitsha, did not like the showers that were installed as part of the SWH programme. Residents feel as though a shower doesn't fully clean them, and that they prefer bathing. This makes the shower spout on most camping bags unnecessary, but heating the bag for bath water is still useful.

The simplicity and low cost of the solar hot water bag is especially appealing. While many new energy saving innovations could be vulnerable to theft and vandalism, the solar hot water bag could be made of such cheap materials that there would be no motivation to steal it.

These concepts could be incorporated into either single family homes, with individuals filling their bag each day from a tap, or it could be a group venture. One local station could fill up many solar bags throughout the day and hand them out to homeowners in need of hot water.

Ways to Provide them to the Community

The solar hot water bag could be sold to the community at a central facility as is described in our section labeled "Alternative Energy Centre." They could be purchased and sold at a slight markup and still be affordable.

A solar hot water bag could also easily be made in Monwabisi Park. Using a thick black plastic bag, only an effective means of sealing off the opening would be required to make an effective way heating water. An asthetically pleasing version of this idea could be created at the energy centre and sold to the community. A way of making them could also be taught to people so that they could make them on their own.

While the solar hot water bag will not revolutionize energy usage in Monwabis Park, it could save people a small amount of money, which would help to ease the burden of energy costs for residents. It also is a way to simply introduce alternative energy sources to people. A low cost solution such as this can be tried by residents without significant investment of time or capital. Ideas like this could stimulate alternative ways of thinking about energy use and promote more sustainable energy sources.

Solar Hot Water Bag

www.sz-wholesale.com/uploadFiles/060328180042s.jpg

Redevelopment: Wind Turbine

Benefits	Reduces amount of electricity needed to purchase.
How it Works	Harnesses wind energy and converts to electricity
Used in Community?	Not used.
Ways of obtaining	Many different companies/could make from 40 gallon drum.
Money Spent	Varies
Money Saved	R 150 / month
Problems to Be Considered	Theft and equality between who uses.

A possible solution for the problems that poor South Africans face in Monwabisi Park and other informal settlements around South Africa is the implementation of wind turbines. Monwabisi Park is not completely electrified and as a result many informal electric lines are run from shack to shack which creates a long list of potential problems for the community. A wind turbine which utilizes the 'free' energy provided by the valuable coastal breezes would eliminate many of the potential problems with electricity in the park. The first problem that wind turbines would aide with would be with the initial task of connecting to the government's electric grid. With a wind turbine the power produced would potentially eliminate the need for electricity from the grid.

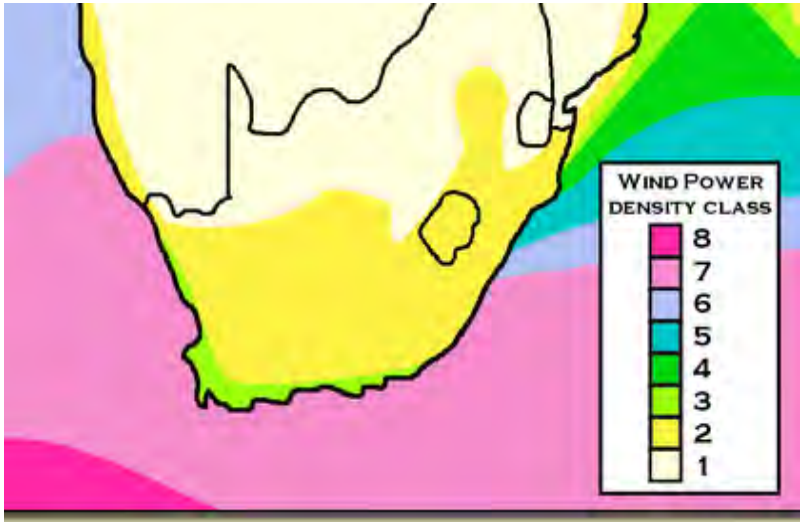


Figure 5-14: Wind Density Map of South Africa. Monwabisi Park is in the medium density green.

We have analyzed the wide range of turbines that could be implemented in the redevelopment of Monwabisi Park. On the lower end of the spectrum, turbines that produce a small amount of energy can be innovative and constructed from recycled oil drums for little to no cost and such wind mills could power an individual home. In this scheme, the drum is cut in half and fitted back together in a manner that catches the wind effectively. (Figure 5-15)

As stated before, the easiest way of obtaining a wind turbine is to construct your own from recycled or purchased materials. During our interviews and surveys, the trend was that the community liked using recycled materials for building because of its practicality. However, through our interviews and walks through the community we discovered that there are no wind turbines present in the park. Interest in wind turbines has been shown in the park and has been seen in surrounding areas such as the Sustainability Institute,[a] which utilizes a wind turbine to power a pump that is part of a filtration system

Figure 5-15: Oil Drum Vertical Axis Wind Turbine

On the higher end of the spectrum, turbines that produce 20kW of energy can be purchased from a company such as the GW Store for roughly R190000 and would supply energy for multiple homes and facilities.[k] There must be a middle ground for the wind turbines used in Monwabisi Park because through our research we have found that the higher end of the wind turbines may not be suited for application in the park and the lower end may not suffice an individual home's energy demands. From Figure 5-5 it is seen that the energy demands of a typical home depends directly on what appliances are used in the home and how long they are used each day.

If a homeowner uses an electric stove, electric light, and a radio, 1.6kW will be required to power all of those devices. This means that a wind turbine of at least 3kW will be required to power those appliances because the rating of a turbine is usually only under ideal wind conditions. A 3kW wind turbine will cost about R50000 which is a sizable investment but the benefits gained from it will outweigh having to pay for the initial cost. This middle size turbine would probably be ideal for Monwabisi Park; however it is not a good technology for individual application within the park.

We would like a wind turbine that can provide the energy needs for a number of residents and not just one home because the redevelopment plans are for the community as a whole. Limiting what appliances a homeowner can use when drawing energy from the wind turbine might be a way to supply a larger number of homes with power. Since there will be a wind turbine incorporated into the Alternative Energy Centre the turbine could power the entire centre and potentially other surrounding commercial facilities and homes. Figure 5-16 shows that a 3Kw turbine could provide electricity to one home which uses all the appliances from the previous example, but a 20Kw turbine will provide energy to six times the amount of homes.

The amount of homes that can be powered by the wind turbines depends on what appliances are used in the home. If homeowners use the grid for the high wattage cooking appliances such as an electric stove which requires 1500watts to operate, and the wind turbine power for all of their smaller appliances such as refrigerators which require 226watts, then more homes could benefit from the wind turbines' free energy. If the wind turbine acted as the power supply for multiple homes each home could have a different set of outlets for their electrical appliances. These outlets would consist of one set that is electricity from the grid, for higher wattage appliances, and the other set that is electricity from the wind turbine, for lower wattage appliances. To make sure that everyone gets equal amounts of electricity, the electricity will be converted to a wattage which will be equal amongst the homes receiving the electricity. We recommend that the wattage be no more than 500watts because in a typical home the only appliance that exceeds this is the electric stove and we want the homeowner to use the grid for high wattage appliances such as that. Limiting the wattage provided to each home will prevent any individuals trying to get more electricity for free as well as prevent any jealousies and problems from occurring between individuals. If wind turbines were implemented throughout Monwabisi Park more homes could benefit from the free energy provided by the coastal winds and wind turbines resulting in a better and more sustainable livelihood for Monwabisi Park residents.

Wind Turbine	Energy Produced	House Equivalent	Cost
Aeolus	3Kw	1	R42,028.08
GW	20Kw	6	R190,385.66

Figure 5-16: Chart showing the cost and the number of homes that two different sized wind turbines would cover.

KESTREL E400[1] (3 KW)

Rated output = 3000 W
Rated wind speed = 12.5 m/s (45 km/h)
Min. Wind Speed = 2.8 m/s (10 Km/h)
Rotor Diameter = 4m
Tower Height = 12-15m
Tower Top Mass = 150 kg
Annual Output in Cape Town = approx. 3000 kWh

While they are more expensive than vertical axis wind turbines, horizontal axis rotor types like this model are much more efficient and can generate more power. If money was available for the investment, a model such as this could be used to provide power for a community building. This electrical supply could be in addition to the grid power supply or to other alternative energy sources such as solar panels.

www.kestrelwind.co.za

Energy Information Program (Brochure Cover)

Alternative Energy Suggestions

Through careful examination of the current energy uses in Monwabisi Park we, the WPI Energy Services project group, would like to provide some ideas that could possibly save the people of this community money, as well as reduce their energy demands. These are immediate solutions that we feel would be most beneficial to the community's current living situation.

Cooking Alternative

Hot Boxes could save hundreds of rand per year in cooking costs by reducing stove usage.

Electricity Conservation

Being mindful of electricity usage and conservation could show many benefits.

Hot Water Alternative

Using the stove to heat water for bathing could be eliminated with the use of solar hot water bags

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Energy Services
Indlovu Project: Monwabisi Park

E-mail: CT08Energy@wpi.edu

Worcester Polytechnic Institute

Alternative Energy Information

The benefits of utilizing alternative energy in an informal settlement

Monwabisi Park
Indlovu Project

Energy Information Program (Brochure Inside)

Proposed Solution: Hot Box

Money Saved: 438 rand/year
Money Spent: 200 rand

How it Works:
"Insulated Cooking." Keep the heat in that is used to cook food and no replacement heat is needed to complete the cooking process.

Does it really cook my food?
Yes! To truly benefit from the Hot Box a subtle thinking shift is needed but once the benefits are seen its hard to change back to the conventional cooking methods.

What type of pot do you use in the Hot Box?
Any pot you currently use to cook with that fits inside of the hot box will work fine.

Do you need to heat the Hot Box?
No! Keep the Hot Box away from heat and fire.

What type of meals can be cooked?

- Beans, Legumes, Grains, Pulses
- Soups, Stews, Casseroles
- Steamed Vegetables
- Rice, Pasta, Mieliepap, Samp

Where to Purchase:

Claremont: Wellness Warehouse Cavendish (021) 673 7200
Kloof Street: Wellness Warehouse Kloof (021) 464 5142
Diep River: Cristy's Sports (021) 715 5020
Tokai: Sustainable Living Centre - West Lake (021) 701 2029
Muizenberg: Nin's (021) 788 9599

www.theHOTBOXco.co.za

Proposed Solution: Electricity Conservation

Money Saved: 255 rand/year
Money Spent: None

How it Works:
"Electricity Conservation." Using electrical appliances less decreases your electricity costs monthly.

Does it really save me money?
Yes! An electrical appliance that runs for 1/2 of the time costs 1/2 as much money. Using your television for 2 hours instead of 4 hours a day will save you 5.30 rand per month.

Do I need to use everything less to save money?
No. Even using one appliance less will be beneficial in the long run. The more appliance usages are reduced, the more money will be saved in the long run.

Does the type of light bulb I use effect the amount of money I pay for electricity?
Yes! You can save 3.5 rand per month using a 11W CFL light bulb instead of older incandescent light bulbs.

Appliance	Old Hours Used / Day	New Hours Used / Day	Old Monthly Cost	New Monthly Cost	Savings
Electric Stove	3	2.5	R 79.55	R 66.29	R 13.26
Television	4	3	R 10.61	R 7.96	R 2.65
Stereo	6	4	R 5.30	R 3.54	R 1.77
11 Watt CFL	4	4	R 4.24	R 0.78	R 3.46
			R 99.71	R 78.56	R 21.14

Proposed Solution: Solar Hot Water Bag

Money Saved: 160 rand/year
Money Spent: 150-250 rand

How it Works:
"Solar Heating." Use the sun's energy to heat water in a black bag which can be used for bathing.

Does it really heat my water?
Yes! Place water in the bag on a sunny day and in roughly 2 hours the water will be warm enough to bathe with.

Do you need to heat the Solar Hot Water Bag?
No! The sun does all of the heating, keep away from heat and fire.

Do I need to add anything special to the water?
No. Water right from the tap can be poured into the bag and left outdoors.

Does it work on a cloudy day?
No. On cloudy days you will need to heat the water on the stove in order to bathe.

Where to Purchase:
Camping Supply Stores

Bellville:
Cape Union Mart- (021) 914 1441
Outdoor Warehouse- (021) 948 6221

Hout Bay:
Mountain Mail Order- (021) 790 6026

Cape Town:
Christie Sports Outdoor Centre- (021) 712 5078

Alternative Energy Centre

In a community such as Monwabisi Park, where there is a great need for new energy ideas, there needs to be an effective way of providing information, supplies, and services to the people. One way of doing this would be to have a central facility, employing trained community members, where people can come to learn about different energy ideas, and to purchase necessary supplies or technologies to meet their own energy needs.

Integrated Energy Centres

An idea such as this has already been tried by the Department of Minerals and Energy. Called Integrated Energy Centres (IeCs), these facilities are one-stop shops for a community's energy needs. They sell basic energy products, including petrol, LP gas, paraffin, and candles. They function as a community coop, employing between 5 and 10 full time workers.

The products sold at the IeC are bought directly from suppliers, eliminating the middle man, and driving down costs for the community. As well as providing cheap products, a core goal of the IeC is to provide important information about energy practices. IeC employees provide training to consumers about safe use of paraffin and LPG. Paraffin is also sold in regulated safe containers to ensure safety.

Caba Mdeni Integrated Energy Centre

Located in the Magadla village in the Eastern Cape, Caba Mdeni IeC was created on 4 December 2004. Since October of 2005, the IeC has been able to support the salaries of its 10 full time employees through sales revenue.

Services provided include:

- Petrol
- Diesel
- LP Gas
- Candles
- Clean bottled Paraffin
- lubricants and Beverages

Alternative Energy Centre

We would like to propose the creation of a facility that provides a similar service as the Integrated Energy Centre, but with a focus on sustainable alternatives to current energy use. As the community currently uses electricity, paraffin, and LP gas to cook and heat with, information and training on how to properly use these energy sources would be essential to the energy centre. One or more "energy specialists" would need to be trained to understand both new innovations in energy usage, but also the safe use of current practices. While new energy ideas need to be encouraged, current practices must be respected, and efforts to provide information on safe practices are essential to the community.

The energy specialist will also be educated about various alternative energy sources. He or she will be equipped with information on hot boxes, solar hot water bags, and wind turbines. Knowing about these technologies, and working at a central facility, s/he will have the ability to interact with many members of the community and influence residents' energy practices.

The alternative energy centre would also provide actual products for the community. It could stock alternative fuels to paraffin, such as LP gas, or ethanol gel, which is a much safer and more efficient cooking fuel. The centre could also sell Hot Boxes to residents. To ease suspicions of Hot Boxes not cooking food properly, the AEC could have demonstrations periodically that show the Hot Box working, and allowing people to try food cooked the Hot Box.

This facility would also be where people could have an electricity audit preformed. The employees would be trained and supplied with calculators and information necessary to perform an accurate assessment of a household's electricity usage.

This facility could also be combined with a centralized hot water facility in order to provide even more service to the community from a single location.

An alternative energy centre would create job opportunities, increase the sustainability of the community, while promoting communal values.

Requirements for Centralized Hot Water

- Multiple Solar Water Heaters
- Roof Space for SWHS
- Piped water supply for SWHs
- Plumbing to run water to faucet
- Bucket sleeves to insulate hot water
- Employee to distribute hot water

Methodology

1. Interview with Di Womersley

10/28/08

This day was our first trip to Monwabisi Park. We sat down and had a conversation with Di Wormersley, a member of the NGO "Shaster Foundation", who told us general facts about Monwabisi Park and the Indlovu Project. Di is very influential in the Indlovu Project and she has helped us with gathering information for our project. She does not live in Monwabisi Park, so we often verified the information she told us with members of the community. She has taken a stance of working to help the community without any influence or aid from any governmental or political bodies. Seeing as we are working with various city agencies, Di would provide a valuable perspective as someone who works separately from the city. This initial interview gave us information to help focus our project and helped us decide on questions that we wanted to ask Buyiswa and the co-researchers. She was most interested in small-scale solutions which could potentially be put into practice immediately. It was a good base interview and the facts are verified in future interviews/ surveys.

2. Tour of C Section with Yolisile, Luzoku and Anele

10/28/08

The second part of our first day in the park was a tour of the park with some of the co researchers. We started at the Indlovu Centre, viewing several water taps and toilets, and also observing the outsides of many homes and the electrical wires hanging all over. The focus of this trip was to get a first impression of the area and to ask many questions to our guides. We also traveled to Yolisile's home and were able to view some of the energy devices and appliances. This was a very informative view into an average home and also a chance to photograph common cooking and heating devices.

An important result of this trip with the coresearchers was our chance to become familiar with interacting with them. Conversation was difficult at first. There was a significant language barrier, and questions were often not understood. We and the coresearchers both adapted quickly though, and learned ways to rephrase and clarify questions.

This trip was a good chance for us to get a lot of questions answered quickly. Much of the data we learned during this time was repeated or corrected later, but it was more important for us to gain the experience in communication and to get a good view of the park from the ground.

Perhaps most importantly, we were able to start to form relationships with the coresearchers. They did not know what to expect from working with us, and it was important that we make a good first impression. We worked with the coresearchers for the duration of our research, and the friendships we formed were essential to the success of our project. Future interviews were much more relaxed and allowed us to gather more specific information.

3. Interview with Buyiswa and Coresearchers

10/30/08

During this trip to Monwabisi Park we set up a meeting with the six co-researchers and Buyiswa, the woman who helps run the Indlovu Center, who we have been working with during our time in the park. We met with the co-researchers and Buyiswa in the Youth Centre to discuss the energy services utilized by people in Monwabisi Park.

This was our first formal introduction to Buyiswa, who would be a pivotal resource to our project. She is seen as a community leader, and understands the subtleties of working with the community. As the member of the community who works most closely with Di Womersley, she has become very interested in ideas of alternative and sustainable energy. She has insight into the sentiment of the community, and is able to tell us how she thinks our ideas will be received, and about different problems we will encounter.

Meeting with all the coresearchers at once also gave us a chance to gather data about current conditions and have it verified by a group of 6, instead of just an individual.
With the informal interviewing format we were using, we were able to casually converse about different energy service issues and gather much more in-depth information than we would be able to gather using door to door surveying.

4. Surveying Residents

10/31/08

The most quantitative data we were able to collect came from traveling from house to house and asking a series of survey questions to the residents. On the first day, Sept 31, we were exposed to our first opportunity to question various community members. Accompanied by two of our coresearchers, we were taken throughout C section. We found that some of the residents could understand and speak English, and those who couldn't were translated by our coresearchers. Questions at first were basic, such as how much electricity do you use, and how much do you pay for it? On the first day we were able to get a preliminary sense of how much people spend on electricity, and what they use it for. It also allowed us to see how questions must be asked. We were interested in what people used for insulating their shacks, but found that people weren't familiar with the term "insulation."

Methodology

4. Surveying Residents Continued

10/31/08

On the other two days we surveyed residents we first met with coresearchers to go over a set of prepared questions. This ensured that the coresearchers fully understood what information we were looking for, so they could help us to learn from the residents with whom we could not communicate directly.

We found that residents showed different levels of enthusiasm when answering our questions. Some residents seemed eager to answer our questions and openly conversed with us regarding electricity issues, while others were more reserved. A woman we interviewed told us "I hope you are not just interviewing us and then not doing anything." Some of the residents of Monwabisi feel as if they are made many empty promises. We had to be aware of this and be clear of our intentions as students doing research with the end goal of making recommendations. We also had to be respectful of people who were not willing to openly share their feelings.

After we went on our three trips to survey residents, we had collected a small, but consistent set of data regarding electricity practices. We surveyed residents from C1, who all had access to a prepayment meter, as well as residents of C2, who had to share a prepayment meter or used no electricity at all. Along with the quantitative data we collected regarding electricity use, we were also able to gather qualitative data from some residents regarding their concerns with electricity. We made sure to give the interviewee a chance to voice any concerns they had, or just add anything they would like to say. Hearing the concerns of various individuals gave us a good sense of community opinion regarding electricity issues. Overall, the survey data gave us confirmation of community-wide electricity use and community concerns regarding electricity. We could use that data in conjunction with the more detailed and specific information we gathered from interviews with the coresearchers to better understand the current energy situation in Monwabisi Park.

5. Interview with Wouter Roggen re: Kuyasa Programme

11/12/2008

Jenny Josefson, an intern of Jaques DuToit of the Sustainable Livelihoods branch of the Environmental Resource management Department was able to get us in contact with Wouter Roggen, who has been working with the Kuyasa Programme for the last few years. We met with him for an hour in hopes of learning about the successes and failures of implementing the Kuyasa Programme. We found, however, that he had not been involved in the actual initial testing phase of the Kuyasa Programme, which occurred years before he joined with the project. He was instead able to inform us about the complexities of organizing funding for a large-scale project. Mr. Roggen provided insight into the financial difficulties a plan for large-scale future redevelopment in Monwabisi Park would run into.

Our interview was conducted in a much more structured and formal way than with the coresearchers. Mr. Roggen could only meet with us for an hour, so our questions had to be concise and organized. We made sure to have an excess of questions so we could adapt the interview to focus on Mr. Roggen's expertise. The interview provided us with a large amount of information in a short period of time, and allowed us to ask specific questions about the programme from someone who actually worked on it.

6. Interview with Cornelia

11/25/08

In an effort to have a complete energy profile of one of the residents of the initial burn site, we sat down with Cornelia in her home behind the Indlovu Centre. We were put in contact with her through Buyiswa. As opposed to our earlier interviews with people, where we were looking for a general idea of the energy services people use, we wanted to know all the details of energy use in Cornelia's home. The level of detail we wanted made for a much longer and in-depth interview. Buyiswa told us that Cornelia speaks English well and would be willing to talk with us. This receptivity was critical, as we wouldn't have wanted to impose on someone who was not interested in sharing information with us. Cornelia was very open and very willing to go into the type of specific data we needed.

We also presented her with a hot box for her cooking. She had used her own hot box before it burned in the fire. We presented her with the box to borrow, and asked her to fill out a simple form documenting cooking times to find energy savings. She agreed, and we picked up the cooker and the forms a week later.

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Eco-Economy Redevelopment

Fruit and Vegetable Stand, C Section Monwabisi Park

Chapter Six Contents:

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Introduction

Redevelopment of informal settlements in South Africa has been a struggle for volunteers, non-government organizations, and government organizations alike. To date, no organization has perfected a method for successfully implementing community redevelopment in informal settlements. The current method for redevelopment of informal settlements in Cape Town, South Africa has had some success in upgrading communities of South Africa, however the current structure is overloaded and the government cannot keep up with the demand for new houses. It is crucial for redevelopment organizations to evaluate the way informal settlements have grown and how past redevelopment efforts have been successful, but also how these efforts have failed. This chapter seeks to investigate how local economic activity can grow and expand with more of an emphasis on community-based redevelopment.

In Monwabisi Park the economy is struggling to support the growing population. The formal economy of the surrounding area is unable to provide adequate jobs for the expansive informal population of over twenty-five thousand residents. The project team has discovered that only 19 percent of a sample population is employed full-time, thus leaving a large percentage either underemployed or unemployed. In addition, the lack of literacy, trade skills, business training, and funding prevents the informal businesses of the region from expanding or serving as a source of economic structure for the community. To address these problems, the Monwabisi Park community is in great need of a structured community redevelopment effort with significant attention paid to economic growth.

The City of Cape Town has been doing major redevelopment in the informal settlements surrounding the city, but there are some basic flaws in their current approach. One major fault is that their efforts are geared toward arbitrarily giving housing to people in informal settlements based on a waiting list. This creates the undesirable expectation among informal settlement dwellers that housing should be provided for free and by waiting long enough they will receive the upgraded housing. However, it is clear that this waiting list method is not working; According to Alastair Graham from the VPUU, the Cape Town government has the capacity to produce only 10,000 households per year and a waiting list of over 400,000 households to build. Therefore, it is a critical that the government modifies, or expands its current approach toward rebuilding informal settlements in order to break this undesirable expectation. By focusing their redevelopment efforts on primarily providing upgraded housing through private contractors the government misses a unique opportunity to help jumpstart the development within the informal settlements. By supporting a redevelopment method that utilizes local labourers the city will be able to provide several economic opportunities within the community. A redevelopment effort in Monwabisi Park that addresses not just housing, but developing the other major aspects of a functioning society such as economy, energy, water, transportation, safety and sanitation could serve as a sample formula for redeveloping other areas. The chapter will focus on creating an economic plan for a potential redevelopment effort to be implemented in a seed section of Monwabisi Park.

While working in the community, the project team identified many issues that a redevelopment plan implemented in Monwabisi Park should address. The major issue affecting the people of Monwabisi Park is unemployment, and the lack of jobs in Cape Town and the surrounding areas as well as a lack of available skills training. The overall redevelopment in-

Project team member, Mike Fitzpatrick, poses with a cell phone service and repair shop owner in C section, Monwabisi Park.

volves the use of EcoBeam structures, which have been previously used in Monwabisi Park upgrading. EcoBeam housing structures are simple to construct and easy to learn, and thus amenable to utilizing local labour. In addition, the materials that go into EcoBeam houses, mainly EcoBeams and sandbags, can be produced in Monwabisi Park. An Ecobeam factory, which produces EcoBeams made of timber and steel, does not require electricity and can employ a minimum of four individuals to construct these beams. Not only can this industry provide jobs for residents, it contributes to the skill development of these residents in the area of carpentry.

In addition to the EcoBeam factory, the establishment of a sandbag sewing factory is critical to stimulating local economic growth and creating jobs for residents. Once community redevelopment begins, these sandbags can be used in the EcoBeam houses and buildings. After an initial investment of sewing machines and a place to start the factory, the production and purchasing of the sandbags can ultimately pay the workers a considerable salary with the remaining rand to be put aside in a community redevelopment fund.

As the key redevelopment industries develop and the redevelopment advances, there will be a need for management within the industries. While there are many people who possess the raw skills for management in Monwabisi Park, the skills are undeveloped and they do not have the basic knowledge to manage groups of people. In order to address this, the project team has created a plan to incorporate an apprenticeship program to train local community members the basic management skills needed to run the EcoBeam factory, sand bag factory, and construction operations. operation on their own.

Along with management of key redevelopment industries, there will need to be some sort of management of the overall redevelopment. Plans for this management are outlined in the chapter. This management will be responsible for making decisions regarding what to do with incoming funding, such as where the funds get allocated to. The project team has devised a plan for establishing a Monwabisi Park Forum to handle all decisions that affect the entire community. The forum will be comprised of representatives for members from eight aspects of the community: women, youth, health-care, elders, disabled, business, Shaster, and Indlovu. All members of the forum will be elected by their respective groups except for the Shaster and Indlovu representatives, who will be Dianne Womersley and Buyiswa Tonono respectively. Shaster will propose ideas for the use of funding to the Monwabisi Forum, who will then either accept or reject the idea. If the idea is accepted, it will be implemented in the redevelopment; if the idea is rejected, Shaster will then rework the idea and bring it back to the forum to be looked at again.

One of the major issues with the economy of informal settlements is the unbalanced flow of the Rand. There is very little Rand coming into informal settlements and most of the Rand earned is spent back in the formal market on living necessities unavailable in the informal settlement. Creating a local exchange will make communities less reliant on the Rand and the formal market, a key aspect to becoming a sustainable, independent community. As Quintiliani writes, complementary schemes in third world countries such as Brazil and Thailand have been successful in improving the quality of life for communities and also enabling local businesses to thrive and grow.[e]

A complementary currency scheme is essentially an agreement within a community to use and accept a non-national currency as a means of payment. This kind of strategy is beneficial in an informal settlement because it allows people who have no means to participate in the formal economy to be active contributors to the local economy.[e]

The implementation of a complementary currency is an ideal strategy to be included in the WPI plan for redevelopment because it works closely with the principles of self-help, local economic growth, and community involvement. This redevelopment initiative lends nicely to the creation of a complementary currency system because of the number of new programs and enterprises that will be established for community benefit. Because these organizations are entirely new to the community there is no expectation of how things are to be structured or managed. This allows for the perfect experiment to see how a community embraces the idea of a complementary currency. This experiment is valuable because it introduces the complementary currency in a new, natural way instead of forcing local businesses to accept a complementary currency or change in any other way. The project team's plan includes the creation of new jobs that will be critical to the successful implementation of a complementary currency strategy. The infrastructure and logistics for using a complementary currency scheme are written about in detail within this chapter.

Key Redevelopment Principles

- Job creation through the community redevelopment process
- Skill development and transfer through apprenticeship and training programs
- Community involvement in managing an investment
- Utilizing a complementary currency to lessen dependency on the Rand

MWP Residents Outside Soup Kitchen

Current Economic Conditions in Monwabisi Park

In Monwabisi Park the economy is struggling to support the growing population. The unemployment rate in Monwabisi Park is approximately 50 percent as the formal economy of the surrounding area is unable to provide adequate jobs for the expansive informal population of over fifteen-thousand residents. As a result, 80 percent of households are unable to earn the minimum subsistence level of R1900 (Cape Town Social Survey, 2005). In addition, the lack of literacy, trade skills, business training, and funding prevents the informal businesses of the region from expanding or serving as the impetus for economic growth for the community. To address these problems, the Monwabisi Park community is in great need of a structured economic redevelopment effort .

This chapter also provides a GIS mapping of the majority of the informal enterprises that exists in C-section. Next, the chapter outlines the advantages and disadvantages of owning and operating a business in the informal economy.

In order to better understand how informal businesses are started, how they operate, and what challenges they face this chapter also includes personal biographies of some shop owners within Monwabisi Park.

Another aspect of economic activity that is discussed in this chapter is the transportation system that is crucial for getting people to work everyday. Also included is a brief overview of employment trends and statistics within Monawabis Park.

This chapter concludes with a survey of the current skills and desired jobs and training opportunities of the community.

INTRODUCTION TO THE ECONOMY

In any sort of redevelopment initiative it is crucial to understand the existing conditions of the community and to investigate the needs of the people who live in the community as well as the community leaders. Economic redevelopment can be a challenge in a poverty-stricken community for two reasons: first, some people and business owners are reluctant to embrace any kind of change even if it is for the better; and second, greed and corruption is always a strong possibility in a community that is cash poor and family orientated. In order to address these challenges it is critical to involve as many members and leaders from within the community in the brainstorming and planning of redevelopment. One important lesson associated with redevelopment is the necessity of ensuring to the community that the work of the project team will continue after the team has left Monwabisi Park. In order to make a sustainable impact on the community the project team has made a concerted effort to involve as many local people in the planning process as well as training local people to continue with the redevelopment plans.

This section seeks to provide a thorough overview of the current economic conditions within Monwabisi Park as a whole by extrapolating from information collected predominately from community members and leaders within C-section.

The first subsection of this chapter explains the many types of informal enterprises that constitute the basic economic activity of the community.

African Cash Store, C-section of Monwabisi Park

Informal Enterprises in C Section of MWP

The types of businesses found within C section of Monwabisi Park are classified as informal enterprises. These types of enterprises have been established by residents of the community so they can generate some sort of income to provide for their families and themselves. Other enterprises in Monwabisi Park are established by squatters, who have mainly come from different areas of South Africa and Somalia to earn money to send home to their families. Some of these businesses are based out of the owner's home, while others rent or build separate shacks for their enterprise.

Cash Store, C Section MWP

Types of Informal Businesses

Informal businesses offer basic goods and services for the community members. They are important aspects to the community, as they provide employment for some and goods and services for others.

A common informal enterprise found in C section is the spaza shop. A spaza shop is a small business similar to a convenient store. Residents can purchase a variety of small goods which include snacks and drinks, sweets, fruits and vegetables, airtime, tobacco products, amongst other small items.

A cash store is similar to a spaza shop, but it can be more closely compared to a small grocery store. It provides many of the same items, but in a larger variety and often in larger quantities. For example, one can purchase a large bag of rice or mealie meal from a cash store. Some cash stores also run specials, where residents can purchase several staple foods, like rice, flour, beans, samp, etc., for a discounted price rather than buying them all individually.

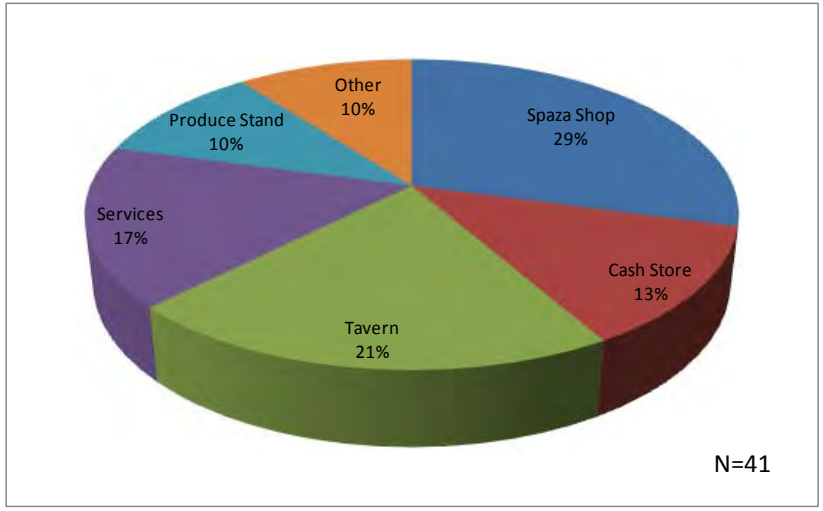


Figure 1: Types of Informal Enterprises in C Section

A tavern, also known as a *shebeen*, is the local informal bar. They are often the centre of social interaction, and are frequently equipped with pool tables, music, and African beer.

In addition, one can find a variety of informal enterprises which offer services to the community. A barber shop and shoe repair shop are examples of some of the types of services provided. In addition, there are stores where cell phones can be purchased and repaired. Alternatively, residents can utilize public pay phone centres.

There are other types of shops that are located within C section that do not easily fit the aforementioned categories. They include a raw meat shop, a small hardware store, a bread shop, and a liquor store. In addition there are shops that provide cooked meats such as "smilies" (sheep's heads) and cow's hoofs.

In general, informal businesses allow owners to generate an income to support themselves and perhaps save some money to send home. However, most businesses do not produce enough profit for expansion and growth. Thus, the redevelopment plan must support and strengthen these existing businesses.[1]

GIS Mapping of Informal Enterprises

The GIS map (Figure 2) shows the location of the informal enterprises in C section of Monwabisi Park, as indicated by the green circles. Many of these businesses are located along the main roads of Mew Way and Steve Biko Road. This provides a main commercial area where many residents go when in need of goods and services. Businesses that are located along the sides of these major roads surrounding Monwabisi Park are popular because many people within the community travel and take public transportation which is located on these roads. Street-centred businesses provide quick and convenient places for locals to pick up food and other necessities on a daily basis. In addition, there are some enterprises located within the section. Generally these businesses are located along the main footpaths for convenience and safety. Shebeens comprise a majority of these businesses as they are located away from the main roads.[1]

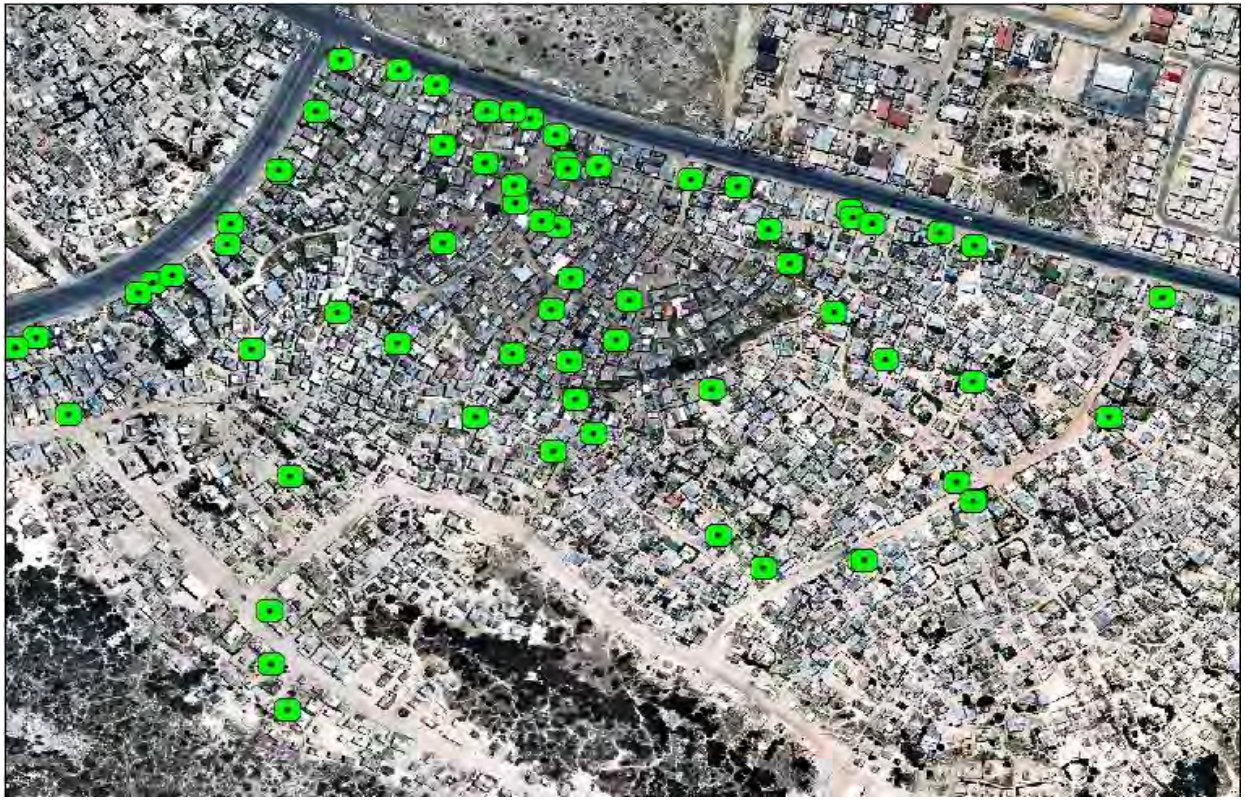


Figure 2: GIS Mapping of Informal Enterprises in Monwabisi Park (November 2008)

Advantages and Disadvantages of Informal Enterprises

Informal enterprises are not regulated by the government and this provides advantages and disadvantages for the business itself and subsequently the owner. Many times, the owner of a business is the principal worker in the business and other employed individuals are usually family or friends of the business owner. Thus, the following advantages and disadvantages are one in the same for the business and the owner[h].

Advantages of Informal Enterprises

Due to a lack of governmental regulation, the businesses are not taxed, thus this provides more money for the owner to keep. In addition, the owner does not have to offer a minimum wage to employees or grant sick and vacation time. In general, there are no formal worker's protection rights available to employees, if the business does hire. Finally, these informal enterprises do not have to follow safety codes or regulations as a result of the lack of government oversight. Overall, these advantages contribute to lower operating expenses for the owners.

Disadvantages of Informal Enterprises

While there a several advantages, there are disadvantages which hinder the growth and profitability of these business. Without any governmental regulation, it is difficult for the owners to obtain loans or apply for government funding which would ultimately assist in improvements and expansion to the business.[f] This funding could also assist a business in times of hardship. For example, if the business is damaged or a victim of crime or theft, this money could be used to rebuild or repair the loss. It is also hard to obtain skill development without governmental support. A lack of communication and funding with the city makes it difficult for business owners to hear about and afford business training programs that would assist them in expanding and development their business.[a]

Owners find it difficult to profit from their businesses due to a lack of business skills and training. They do not possess the educational background for establishing a business, maintaining a business, and further developing a business in order for it to be profitable and generate a significant income. Many of the business owners in Monwabisi Park would like to see workshops which focus on strengthening their skills in order to improve their business. Some areas which they would like to seek training include accounting, management, customer service and the overall basics of operating a business.[5]

The businesses owners' main goal is to earn and save Rand; however this can be difficult for them to do. In order to stock one's business with goods and/or supplies, the business owner must purchase these items from the formal businesses in Cape Town and its suburbs or from the market in Harare, an informal settlement on the opposite side of Mew Way. Thus, Rand earned is being spent outside the community, and it not circulated within the community. Travel costs and purchasing from outside also results in high prices for the goods and services of these businesses. In response to this problem, some of the businesses within C Section have joined together to buy in wholesale bulk to stock their stores, and thus their prices are less expensive for the residents.

Businesses Plotted in GIS Map*

Spaza Shop— 14

Tavern— 10

Services— 8

Cash Store— 6

Produce Stand— 5

Other— 5

*This GIS mapping shows the most up to date information as of 11/6/08-11/7/08. The location and number of each type of business may have changed since then.

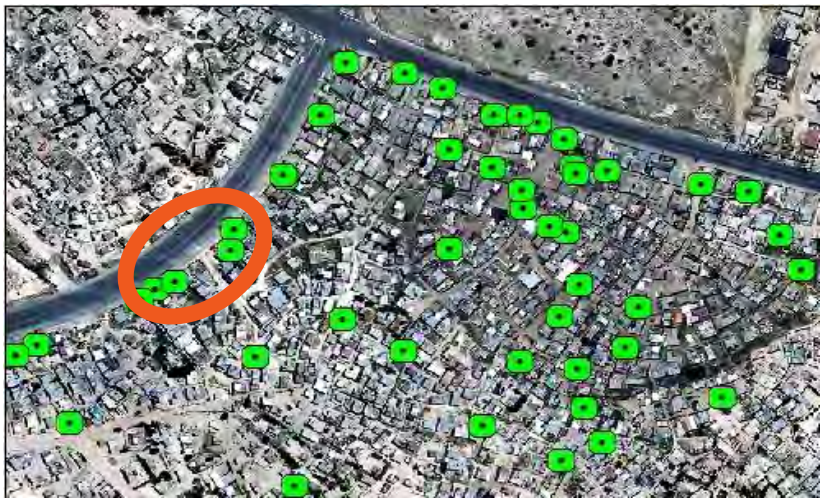
Local Business Biographies

Monwabisi Park is an area full of informal economic activity. While many of these informal enterprises have existed for years there is also a group of people in Monwabisi with a strong entrepreneurial spirit. According to members of the community their success depends on many different factors. One crucial aspect is the business training and experience of the shop owner. This section provides a personal insight into the operations of some informal enterprises and the people who keep them running.

THE RASTAR SHOP

Opened in 2003

The Rastar Shop is a small spaza shop that specializes in sales of fruit, paraffin and liquor. This business is located along the sides of Steve Biko road in C-section of Monwabisi Park. According the owner, Geinikhaya Somashini, this is a safe area for a business as he has never had any issues with crime or theft at his shop. Somashini is able to keep a tight watch over his business during the night time as the Rastar Shop doubles as his house. In the back end of the shop Somashini has all of the amenities and furniture typically found in the other shacks of Monwabisi Park. In 2003 Somashini purchased the land where the Rastar Shop is now located for R1,500 from someone who was leaving Monwabisi Park for the Eastern Cape. The previous owner of the lot did not have a business in this location as it was just a home. Somashini decided to turn this lot into a home-based business because of its advantageous location on the side of Steve Biko Road.



Location of The Rastar Shop

Aside from Somashini and his family members who help to run the Rastar Shop, Somashini employs one other person who works in the shop every day. Aside from acting as a cashier at the store during business hours the employees have to purchase stock every Saturday and Monday. The Rastar Shop purchases fruit from a wholesaler called Marco in Nyanga, paraffin from a Garage in Bougor, Khaylitsha, and liquor from various people who sell cases of liquor for wholesale.

During the summer months business peaks; much of this is caused because of the hot weather. According to Somashini the busiest days of the week are on Friday and Saturday because people have more money to spend. Somashini explained that during the week when people are short on cash he will grant loans to people whom he knows personally.

OWNER BIOGRAPHY

Geinikhaya Somashini

Somashini, or "shoes" as he is commonly referred to by people who know him in the community was born in the Eastern Cape on October 23rd, 1978. Somashini came to Monwabisi Park in 1984 where he studied and finished his matriculation in 1999. Aside from running the Rastar Shop Somashini has worked as a volunteer community worker since 2002 and a volunteer police officer since 2004. Somashini hopes to learn more about how to run a business and eventually develop his spaza shop into a larger cash store. Shoes enjoys playing football and his favorite football club is the Kaizer Chiefs.[2]

The Rastar Shop and Somashini

TAWAKAL CASH STORE

Opened in 2007

The Tawakal Cash Store is one the larger cash stores in C-section that has been very successful because of the smart business practices that the owners have implemented. Tawakal is able to provide meat, vegetables, drinks, parrafin, cell phone airtime, and other groceries to their customers at a discounted price.

Tawakal is exceptionally popular among the locals because of their specials—one deal includes rice, flour, maize, samp, sugar, fish oil, and beans for R330. Generally, a bag of rice costs R100, thus one can see the savings with this type of deal. In addition, smaller stores cannot offer this kind of value.

This business is operated by a group of individuals who have come from Somalia. They purchase stock in groups in order to obtain a large quantity price discount. Before Somalian, Ali Gure, began renting the lot where Tawakal is now located the lot was used to run a small shop and tavern. Today, this lot consists of the large Cash Store as well as a living quarters in the back for Gure and his family.

Tawakal is operated by Gure and three other people who work with him. Gure and his co-workers make purchases five days a week on Monday thru Friday. The Somalians are able to transport their stock in trucks that they share between stores. According to Gure the majority of their stock is purchased from the Cash and Carry in Epping.

Despite their popularity among local people in the community Tawakal has been the victim of several crimes. In May of 2008 Tawakal was the victim of many Xenophobic related crimes. Recently, these crimes have declined, however Gure still keeps a close watch on his store.[2]

Tawakal Cash Store, C-section Monwabisi Park

Personal Account from a MWP Resident

While the informal businesses provide a source of income and a job for some individuals, many must seek to find employment outside of Monwabisi Park. Most times, the employment obtained by individuals pays minimally and requires a long day and the use of costly transportation. Below is a brief account about a resident from Monwabisi Park who held a job outside of the settlement for a brief period of time. Many of the challenges described in this account are present in the lives of others living in Monwabisi Park, as discussed in the upcoming section.

Anele is a current Monwabisi Park resident who has travelled from her home in the Eastern Cape in search of employment. She has left behind two children in hopes of obtaining a job in order to save money to send home to her family. Currently she receives R460 per month from the government through social grants for her children, but this is not sufficient to sustain her family.

Before working as a co-researcher in the WPI/Shaster Foundation program, Anele found a job as a domestic worker for a family's home in Woodstock, a suburb outside of Cape Town. Anele states that jobs in general are very difficult to come by, and she was lucky to hear about this job from a neighbor.

As a domestic worker, Anele worked two days out of the week earning R80 a day. While working in the family's home, she performed many duties. These included cleaning the house, washing clothes, dishes, and windows, and taking care of the owners' cat.

Despite the fact that Anele earned R80 per day, her demanding schedule for the work day and the costs of transportation to and from her place of employment makes the job seem almost futile. In order to get to her job on time, Anele left her home in MWP at 0600 and walked to the train station to catch the 0720 train. She would arrive at her job at 0800 and work until 1700. She would not return back to her home until 1930. Transportation costs totaled R11 per day, thus her net earnings for one day of work was R69. Although Anele was fortunate to have a job, saving money for her family while also providing for herself proved to be difficult, working only two days a week at this income.

Photo of Anele

Employment in Monwabisi Park

A major concern for the residents of Monwabisi Park is employment. Finding a job or a source of income is a very difficult task for many individuals, but one that is a crucial aspect to their ability to provide basic necessities for themselves and their families. Employment for residents ranges to those who own their own business in Monwabisi Park to those who find employment in Cape Town. Still, a vast amount of individuals are unable to obtain jobs due to many constraints and limitations. When unemployed community members are asked what type of job they wish to possess, the general response is "I just need a job; I don't care what I do."

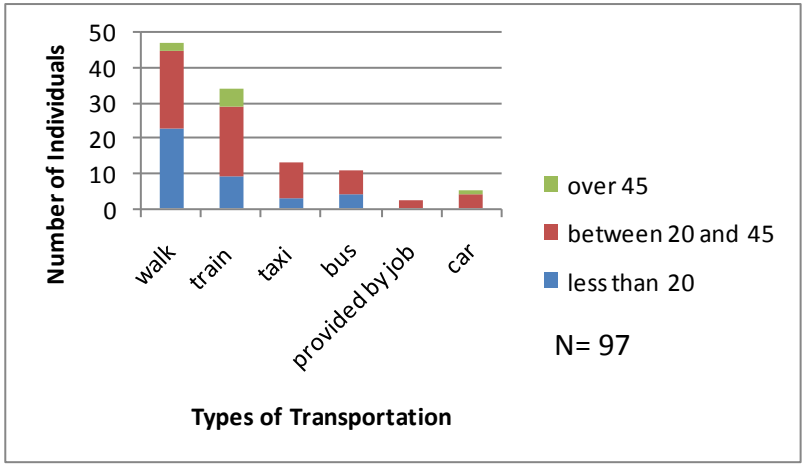


Figure 5: Modes of Commuter Transportation by Age for MWP residents

Types of Employment for Monwabisi Park Residents

Once individuals complete their matriculation from school, they have two main options: to continue their education or to find a job. Those who continue their education usually enrol in trade training programs in areas like carpentry, plumbing, or electrical work. They continue this training until completion or until they cannot afford it anymore, in which case they are also faced with the challenge of finding a job.

The formal economy in the Cape Town area offers individuals the opportunity to obtain basic jobs. Some work in trades, while others obtain jobs working in local grocery markets, stores or pharmacies as cashiers or shelf stockers. Some individuals work in restaurants or coffee shops as cleaning people or waiters/ waitresses. Generally, these individuals make approximately R1.300 per month. Many find employment as domestic workers in people's homes or in one of Cape Town's hotels, earning between R1.500 -1.600 per month. A popular job to obtain is to be a security guard, as these individuals make R2.500 per month, which is considered to be a substantial amount of money. A rare opportunity for a few individuals in Monwabisi Park is to work for the government. In this case, one can make a considerable salary working for the public transportation systems. Those who do not work in Cape Town are either unemployed or have established an informal business in Monwabisi Park, as discussed previously.

Figures 3 & 4 show the employment and unemployment rates of those between ages 20-45 and over age 45. Note that these charts are represented from a survey of 97 individuals, and thus does not portray a complete, accurate representation of Monwabisi Park.[3]

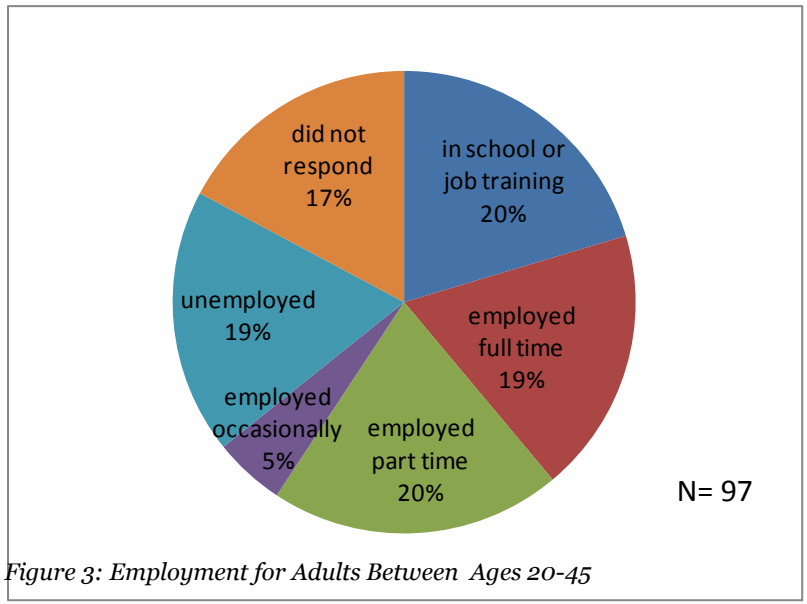


Figure 3: Employment for Adults Between Ages 20-45

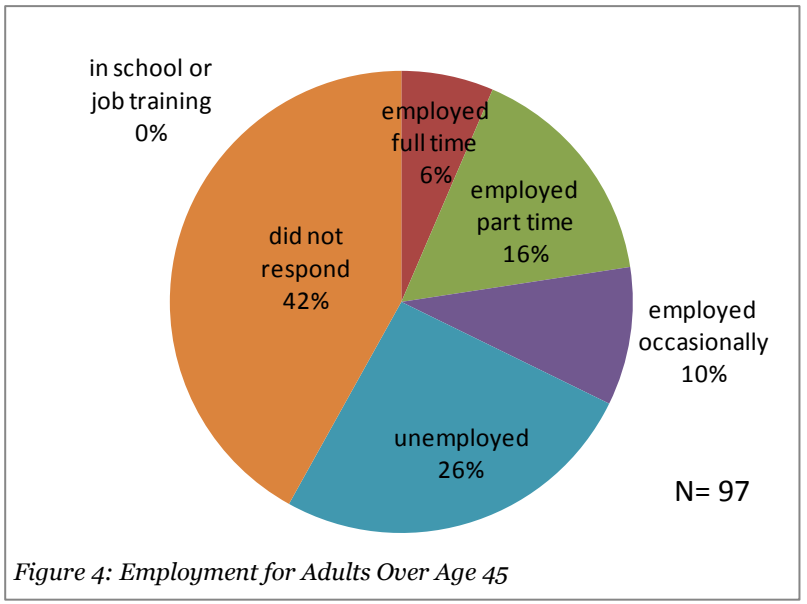


Figure 4: Employment for Adults Over Age 45

Transportation

Transportation to jobs in Cape Town is a problem which

affects employed individuals. Many cannot afford to have cars of their own; thus they rely public transportation, mainly the train and/or public taxis, to get to work. The transportation costs to travel to their jobs often consume a percentage of their earnings, and thus having a job in Cape Town can be futile. Figure 5 shows that only a small amount of individuals receive transportation from their job, otherwise they must rely on walking or taking the train as primary means of travelling to and from work and other places outside of the settlement. [3]

Social Grants

In 2005, the South African government spent over R3-billion on social grants to over 10 million individuals who are not employed by the government. Out of these 10 million, 6 million of these beneficiaries are children. From 1994-2004, annual expenditure by the government on social grants increased 3.5 times from R10-billion to R34.8-billion.[i] Increases in amounts given for each social grant over the past three years are shown in Table 1. Those who benefit from these grants mainly include the disabled, the elderly, those with children and foster children, war veterans, and those who are care dependent.[i] These social grants are either deposited into the individuals' bank accounts, or given directly in cash from Social Services. Social grants give some relief to impoverished families; however, many still find it difficult to save enough funds to pay for basic monthly costs.

Type of Grant	Amount in 2005	Amount before 1 Oct, 2008	Amount after 1 Oct, 2008
State of Pension	780	940	960
Disability Grant	780	940	960
War Veteran's Grant	N/A	960	980
Foster Child Grant	560	650	650
Care Dependency Grant	780	940	960
Child Support Grant	180	210	230
Grant in Aid	N/A	210	230

Table 1: Social Grant Increases from 2005 and as of 1 October 2008 from Department of Social Justice.[c]

Photo of Thobisa

Basic Economic Profile of a Monwabisi Park Resident

Thobisa currently lives in Monwabisi Park and works as a co-researcher in the WPI/ Shaster Foundation program. She has come from the Eastern Cape, where she has left her family including her child, to save money to send home. Before working as a co-researcher earning R50 a day (which is a temporary job for two months), she established a small shebeen located in her home which has been her principle source of income in addition to the grant she receives for her child from the government. Despite these two sources of income she still struggles to save money for her family and for herself to travel back to the Eastern Cape and to spend on other monthly necessities.

Thobisa's monthly sources of income and expenses are summarized in Table 2. Although there is a net of R80, this does not take into account any emergency expenses, and the basic necessities expenses are only rough estimates. Thobisa asserts that the amount allotted for food is not sufficient for an entire month. For those who pay the city for electricity from a box, the expense ranges from R50-R250 depending on how big the shack is, how many people live in it, and how many appliances are running off the box. Some individuals who do not have a shack number must take electricity from their neighbour, who generally charges a flat rate. Thobisa does not have a number, and thus pays R100 to a neighbour for the use of electricity from his box. Many individuals, including Thobisa, also strive to save money to send home to the Eastern Cape and to travel there during the holidays, an approximate round trip expense of R900.

Description	Gross Income	Expenses
Government Support		
Child Support Grant	R230	
Shebeen		
Purchasing Beer		R660
Selling Beer	R960	
Basic Necessities		
Food		R150
Electricity		R100
Clothing		R100
Other		R100
Gross Income	R1190	
Expenses	R1110	
Net Income	R80	

Table 2: Basic Economic Profile of a Monwabisi Park Resident.

Current Skills and Desired Training/Jobs

Throughout Monwabisi Park there are many people with numerous skills in many different fields. Despite the skill sets that these people possess, they still have difficulties finding jobs in the formal Cape Town economy due to various setbacks.

Current Skills In MWP

Those who do not work within MWP in the informal enterprises possess skills and trades which they utilize in hopes of finding jobs in Cape Town. During interviews and discussions with community members, it was discovered that many of the men have worked in building trades as carpenters, electricians, plasterers, toppers, painters, amongst others. Many of the women have found employment as housekeepers, cleaning ladies, cashiers, and child or elderly caretakers. Figure 6 shows the range and quantity of skills possessed by a sample population of residents. The skills represented in this graph are both useful for a community redevelopment effort, and marketable in the formal Cape Town market.

Individuals have come to Monwabisi Park to find jobs in Cape Town, but this has proved to be a difficult task. Although they have experience in the aforementioned jobs and trades, they do not have the proper documentation or certification papers to confirm training in these areas. Some individuals have begun trade training programs post-matriculation, but must drop out because they are unable to afford the cost of the programs. As a result of a lack of this documentation, employers are loath to hire these individuals. If one is fortunate enough to obtain a job, he/she is usually hired on a contract basis which only lasts three, six or twelve months. Once the contract has expired, the people are again left unemployed. [4, 5]

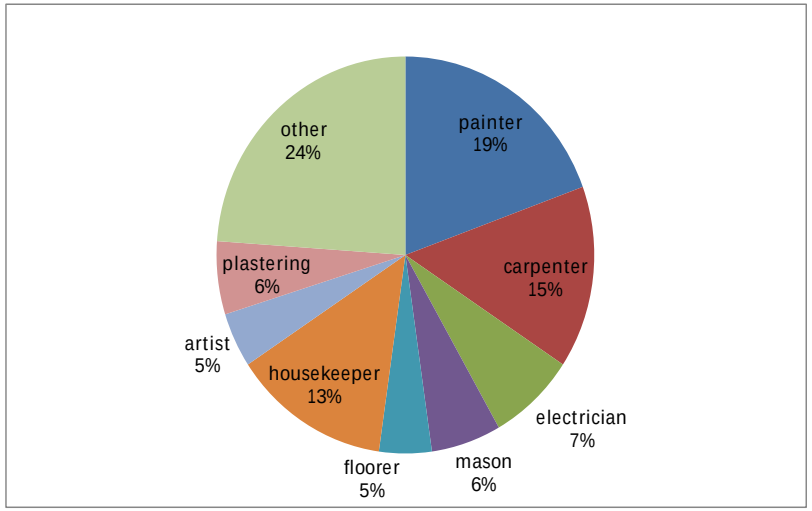


Figure 6: Sample Skills Inventory in C-Section of Monwabisi Park

Desired Skill Development and Training In MWP

Many of the community members would like to see workshops or training programs offered to further develop their skills and learn new ones. While some are currently undergoing training programs, others are unable to afford them. Proof of any training and skill development would be necessary for them to obtain employment in skilled markets such as carpentry or welding.

In a recent survey of community members who received VPUU security training, some of the desired training courses were revealed as shown in Figures 7 & 8. The majority of surveyed people thought that bread making would be the most useful training. They also expressed an interest in receiving sewing training.

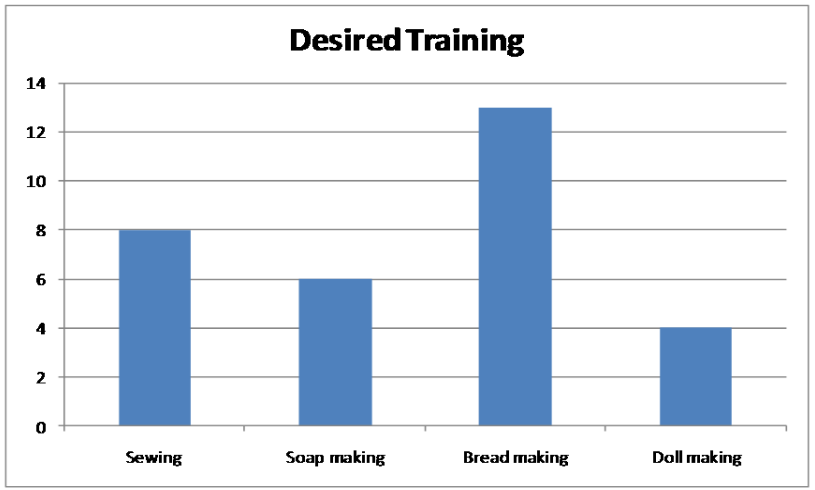


Figure 7

In a survey of the same sample group, people expressed the greatest interest in jobs in the culinary arts. Other jobs people were interested in include becoming a cleaning person, and becoming a receptionist. Since jobs like these do not exist within Monwabisi Park, people will need to enter the formal economy for such jobs. However, when housing redevelopment in Monwabisi Park begins, jobs for carpenters and electricians will begin to become available.[5]

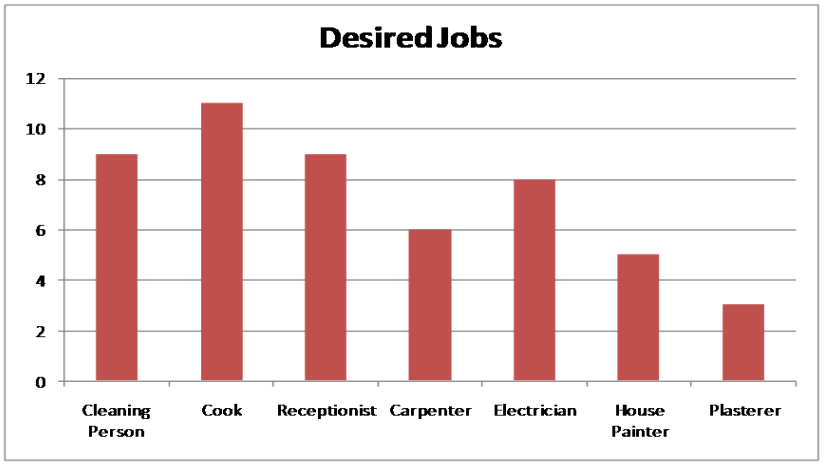


Figure 8

Managing a Community Fund within the Community

When it comes to managing community funds for redevelopment there is a strong emphasis to make sure that money is well managed and that everyone in the community benefits equally from a community-wide investment. This is especially important in a community like Monwabisi Park where people are earning the minimum amount of Rand needed to survive. In order to account for concerns like this, among others, there needs to be a system for managing these funds in a fair and practical manner throughout the community. The economy team has proposed a plan to allocate and utilize any external funding that materializes in order to support the Monwabisi Park redevelopment.

Characteristics of Dealing with a Community Fund

In order to effectively manage an investment for redevelopment within Monwabisi Park the project team proposes a simple, standardized structure for allocating these funds. When dealing with community funds in an informal settlement there are several special considerations that need to be accounted for to ensure that the finances are fairly distributed throughout the community. One of the goals of the project team is to transition as much control and responsibility for managing and allocating the investment into the hands of the community. This is the best practice because it allows for the community to feel a sense of ownership and pride in what they are accomplishing as more of the responsibility for redevelopment is in their hands. This method also allows for helpful money and management skills to be spread throughout the community. However, the biggest concern with this approach is that people might be tempted to misuse community funds.

Another concern is that if an outside organization controls the funds in order to reduce the opportunity for corruption then the community will not have enough control over how the redevelopment actually happens. Taking into consideration these two primary concerns the project team has planned a system for effectively managing community funds so that the community has control over how the funds are allocated, but there is still unbiased outside oversight to monitor for any corruption. It is crucial that the organization responsible for monitoring over the allocations made for redevelopment is as transparent as possible with their financial records and spending. This information needs to be made public and easily understandable to the community and all other interested parties. Having this kind of transparency will establish more trust and interest throughout the community in the redevelopment effort.

Transparency of Funds

In order counter the possibility of corruption the project team plans to have the Shaster Foundation, an unbiased outside organization oversee the investment that is made for redevelopment. The Shaster Foundation will keep the investment funding in a bank account called the "*community redevelopment fund.*" Shaster will be responsible for keeping the financial and spending records of the community redevelopment fund up to date and in good standing. Shaster will also make sure that this information is made available to the public and so that it is easily understandable to someone who may not know anything about financial management. Creating this kind of transparency in the management of the community redevelopment fund is important to keeping the community informed about how the redevelopment is progressing forward. It is also an important way that the Shaster Foundation maintains its reputation within the community as a local non-profit organization devoted to the community rather than a larger, powerful redevelopment bank with its own self-interested agenda.

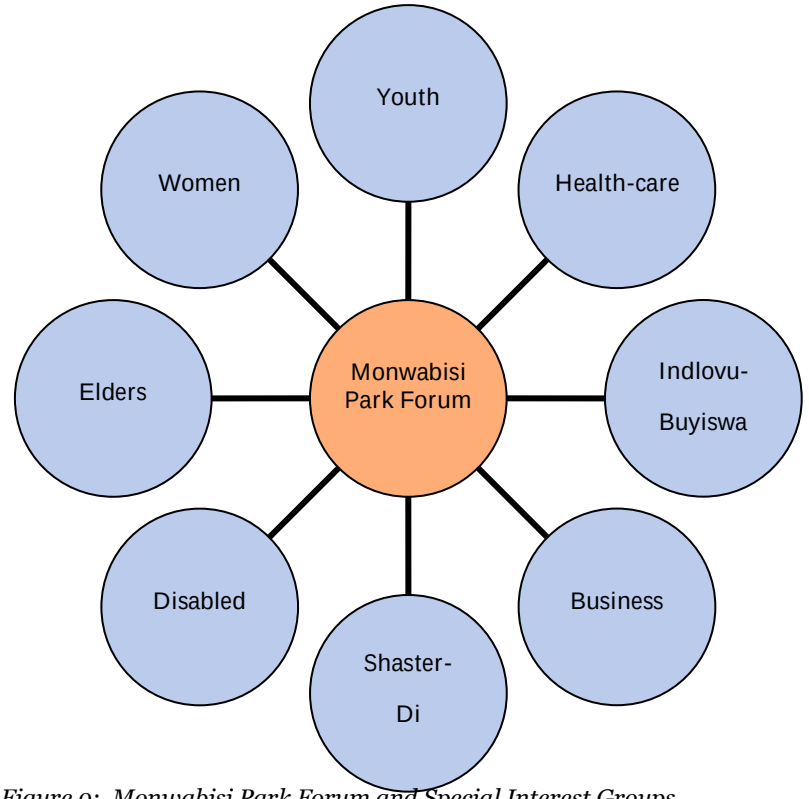


Figure 9: Monwabisi Park Forum and Special Interest Groups

The WPI Local Economic Growth Plan

After seven weeks of researching sustainable redevelopment and another seven weeks of fieldwork in Monwabisi Park, the WPI project team has created a plan for local economic redevelopment of Monwabisi Park. This plan for redevelopment focuses on how the development of new housing can stimulate local economic growth, job creation and skills development. The plan for redevelopment also investigates the creation of a local job bank that will include jobs that are created locally though redevelopment, and jobs that are available outside of Monwabisi Park. The last aspect of the WPI plan for redevelopment is the use of a complementary currency system to help stimulate local economic growth. The WPI project team hopes that the ideas that are presented in this plan can be used by the Shaster Foundation to assist with the brainstorming and development of a plan that is embraced by the MWP forum and also used to acquire outside funding. Many of the ideas presented in this plan for redevelopment were created under the assumption that the Shaster Foundation will be able to acquire outside funding to help finance the basic investments needed to jump-start local economic activity and redevelopment.

THE MWP FORUM

Although the Shaster Foundation has overall control of the community redevelopment fund Shaster has a minimal role in making the final decision as to how the money is spent for redevelopment. Ultimately, the community will vote on how the funds are allocated for the redevelopment effort through the Monwabisi Park forum. The Monwabisi Park forum was the idea of Indlovu Project Manger, Buyiswa Tonono, and Shaster Project Director Dianne Womersely. The MWP forum will be created to include all of the special interest groups that exist within MWP so that decisions made on the behalf of the community will not overlook the perspective of any group within the community. This forum consists of elected members from the following special interest groups: women, disabled, youth, heath-care, business members, and the elders.

SHASTER AND MWP FORUM COLLABORATION

Although the MWP forum is the best group to ultimately decide on how funding is allocated for redevelopment, it is unlikely that this group of skilled and unskilled community members will be able to plan and agree on an effective plan for allocating funding for sustainable community redevelopment. In order to help facilitate the meetings with the MWP forum the project team suggests that the Shaster Foundation is also involved in the forum's meetings in the beginning of the redevelopment effort. The project team suggests that the Shaster Foundation hosts a series of brainstorming meetings with the MWP forum to introduce the ideas of redevelopment and how money might be spent and allocated for redevelopment in the community. Then, using the information collected during these forums as well as the information collected from the WPI projects, the project team suggests that the Shaster Foundation proposes a plan for allocating the community redevelopment funds to the MWP forum. The MWP forum will then either accept the plan for allocating the funds or reject the plan and make modifications as necessary until the plan is perfected. In this scenario the Shaster Foundation acts as a consultant to the MWP forum to help them make a smart, effective plan for sustainable redevelopment. The relationship between the Shaster Foundation and the MWP forum is outlined in Figure 10.

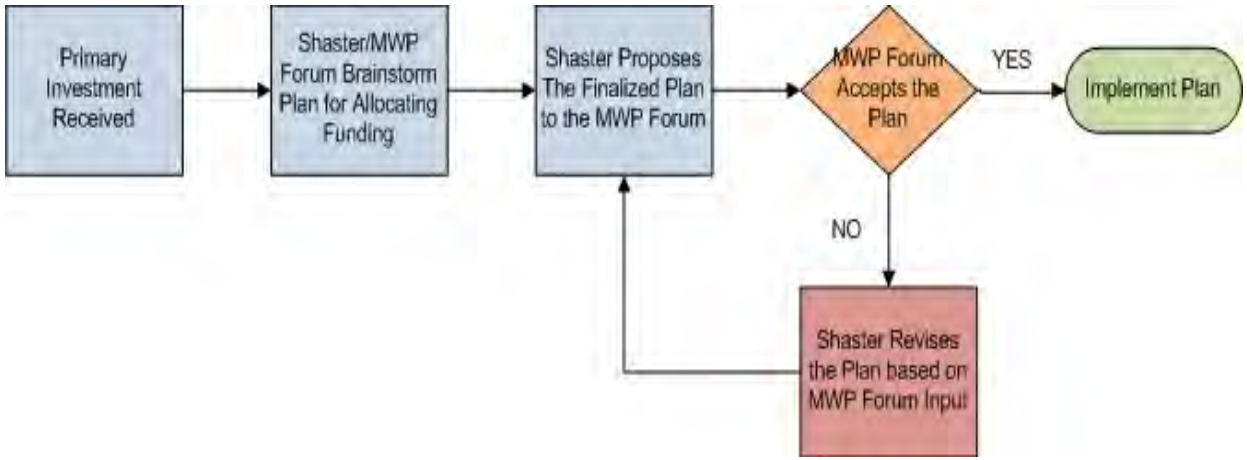


Figure 10: Shaster and MWP Forum Planning

Key Redevelopment Industries for Stimulating Growth

Throughout the course of seven weeks of fieldwork within the community of Monwabisi Park the project team was able to identify housing as one of the most sought after needs for redevelopment within the community. In order to deliver sustainable housing and also jump-start local economic growth the economy team identified three key industries to be established within the community. The three industries explained in detail throughout this section will not only bring new jobs and skills to the community, but will also instil a since of pride and ownership to the overall economic redevelopment of the community.

THE ECO-BEAM WAY

Eco-beam technologies has developed an extraordinarily simple way of manufacturing high quality, safe, housing that requires minimal materials and facilities. The Eco-beam system is practical and does not require electricity at the construction site, which lends nicely to developing in informal settlements, like MWP, where electricity is not readily available. Keeping the costs of materials and facilities required for building to a minimum is crucial for redevelopment in the informal settlements because households can not afford to purchase very much more than the food and basic necessities for daily survival.

Although the Eco-beam system does not require any electricity or many materials the Eco-beam structures are not of poor quality. Eco-beam structures are just as durable as traditional timber construction, yet the Eco-beam structures are more environmentally friendly and they are fire-resistant.

The photo of Makazi's Guesthouse on this page shows the construction of an Eco-beam facility in MWP. The construction consists of eco-beams, sandbags, and plaster. All of the labour for this project was sourced within MWP. The simplistic, affordable approach to building Eco-beam housing is a perfect method for bringing housing to informal settlements. However in order to bring housing to MWP on a large scale three key investments in a Eco-beam Factory, Sand Bag Sewing Factory, and Sand Bag Filling Operation are critical. These three investments are what the project team refers to as the key redevelopment industries. These three industries are discussed in detail in the next chapter.

Makazi's Guest House of the Indlovu Project, Monwabisi Park

WPI Students working at the EcoBeam Factory in Epping 1, Cape Town

Eco-Beam Sand Bag Factory

Eco Beam houses are constructed from two major components, beams and sand bags. The materials for these houses can be made right within the community after a few investments. Once the materials are produced, these houses can easily be constructed by community members once they have received training.

Sewing machine workshop at Berzack's

Establishing a Sand Bag Factory

A sand bag factory located in Monwabisi Park could benefit the community in multiple ways. The first major benefit for the community will be the creation of jobs, as employees will be needed to sew sand bags for both a profit and use in the community. As housing redevelopment begins, the sand bags will be a key material in the development, and having them produced within the community will reduce cost by of each sand bag by approximately 25%. In order to set up such an operation in Monwabisi Park, there are many steps that need to be taken.

The first step towards creating a factory is identifying a buyer for the sand bags. Currently Mike Tremeer, the owner of Eco Beam, outsources all sand bags produced for his structures to sewing factories in South Africa. Currently, the factories purchase the fabric and sewing cotton from the company that produces the fabric for approximately 60 cents, and Mike purchases the sewn bags for approximately 80 cents, creating a profit of 20 cents. Mike has shown interest in sourcing some of his production of sand bags to cash-poor communities such as Monwabisi Park, if the opportunity were to arise. He also said that because of the demand for sand bags, he will purchase as many sand bags as the factory is able to produce.

Sewing machine workshop at Berzack's

With a buyer identified, a location for a factory needs to be established. According to Mike's estimates, a space of 6m by 3m can hold six sewing machines and all the materials needed to produce a week's worth of sand bags. Because of the composition of the fabric used to make the sand bags, they must be kept out of direct sunlight, so the factory must have a place to store raw materials and completed sand bag. In addition to the space and storage requirements, the factory must have at least one electrical outlet per sewing machine. Additional outlets for lighting may be needed if there is not enough natural light coming into the factory. The final main concern when establishing the factory is security. The sewing machines and sand bags being produced are valuable commodities that need to be protected, and capable doors, windows, and locks need to be used to secure the items.

The third step in setting up a sand bag factory is getting machines to sew the sand bags with. The only major requirement of the sewing machines purchased is that they are industrial machines. This is because the sewing machines will be used for many hours a day, and the motors on domestic machines can not handle such a stringent workload. Other than being an industrial, the machine must be able to perform a single stitch, the simplest stitch performed by sewing machines. While other stitches can be used, that will only complicate production and require a more expensive machine.

Once a buyer and location are established, and machines purchased, people must be trained how to produce sand bags. If machines are purchased from Berzack's, a local sewing machine distributor, they will give a one-day, complimentary class on how to use sewing machines to a group of up to ten people.

Estimated Cost Analysis For Sand Bag Factory[6]

Equipment Needed—

- Two industrial sewing machines R5500
- 2L Machine Oil R35
- Sewing machine needles R20
- Scissors— R10

Materials Needed—

- Sand bag material
- Sand bag thread

Building for Factory

Estimated Initial Investment— R5565

Once a group of people from Monwabisi Park are trained in how to use the gmachines, they can begin working at the sand bag factory. Using a two shift day (morning and afternoon), and having people work every other day, as many as four people can be employed per machine. This structure will also leave one day a week open for these employees to conduct workshops to train other people in Monwabisi Park how to use the sewing machines. The machines will also be available for other purposes that could further enhance the redevelopment in MWP.

Filling Sand Bags

After sand bags are sewn, they need to be filled before they can be used for construction and insulation. The bags can be filled easily by almost anyone, and they do not require much physical labour. When constructing the Community Centre, the Indlovu Project had children from the crèche fill bags after school. A similar strategy can be applied to future redevelopment, as it provides free labour, and also allows more people to become involved in the redevelopment, creating a sense of ownership. Also, according to Dianne Womersley and Buyiswa Tonono, the children enjoyed filling the bags, and it was a good way to keep them from making poor decisions with their free time.

Children filling san d bags for the Backpacker's Lodge

ESTABLISHING AN ECO BEAM FACTORY

An Eco Beam factory is a slightly more complicated endeavour than a sand bag factory. Producing Eco Beams within Monwabisi Park will certainly lower the cost of housing redevelopment, as there will be no need to pay for outside labour in production of the beams. However, due to there being significantly less beams than sand bags used in an Eco Beam structure, there is not as much of an outside market for the beams. Most of the beams will be going to the redevelopment, so there will not be a significant income from the factory.

The first step in establishing an Eco Beam factory will be identifying a location for the operation. Due to the size of the beams needed for houses, the factory will need to be substantially larger than a sand bag factory. The actual production of the beams does not require any electricity, so as long as the factory has ample natural lighting, no electricity will be needed. Although the beams will not deteriorate in the sun like the sand bags, a closed storage facility should be included in the factory to protect beams from the damaging elements of nature.

After a location is determined, and a factory building constructed, the equipment for producing beams needs to be purchased. Because the Eco Beam has been optimized for simplicity, there is not much equipment needed to produce a beam. The lattice structure of the beam is bent into its shape using a hand press and a few basic hand tools. The hand press and the actual building in which the factory will be located are the only two major investments needed for the operation. Other purchases that are needed are basic tools, such

Cost Analysis For Eco Beam Factory[7]

Equipment Needed—

- Hand Press R2000
- Angle Iron
- Hammer
- Hand Saw
- Measuring Tape
- Table R300

Materials Needed—

- Steel
- Timber

Building for Factory—

- Shipping Container R100000

Estimated Initial Investment— R103000

Redevelopment Job Creation

One of the most important principles being applied to the MWP redevelopment effort is the great desire and vision to use as much labour from within MWP to upgrade the housing and community infrastructure. This will allow a much greater percentage of the funding for the project to remain within and directly benefit the community members in a distinctly higher percentage than is often found in many redevelopment efforts where outside contractors are highly utilized. The redevelopment effort will serve as a catalyst to engage and revitalize the local MWP economy.

as: strips angle iron for the construction of an EcoBeam, hammers for nailing in the lattice structure of EcoBeam, and hand saws for cutting EcoBeam to length. In addition to construction materials for the factory, raw materials will need to continually be purchased for making the EcoBeam's.

Once the materials are all purchased and the factory is built, there will need to be training sessions to learn how to construct Eco Beams. The training is a fairly simple process and can take place in a couple of days by current EcoBeam employees. The factory itself is a fairly simple structure that doesn't require a great deal of space or construction to organize. In addition, while a shipping container was suggested by EcoBeam staff a similarly sized structure such as a wendy house may be just as suitable and could be a potential source of fund savings.

Manager Apprentice Program

While there are many people possessing capable personalities for managerial positions in Monwabisi Park, they often lack the skills necessary for managing. Setting up an apprentice program at the start of redevelopment will aid in developing the necessary skills to hand managing over to the people of Monwabisi Park.

The apprentice program would employ managers from outside the community to temporarily control the construction management, EcoBeam factory, and the sand bag factory. During this temporary employment, the outside managers will be shadowed by the member of the Monwabisi Park community who is selected to become the managers of the redevelopment industries.

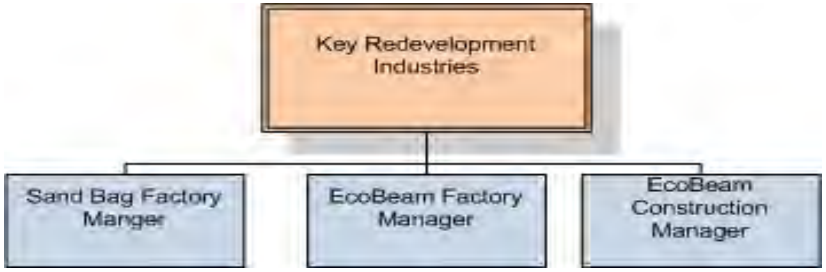
During this apprenticeship program, factories will be in full operation. In addition to allowing production to start sooner, it will also allow the apprentices to see the issues that they will face during operation. The temporary managers will also offer other instruction on situations that may not arise during the apprenticeship program. The duration of the program will be determined by the temporary managers; when they feel that the Monwabisi Park managers have the ability to manage their factory by themselves, and then the program will be complete.

The temporary managers may be volunteers, but they will most likely be compensated by the Shaster Foundation.

Sand Bag and EcoBeam Factory Managers

The sand bag factory manager and EcoBeam factory manager will share many of the same responsibilities for their respective factories. In addition to their responsibilities running the factories, they will also report directly to the complimentary currency manager from the Shaster Foundation.

The first responsibility of the factory managers will be to set up the initial training sessions for the employees. The sand bag factory training can be done through Berzack's, a South African sewing machine distributor that also offers many different training sessions. The EcoBeam training will most likely have to be done with Mike Tremeer or one of EcoBeam's factory workers. The factory managers should also participate in the training as well so that they can have adequate knowledge of all processes being performed in the factory.



After the employees have received their training, the manager will be responsible for setting up shifts. All shifts for the sewing factory will have two employees working, and all shifts for the EcoBeam factory will have four employees working. Sample shift schedules are shown for both the EcoBeam factory and the sand bag factory. The managers should post all schedules in a place visible to all factory employees so that it is easily accessible, and it also adds a level of accountability. While the posted schedule will serve as a way of enforcing attendance to required shifts, the manager will ultimately be responsible for getting employees to show up on time for their shifts.

In addition to setting up the employee manufacturing shifts at the sand bag factory, the manager will be responsible for setting up the Friday sewing

Sand Bag Factory Work Schedule

	Monday	Tuesday	Wednesday	Thursday
8:00-12:00	Shift A	Shift C	Shift A	Shift C
12:30-4:30	Shift B	Shift D	Shift B	Shift D

Friday Sewing Workshop Schedule

	Workers	Trainee 1	Trainee 2	Trainee 3	Trainee 4
8:00-9:30	Shift A				
10:00-11:30	Shift B				
12:30-2:00	Shift C				
2:30-4:00	Shift D				

EcoBeam Factory Schedule					
Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-12:00	Shift A	Shift C	Shift A	Shift C	Shift A
12:30-4:30	Shift B	Shift D	Shift B	Shift D	Shift B
Week 2	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-12:00	Shift C	Shift A	Shift C	Shift A	Shift C
12:30-4:30	Shift D	Shift B	Shift D	Shift B	Shift D

workshops. These workshops will be run by the employees of the sand bag factory, and all employees will be required to work one session a week. The sessions will be open to all community members who have a desire to learn how to sew. Each session will consist of four community members and two factory employees in order to allow significant hands-on time. In order to allow as many people as possible to learn how to use the sewing machines, people will be limited to attending one session a week. All session signups will be done through the factory manager, and a list of who is signed up for which session will be posted on the outside of the factory every week. A sample workshop schedule and signup sheet is shown on this page.

Both factory managers will also be responsible for ensuring that all shifts meet their quotas and that all workers are productive. This can be done by monitoring the factory occasionally, and by doing random beam or bag counts throughout the week. The employees, along with the managers, will be held accountable for any quotas not met and will receive subsequent pay cuts for that week. In addition to ensuring quotas are met, managers will be responsible for monitoring the quality of the bags and beams created at the factories. This can be accomplished by performing periodical checks of the bags and beams being produced.

Both managers will also be responsible for the supplies of the factory. The first sector of supplies they will be responsible for is the maintenance of the factory tools. If something is broken they are responsible for either fixing it, or filing a funding request form for purchasing a replacement or paying someone to fix the broken part. In addition to tool maintenance, the factory managers will be responsible for setting up pick up and delivery of the raw materials. For the sand bag factory, this will consist of the sand bag material and the cotton thread. For the EcoBeam factory, deliveries will consist of timber and sheet metal. These deliveries should be the same every week, so the managers will not have to concern themselves with adjusting amounts, just making sure everything gets delivered every week.

In addition to those responsibilities, the EcoBeam factory manager will be responsible for producing the correct length beams. For beams being sold to EcoBeam, this information will be gathered from the order placed by EcoBeam. For beams being used for the redevelopment of Monwabisi Park, these orders will come directly from the construction manager.

Funding Request Form

Date: ____/____/_____

Funds Requested: R_____

Funds Needed For: _____

_____

_____

_____

_____ _____

Fund Applicant Name Fund Applicant Signature

_____ _____

Shaster Employee Name Shaster Employee Signature

Jobs Created by Key Redevelopment Industries

Using the sample structures outlined in this section, the following jobs will be created within Monwabisi Park:

Sand Bag Factory

1 Manager 8 Employees

EcoBeam Factory

1 Manager 16 Employees

Other Redevelopment

2 Managers

Total Jobs Created- 28

Construction Manager

The construction manager will have many responsibilities as redevelopment of Monwabisi Park begins. In order to fulfill his responsibilities, the construction manager will need to be very knowledgeable of the EcoBeam building system and the materials required to build EcoBeam structures. This knowledge will be gained by working closely with Mike Tremeer or an employee of EcoBeam in the apprentice program.

Once the construction manager has an adequate grasp on the EcoBeam building strategy, he will be able to begin managing the actual construction issues. The major sector the construction manager will be managing is the materials required for construction. The construction manager will work directly with the EcoBeam factory manager and the sand bag factory manager to place orders for EcoBeams and sand bags. These orders will be placed using a form to be filled out by the construction manager for each structure being built. As the materials become available, the construction manager will be responsible for setting up

Sand bag order form

Quantitity: _____

Required for: _____
_____
_____
_____

Date needed: ____/____/_____

Construction manager

_____ _____
Print Name Sign Name

Sand bag factory manager

_____ _____
Print Name Sign Name

Sand Bag Order Form

delivery of the materials to the construction site. As the materials become available, the construction manager will be responsible for setting up delivery of the materials to the construction site.

Once sand bags are ordered and arrive on site, the construction manager will be in charge of allocating areas of the construction site, or surrounding area, that can be dug up to fill sand bags. Once that area is allocated, responsibility for managing the filling of sand bags is handed over to the sand bag filling manager. Allocating a filling area close to the construction site is important because transporting filled sand bags is difficult, and the bags can be immediately installed in the structure if they are filled as the demand arises.

In addition to ordering beams and sand bags through local managers, the construction manager will also have to go outside of Monwabisi Park to obtain materials. These materials include roofing, plaster, and small materials like nails. To order materials from outside vendors, the construction manager will need to fill out a funding request form. Delivery of these items should be done through the Monwabisi driver whenever possible.

EcoBeam order form

Length of EcoBeam: _____cm Quantitity: _____

Required for: _____
_____
_____
_____

Date needed: ____/____/_____

Construction manager

_____ _____
Print Name Sign Name

EcoBeam manager

_____ _____
Print Name Sign Name

EcoBeam Order Form

Sand Bag Filling Manager

As the sand bags are created in the factory and the demand for filled sand bags increases, there will be a need for someone to manage filling sand bags. As the sand bag filling will mostly serve as an after school program for the local youth and crèche students, the local crèche teachers will make the most effective managers. Their responsibilities in managing the filling operation will include making sure that the bags are being filled correctly and delivered to the proper location. Also, they will ensure that the sand for the bags is coming from the location designated by the construction manager.

As demand for sand bags increases, managing and filling may evolve into full time jobs. It should be kept as an after school activity for youth as long as possible, as it decreases the cost of building, and it also gives the youth something productive to do with their time.

Sand Bag Factory Workers

Sand bag factory workers will work four hour shifts in the factory. During their shifts they will be assigned a certain amount of bags to produce. This number will be determined as the productivity level is determined. In addition to sand bag production, the workers will be in charge of running training sessions for interested community members on Fridays.

The first step to making the sand bags is cutting the fabric to length. This task will be completed most efficiently by cutting all the sheets required for the entire shift at the start of the shift; however it is up to the worker to determine their preferred method.

After the material is cut, it must be folded and sewn to appropriately seal the bag. In order to track the workers' pro-

The backpacker's Lodge being constructed of EcoBeams and sand bags

duction, each worker will be given a particular colour of thread to sew with in order to identify which bags were created by which worker. This will simplify the process of determining if a worker missed a quota.

Once the bags are sewn they must be placed in storage. Prior to being placed in storage, the sand bags must be bundled into packs consisting of 100 only sand bags made by one worker in order to simplify the checking process for the manager. After the sand bags have been bundled and stored, they will either be used in building for redevelopment, or they will sold.

Sewers will also be responsible for checking the oil levels at the start of every shift, and cleaning their machine and work station at the end of every shift. Checking the oil and cleaning the machines twice a day will greatly reduce maintenance costs and will allow the machines to be operated on a more consistent basis.

In addition to producing the bags, the sand bag sewers will also be responsible for running sewing workshops on Fridays. These workshops will be for the people of Monwabisi Park to learn how to use the machines. The sessions will be run by two sand bag sewers, and they will be required to run a session every week. Running these sessions will be a required aspect of the job as a sand bag sewer and will not result in any additional pay.

Sewing Sand Bags

Step 1—Cutting the material:

- *For the standard 30cm x 30cm sand bags, raw material must be cut into a 30cm x 70cm rectangle*

Step 2—Folding the material:

- *The rectangle should be folded once 30cm from the edge*
- *Maintaining the original fold, the rectangle should be folded again in the opposite direction. This fold should occur 30cm from the initial fold, leaving a flap of approximately 10cm.*

Step 3—Sewing the bag:

- *The bag will have two seams running parallel to the two unfolded sides of the material*
- *The seams should be made approximately 1cm from the edge of the material*
- *The ends of the seams need to be sealed so that they do not become unravelled*

EcoBeam Factory Workers

The EcoBeam factory workers will work on a similar schedule to the sand bag factory workers, with the factory operating under a two shift per day system. As with the sand bag factory, each shift will be given a quota that they must reach, as a way of ensuring productivity levels are kept high. Unlike the sand bag factory, there will be four people working in the factory at once, with one person operating the hand press, and the other three people assembling EcoBeams.

The hand press operation is a very simple process, however its accuracy is essential to the structure of the EcoBeams. This process is approximately three times as fast as the other fabrication process required in manufacturing EcoBeams, hence there being three workers on the other fabrication, and one on the hand press.

The second fabrication process required for the EcoBeams is also a simple process. Once each bend of the lattice is nailed to the two strips of wood, the beam is complete and can be unclamped and placed in storage. It is then ready to be used for redevelopment or sold.

Manufacturing EcoBeams

Forming the lattice structure:

- *Feed the sheet metal into the hand press and press the "U" channel (approximately 15cm long).*
- *Bend the sheet metal up perpendicular to the "U" channel, forming the lattice pattern*
- *Feed the sheet metal through the hand press and press again to form the next "U" channel*
- *Once the lattice is the appropriate length for the beam being manufactured, cut it and start the process over*

Assembling the beam:

- *Cut two strips of timber to the appropriate length for the beam being manufactured*
- *Mount the two strips of timber to the table by clamping them to the two strips of angle iron on the table*
- *Hammer the lattice structure to the interior of the timber strips (two nails per bend in the lattice)*
- *Once lattice secured to timber, unclamp the beam and place in the appropriate storage pile*

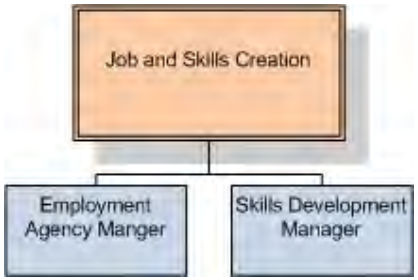
Surplus EcoBeams used by a resident to make a fence

Complementary Currency Structure and Management

In order to create successful sustainable economic growth and job creation it is critical to have a structure to compensate workers that is fair and cannot be corrupted. One of the major challenges faced by organizations that try to create lots of job opportunities is finding a way to create long-term jobs that they can afford to pay. In the informal settlements there is a scarcity of Rand and communities need to look into alternative means to compensate workers. One way that this Rand scarcity can be addressed is thorough the successful implementation of a complementary currency scheme.

Job and Skills Creation

As the redevelopment of Monwabisi Park progresses there will be many opportunities for jobs that will need to be filled. This will not only include the jobs that are described in the following sections, but jobs for carpenters, builders, painters, electricians, among other skilled and unskilled laborers. In order to help match up these opportunities with unemployed residents of Monwabisi Park the project team suggest that a Job and Skills Creation division is created. This division will also create two more jobs that would be supported by the redevelopment—the Employment Agency Manager and the Skills Development Manager. The two primary roles of this division are to act as an employment agency and to find help for people who need a job in MWP. The employment agency manager will be responsible for keeping track of all of the job opportunities that arise from the redevelopment as well jobs that are available outside of MWP. The employment agency manager will also be responsible for keeping a directory of people who come to the Agency looking for work and what skills they have and would like to learn. The benefits of this are two-fold: first, this will help to match up people within Monwabisi Park with jobs and secondly, the information about what skills people would like to learn can be used by the Skills Development Manager. This skills development manager will be responsible for coordinating and planning various skills development seminars. These seminars should bring in professionals so that MWP community members can learn the skills that are necessary for redevelopment and broaden their skill base therefore opening them up to new job opportunities. These two positions will work together to both train people with essential skills and to match skilled workers with jobs.



Job and Skills Creation Outline

Complementary Currencies Defined

A complementary currency is essentially an agreement within a community to use and accept a non-national currency as a means of payment. Complementary currencies are commonly implemented as a fiat currency, a mutual credit system, or some variation of both forms.[e] A fiat currency is similar to a national currency as it is created and distributed by a designated authority, however it is not backed by the government, and its value stems from public confidence. Mutual credit is based off the exchange of simultaneous debits and credits. Throughout the world there have been thousands of successful complementary currencies that were created based off variations of fiat and mutual credit based complementary currency systems.[e]

The primary goal of complementary currencies is to give citizens without the opportunity to generate income in the formal economy a means of exchange that enables them to create sustainable businesses and jobs within the community. Complementary currencies inspire local business and help to keep the wealth of the community within the community. This is a valuable benefit of complementary currencies because the majority of South Africans living in poor, informal communities make and spend their money outside of their local communities.[e] A recent South African New Economics publication about complementary currencies states:

> *"The strength of complementary currencies is that they are only accepted within the communities, allowing the communities to build a local economy and in the process improve the quality of life for all individuals."*[e]

Another benefit of complementary currencies is that they create a local source of income and goods that helps to make the community more self-sufficient and sustainable. Complementary currencies also create strong bonds between members of the local community and stimulate collaboration among members of the community.

A Complementary Currecny Strategy for MWP

As stated in previous chapters there are many jobs that are created from the key redevelopment industries and other aspects of redevelopment. However, there has been no strategy as to how these workers are going to be compensated for their services. Community leaders from MWP have stressed the importance of paying workers in Rand rather than a complementary currency because initially people will not be motivated to earn a complementary currency. However, through many interviews with local community members and

community leaders the project team has drafted the plan for a hybrid complementary currency and Rand-based compensation strategy for paying workers.

According to Dianne Womersely, Directory of the Shaster Foundation, the minimum amount that Shaster will pay their workers is R70 for a days work. However, it is difficult for NGOs to employee many people when they have to pay a minimum wage to everyone and only have limited access to funds. In order to maximize the number of jobs that an investment can afford to support the use of a complementary currency could help create opportunities to compensating and involve more people in the redevelopment. If the community embraces the idea of a complementary currency then the Shaster Foundation could afford to create more jobs for redevelopment by paying workers in the Rand as well as the complementary currency. However, the biggest challenge with this method is getting people interested and educated about the currency as well as establishing a value for the currency throughout the community.

Establishing Value for the Complementary Currecny

Initially, in order to create value for the complementary currency system the project team proposes that the most straightforward and practical approach is taken.

Buywisa Tonono suggests that in order to introduce something such as a complementary currency one needs to start with another new program. Taking this into consideration the project team suggests two new value-adding operations that could be supported by the local economy.

The first operation that will establish value for the complementary currency is the creation of a soup kitchen that only serves soup in exchange for credits. This will encourage people who want to enjoy a nice meal from the soup kitchen to become involved in the complementary currency exchange. In order to maintain the value of the credits the soup kitchen should only give meals in exchange for credits and not make any exceptions. The soup kitchen could be funded by an outside investment or the Shaster Foundation.

Another operation that could be established in order to add value to a complementary currency is the creation of a credits store. The credit store would consist of many commonly purchased items that are found in a Cash Store. In order to attract more customers and attention to this store the credit store would feature special sales where they bundle many commonly purchased items as one, similar to the popular specials at the Tawakal Cash Store. However, what would make the credit store different from the other Cash Stores is that the credit store would only accept credits as a payment. This way people would have to earn credits in order to buy the popular special bundles.

Cash Store to use as a Model for the Credit Store


Soup Kitchen Photo

Initially the credit store would need to be funded by an outside investment. However, it is possible that as the other businesses associated with redevelopment, such as the Key Redevelopment Industries and the Employment Agency, grow their profits could be used to keep the credit store well-stocked.

In order to determine the price in credits for the items in the credits store and the meals served in the soup kitchen the value of one credit needs to be established. Because the products provided from these two operations can easily be translated into a price in Rand the best method is to define one credit as equivalent to one Rand. This is the most practical way to assign a value to a credit because people have already determined a value for most goods and services using the Rand therefore, it will make creating a equivalent value in credits straightforward and easy to understand.

Earning Credits

Initially, before the complementary currency system gains interest throughout the community the workers who are employed by jobs created through the redevelopment would be the only people earn-

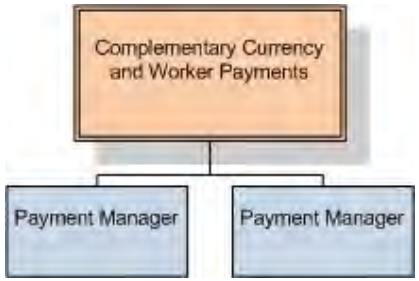
Odd Jobs from Shaster

ing credits. This would include the mangers of the key redevelopment managers and workers, employment agency manager, skill development manager, among others. When interest in the complementary currency grows and more people would like to earn credits the infrastructure for earning credits will expand. The Shaster Foundation can sponsor many different kinds of odd jobs that anyone could do to become involved in the complementary currency exchange system.

The Logistics of Managing The Complementary Currency System and Employee Compensation

In order to keep track of the complementary currency system everyone's balance will be kept on a paper ledger and then updated in a computerized database for safe-keeping. The quantity of credits and Rand that each manager and worker will make needs to be determined later after more information about production, demand, and profit is learned. In the factories the managers will keep track of the performance of each employee by simply marking off each missed quota for the week using the "*Missed Quota Form*." If none of the workers have missed a quota then everyone is paid the same amount of credits and Rand.

It is the responsibility of the two payment managers *(shown in the Complementary Currency and Compensation Hierarchy)* to keep track of the weekly Rand and credit payments for all of the jobs that are created out of the redevelopment. The payment of these workers will be the same every week unless a missed quota form is submitted. In order to facilitate the Rand portion of the employee's wage the payment mangers will automatically deposit the wage in the bank account of the worker (as the Shaster Foundation currently pays their workers). In order to track the credit balances of the workers the two payment mangers will also maintain a database with the names and credit balances of all of the people who have earned credits. Using the information from this database the payment managers will post the credit balances in a public space for the community to view. They will also be responsible for providing the soup kitchen and credit store an updated report of everyone's credit balance so they know who they can trade with on a daily basis. At the end of the day the credit store and soup kitchen will provide a report of who has redeemed their credits to the payment managers so that the database can be updated daily. The *"Credit Balance Form"* will be given to the soup kitchen and credit store managers to help keep track of people's credit balances daily.



Complementary Currency and Compensation Hierarchy

Missed Quota Form

Division: ☐ EcoBeam Factory ☐ Sand Bag Factory Date: ____/____/_____

Employee Name: _____

Quantity Produced: _____ Quota Requirement: _____

_____ Factory Manager Name _____ Factory Manager Signature

_____ Payment Manager Name _____ Payment Manager Signature

Missed Quota Form

Hesitiations and Considerations

As mentioned before, there are many issues of greed, corruption, and nepotism that are likely to be factors when working in an informal settlement. This is especially a concern when dealing with money and jobs. In order to try and offset some of the chances for corruption it is essential that the system is designed to be as transparent to the community as possible. This will inspire a sense of pride, ownership, and community watch to help defray corruption. Also one of the biggest areas where corruption could become a serious problem is among the payment managers who oversee all of the employees wages and the complementary currency. To keep the payment managers fair, it is important that they are employees of the Shaster Foundation so they do not have any control over their own wages. Also it is important that the Shaster Foundation oversees and frequently audits the records and paperwork that the payment managers produce to try and monitor for any corruption. It is possible that the payment managers may also be responsible for producing an annual report to make them even more accountable.

Credit Balance Form

Date: ____/____/_____ Credits used: R_____

Purchase Description: _____

_____

_____

_____ Customer Name _____ Customer Signature

_____ Cashier Name _____ Cashier Signature

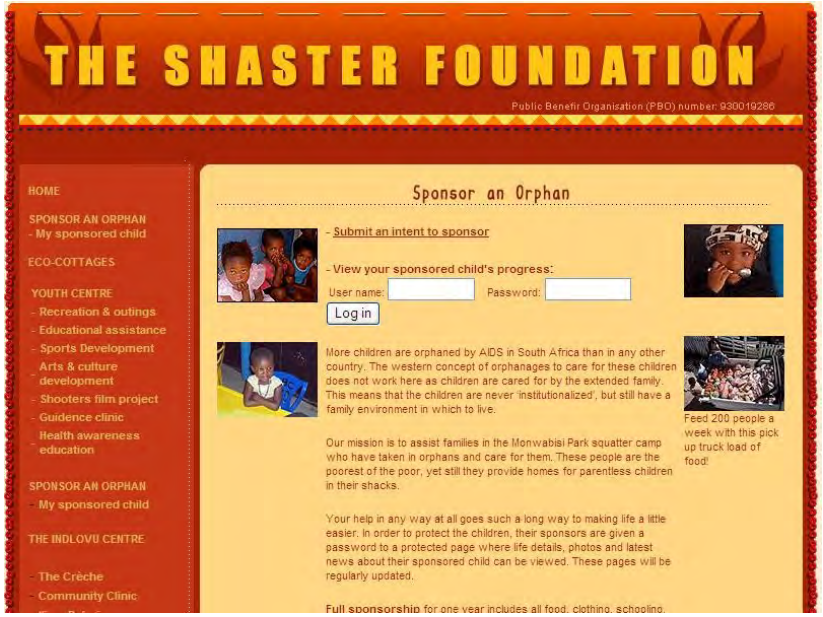
Credit Balance Form

Fundraising Strategies

Gathering funds for a successful redevelopment effort requires a multi-faceted approach to fundraising. Thus multiple strategies must be implemented to ensure a highly successful fundraising effort. These including seeking large government, corporate, and non-profit grants through formal funding requests as well as utilizing the Shaster foundation's website to allow for personal and small group donations targeted for specific development goals.

SHASTER FUNDRAISING

As a non-profit organization without a source of generated income the Shaster Foundation must rely on the generosity of its corporate and personal donors. These financial contributions are of great importance and are essential in allowing the foundation to continue and expand its work. The Shaster foundation is responsible for providing a great number of services to the Monwabisi Park community. These services include the soup kitchen, clinic, crèche, guest house, youth center, and others. Expenses for these operations include not only day to day operating costs but salaries for those employed as well as security for the buildings during the evening and weekends. The Shaster foundation thrives on the generosity of others.[g]



INDIVIDUAL SPONSORSHIPS

While the redevelopment plan will help to serve the strategy of seeking large grants from sponsors, it is also necessary to recognize the importance and value of individual donations. An expansion of the existing Shaster Foundation website will allow individuals to make donations with an understanding of the true value of what their gift can accomplish. As stated by the Shaster foundation founder Di Womersley "people like to feel like their gift has really accomplished something." By displaying the details gathered on the costs for specific community improvements, potential donors can see in real terms what their donation means and what impact it can have on the cash poor community. This will thus allow an individual anywhere in the world to make a real contribution to the Shaster foundation and the projects it supports. It will also allow the individual to have a real understanding of the direct impact their financial contribution can make. While it is currently possible to sponsor an orphan via the foundations website new additions can include more redevelopment oriented sponsorships. Website expansion can include sponsorship opportunities for such things as rebuilding a shack into a sandbag house, providing better insulation for a shack, replacing a families stove with a safer and more efficient alternative, or even building a communal toilet or washing facility. The possible redevelopment sponsorships would be placed on the website with a statement of their value to the community and a listing of the estimated construction cost. This initiative provides a new donation opportunity.

KIVA is a non-profit organization that seeks to provide funding for individuals and small businesses in underprivileged areas. The organizations website, kiva.org, allows users to post details explaining the need for their funds with a picture and explanation of their circumstances and why they are deserving of the funding. Potential lenders are then able to review the posted profiles and subsequently provide loans in increments of $25 to those parties that they believe are deserving of the loans. This allows potential lenders to loan only to those businesses or individuals that they believe in and believe are most trustworthy in terms of repayment.[d] KIVA is a great alternative to many local loan programs or banks that often charge substantial interest rates and unfriendly repayment terms. Establishing a role within the Shaster foundation for a micro-loan manager would allow KIVA to be utilized as means of supplementing any potential gifted funds with loans needed for such purposes as establishing or expanding the sandbag or EcoBeam factory.

Eco-Economy Project Methodology and References

This section explores in detail the project team's methodological approaches to gathering and analyzing the aforementioned information. Many different data gathering techniques were utilized for the existing conditions section, including interviews, surveys, charrettes, field mapping and observation, and photographic/video documentation. As the problems and concerns for the economic climate of Monwabisi Park emerged through these existing conditions and analysis, the project team was able to generate new ideas and plans for funding the redevelopment effort while also stimulating local economic growth for residents through job creation and skill development.

1. Methodology for Mapping Informal Enterprises
11/6/2008-11/7/2008

To begin the team's understanding of the current economic climate of C-Section in Monwabisi Park, the project team mapped the informal enterprises present and observed the different types of businesses in this area. This was done using GIS maps, field observations and photographs which was completed with the assistance of the co-researchers.

Using a printed GIS map of C-section, two members of the team and two co-researchers set out to locate the informal enterprises. Each enterprise was numbered on the map of C section, and at the same time the type of business was recorded in a notebook next to the corresponding number. The project team also asked permission from various informal enterprise owners to take a picture of their business so photographic documentation of each type of business was obtained. It was important to ask permission as to not upset any owner who did not want a picture taken. In addition to mapping these enterprises, the co-researchers provided general information about each type of business such as goods sold, services offered, prices, and differences between different enterprise types.

Spaza Shop- Photo taken during mapping exercise

After gathering this data in Monwabisi Park, the team organized and analyzed the results. The pie chart was generated which depicts the percentage of each type of business in C-section. Also the team generated a GIS map of the informal enterprises using the software program with the mapping team.

This method proved to be effective as the team was able to observe and map many of the businesses in C section. However, the team cannot be completely certain all of the businesses were noted. Mainly, the co-researchers pointed out and located the businesses, and there may have been a few they overlooked or were not aware of. Despite this, we came across many more businesses than we had originally thought we would find. It was also interesting to see that many of them sold very similar or the same items even a short distance from each other. In addition we found that many of the businesses were located either within or directly next to the shop owner's home. The co-researchers were able to provide valuable input on each business and the community perception of the business that would not have been easily attained by mere observation.

2. Methodology for Local Business Biographies
11/24/2008-11/25/2008

To provide a better understanding of the fundamental challenges that informal business owners in Monwabisi Park face on a daily basis the project team completed several interviews with shop owners around C-section of Monwabisi Park. The interviews were completed with the co-researchers, however there was no specific interview plan. The project team adopted this methodology in order to encourage a more open dialogue between the team and the interviewee. This interviewing approach allowed the interviewee to feel more comfortable asking members of the project team about their background and personal experiences. Despite the unstructured interviewing plan, the project team did take special interest to get some fundamental, basic information from

each business such as the shop history, shop item details, purchasing habits, operational logistics, and information about the safety of their location. For some interviews the project team was also able to get a personal biography about the shop owner. This allowed the team to learn more about the goals and aspirations of local shop owners, which can be incorporated into the planning of the overall redevelopment plan.

3. Methodology for Employment in Monwabisi Park

The data for employment and unemployment rates as well as modes of transportation in Monwabisi Park was collected in the survey that the Communications Team devised. For the methodology utilized, see ^ p. ##

4. Methodology for Skills and Desired Training 10/30/2008-11/04/2008

In order to gather data from community members in Monwabisi Park, the project team worked closely with trained members of the local community. These trained community members, known as co-researchers, helped the project team conduct interviews and informal discussions with about 60 Monwabisi Park residents. The purpose of these interviews and discussions was to obtain the skills and learned trades that exist within the community. The interviews were also helpful to determine what kinds of skill development and training workshops would be most successful in the community.

Before conducting interviews in Monwabisi Park the project team met with the co-researchers to explain the details of the interview questions. This was an important step because it allowed for the co-researchers to better understand the value of the information collected. Once they were familiar with the desired information, the project team walked around C-Section of Monwabisi Park under the co-researchers leadership to find individuals to interview. These individuals included those who stopped to talk with the project team in the pathways or those who invited the team into their homes for an interview.

To begin the interview, the co-researchers first asked if the individual was comfortable speaking English or Xhosa. If the former was chosen, the project team briefly discussed the team's purpose in Monwabisi Park – that we are American students interested in gathering information to devise a plan for redevelopment. If the individual preferred Xhosa, the co-researchers would explain the project team's purpose. Once introduced, the project team (or the co-researchers depending on choice of language) asked the individual what he/she does, or has done, for work or a job. The project team asked about the skills or trades they possess, and recorded this information in a notebook. The project team also asked some individuals what type of training or skill development they would like to learn, and recorded these results. It was sometimes difficult to obtain the skills of these individuals, because they do not see themselves as possessing a skill if they did not have a job currently or did not have proper training. By giving examples of skills and trades, the project team was able to extract the necessary information from interviewees. These results were used to generate the pie chart which shows the percentage of skills/ trades a sample population of Monwabisi Park residents possess.

While this methodology allowed the team to gather some useful information, it was restricted only to community members in C section and the actual process was time-consuming. It was sometimes difficult to find individuals to converse with because some did not want to interview with us, most likely because they were skeptical of the presence and motives of the team. Many were concerned that the team was involved with political groups as South African elections are taking place next March. Despite the co-researchers telling them the team's purpose here, they still did not wish to speak with us. Thus, it sometimes took a while to find individuals to speak with, and the smaller area of C section limited the number of individuals available to interview.

5. Methodology for Skills Inventory with VPUU Trained Residents 11/20/2008

In order to gather more data, the project team took an active role in the second charrette. The attendants of this charrette included the co-researchers as well as 18 additional residents who took part of the VPUU security watch training program. The purpose of the charrette was to brainstorm ideas for what these community members would like to see in the Monwabisi Park redevelopment plan as well as obtain more existing conditions data for the WPI project teams.

In order to obtain the skills and work experience of these residents as well as what training they would be interested in receiving the project team devised a template and a survey for them to fill out. Before the charrette, the team generated a Curriculum Vitiate (C.V., also known as a resume) template which would serve as a useful tool in gaining the training, work experience, and skills of these individuals. At the charrette, the attendees filled out this template. For those who were proficient in English, members of the project team were able to guide them through the questions ourselves to obtain the data. The co-researchers assisted those individuals whose primary language was Xhosa to do the same. This information was added to the pie chart previously generated to get a larger population sample and a more accurate representation of the skills available within the community.

In addition to the C.V. devised a survey listed different skills and trades which individuals could check if they were interested in learning. This list will be beneficial in the future as these individuals expressed a desire for different types of training workshops incorporated in the redevelopment plan.

The second charrette proved to be an efficient way of gathering the data the team hoped to gain. By working with a small group of individuals, 18, members of the team were able to interact closely with one or two community members at a time. Conversing with them this way allowed the team to obtain specific desired data. This group of 18 was also quite

[House Number] [Phone]
WP

[First Name] [Sur Name]

Objective/Desired Job

Skills

Experience

Education/Training

Fluent Languages

Curriculum Vitiate Template: The project team worked with the VPUU trained individuals to fill out the above resume template.

diverse which provided more of an accurate representation of the community. The group consisted of men and women of various ages from other sections of Monwabisi Park. This was helpful because the team's previously acquired data was only from members in C section.

6. Methodology for Establishing a Sandbag Factory 11/13/2008-11/25/2008

The main deliverable the project team was seeking to leave behind at Monwabisi Park was a sand bag factory. Prior to the fire that burned down the Indlovu Centre and surrounding buildings, the team had taken significant strides to establishing the factory. The first step, establishing a buyer, was completed on October 13th, 2008. Two members of the project team visited Mike Tremeer at his Eco Beam factory in Epping 1 and talked to him about the possibility of producing sand bags. Mike agreed to provide the fabric needed for making sand bags along with the sewing cotton, and he also agreed to pay 20 cents per sand bag for labour. Due to the constant demand for sand bags, Mike said that he would be able to purchase as many sand bags as the factory were able to produce.

After we determined that we had a buyer, we needed to find a location for the factory. Buyiswa and Dianne Womersley suggested that we use the Wendy house located between the Indlovu Centre and the clinic/youth centre. The building was approximately 6 meters by 3 meters, enough space to fit six sewing machines and all the materials needed for a week of sand bag production, according to Mike Tremeer. A few hurdles had to be overcome before this space was useable for a factory, however. The first was that the building was filled with painting, construction, and decorating supplies that needed to be cleaned up and moved. The actual cleaning of the Wendy house took approximately one week, and with the assistance of MBembe and

The Wendy House prior to clean-up

Oupa, the project team was able to have that work done by November 24th. While that step was completed, the Wendy house still needed to have a new lock for its door, and it also needed to have electrical outlets installed. These steps were planned to be completed in the near future before the fire destroyed the Wendy house.

The next step the project team took to establish the sand bag factory was purchasing sewing machines. After conversations with Mike Tremeer, several Eco Beam employees, and various sewing machine distributors, it was apparent that an industrial machine was required for the factory. The project team decided to purchase two Swift GC 5550 machines from Berzack's, a large South African sewing machine distributor. The machines cost approximately R2500 per machine, and they included a 6 month limited warranty, two liters of extra oil, a training session, and delivery to the Indlovu Centre. The machines were purchased with the fund given the to Cape Town project centre by General Electric.

After purchasing the machines, the project team attended a training session at Berzack's in Maitland on November 24th with eight people from Monwabisi Park, all of whom had received security training from the VPUU. The session covered basic sewing techniques along with basic operating knowledge such as

threading the needle, threading the bobbin, and basic maintenance. By the end of the session, which lasted approximately two hours, the people who attended were able to sew fairly well. The project team had planned to hold additional training sessions at the Community Centre to have those who attended get more familiar with sewing bags, but the machines were lost in the fire. Actual production of the sand bags was scheduled to start before the project team left the area.

A payment scheme had yet to be determined, however the plan was to incorporate a complimentary currency to allow people to use the credits to eventually purchase an Eco Beam home. The work schedule had also yet to be finalized, although a plan for two shifts a day with two people working at a time and people working every other day seemed to be the most likely. This set up would allow a total of eight people to be employed with the two sewing machines that had been purchased, and would allow one day a week to be used for training sessions to teach other community members how to use the machines.

The above picture was taken at Berzack's sew shop Here, the project team and 8 VPUU-trained security guards were trained on the Swift industrial sewing machines.

7. Methodology for Establishing an EcoBeam Factor in MWP
12/04/2008

In order to determine how to plan for the creation of an EcoBeam factory in MWP an interview was conducted with Mike Tremer, founder of EcoBeam as well as his office and operational staff. This included viewing sample pictures of factories established in other poor income areas as well as working through and detailing estimated costs for space and finance requirements. A mini-tour of the existing EcoBeam factory was conducted. While this factory allows for greater and more complicated EcoBeam construction it was shown how it could easily be downscaled for the type of production required for the MWP redevelopment effort. In addition the materials, tools, and equipment were displayed and demonstrated by current employees. Estimated material costs and wages were also provided for reference and to aid in determining estimates.

8. Methodology for Khayelithsa Talent Exchange
10/29/2008

In order to gather data for the Khayelitsha Talent Exchange, the project team interviewed Ginn Fourie and the three bankers of the Emabhozweni Talent Bank. The team of four students, along with Joseph Edozien of the South African New Economics Network, all attended the interview, which was conducted at the Emabhozweni Talent Bank in Khayelitsha. The interview was an informal session during which we shared our ideas for implementing a complimentary currency in Monwabisi Park, and the members of KiTE shared their knowledge of KiTE and its operations.

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Appendix A: Community Exchange System (CES)

The CES is a worldwide effort to encourage people to become less reliant on their national currency. While there are many different structures used for CES, the basic principles remain the same throughout all installations of the system. According to ces.org.za, money in the CES is "a retrospective 'score-keeping' that keeps a record of who did what for whom and who sold what to whom." CES has been established in many different countries, with 102 different establishments in total. The most prominent countries are Australia (27), South Africa (22), New Zealand (19), and the United States (14)[b]. Despite the obvious application of such a system to cash-poor societies, most of these instalments are in upper-middle class societies, a trend that will hopefully change in the near future.

KHAYELITSHA TALENT EXCHANGE

The Khayelitsha Talent Exchange (KiTE), an extension of the South African New Economics Network's (SANE) Community Exchange Program (CES), was founded in July 2008 by area manager Ginn Fourie. Ginn runs the Emabhozweni Talent Bank with the help of the three bankers from Khayelitsha. The bankers have many responsibilities including registering new members, and as of October 2008 they have registered 1000 members, 400 of which are active traders. The Khayelitsha Talent Exchange encourages its members to be less reliant on the Rand by facilitating exchanges using their complimentary currency, the Talent. While exchanges can include some Rand compensation in place of Talents, KiTE does not allow exchanges to be more than half Rand-based. In order to simplify exchanges, KiTE has made one Talent equivalent to one Rand so assigning value to products and labor is straightforward. With this basic currency system, KiTE hopes to help Khayelitsha become more self-sufficient.

Jin and the KiTE bankers

In addition to registering new members, the bankers have several other key responsibilities in running the exchange program. A pivotal responsibility of the bankers is to facilitate exchanges. The main medium for facilitating exchanges is a large whiteboard located in the Talent bank. On this whiteboard bankers write the need or want of a member (the buyer), their name, and their telephone number. They then search the database for someone with a matching skill or good that can fulfill the need on the whiteboard; this person will become the seller. If there is a match, they list the name and number of the person with the skill or good on the board next to the original need and wait for the buyer to come back in. Once the buyer comes in and makes the contact with the seller, the exchange is in the hands of the buyer and seller. All factors of the exchange are handled by the buyer and seller, although the bankers are always available to mediate if a sale conflict cannot be resolved. When the exchange is completed, the seller calls the exchange in to the bank and notifies the bankers of its completion along with the agreed price in Talents. The banker then inputs the exchange into a computer database, and the involved members' balances are updated. Although members are allowed to accumulate negative balances, if their balance becomes too low the bankers will not allow them to purchase any service or good until they sell some of their own goods or services. Another one of their responsibilities is to keep track of members' reliability by making notes on their profiles based on exchange feedback.

Tracking the exchange feedback allows the bankers to avoid facilitating exchanges with problem traders and stick to traders with positive feedback and good trading records. It is through these key responsibilities that the exchange is able to operate smoothly, and through the continued execution of these responsibilities that it will be able to grow.

One of the biggest hurdles that KiTE has faced in its first few months of operation is getting people to understand the exchange. The main marketing for the exchange is word of mouth, and as more people become involved in the exchange, the more word will spread. Once people hear about the exchange and become interested they go to the Talent bank and the bankers explain the system. If there is a large enough group interested, the bankers perform a play to explain the exchange system. The play is performed in Xhosa and addresses many of the major concerns people have with the exchange, such as what they can offer to the exchange, how to register for the exchange, and how exchanges are performed. The bankers took a good-natured approach to the play, using Xhosa humour to get across much of the important information about the exchange system. Another way that they help people understand the Talent exchange is by holding market days, during which people bring their goods and services and display them to one another for people to see what others have to offer. The market days help people see that there is a multitude of things they can offer to the exchange, not just traditional skills like carpentry and painting[8].

Appendix B: Operating Sewing Machines

There are many key aspects to proper operation of the sewing machine. The main controls needed are the foot pedal, which controls speed, and the knee control, which controls the foot [20]. The first step to sewing is lifting the foot and inserting a piece of fabric underneath it. The foot must then be lowered and sewing can begin. During normal operation, the fabric w ill be fed through the machine from front to back. The speed of sewing is

Basic Maintanence

Before starting a sewing shift, the oil level must be checked. This is done by tilting the sewing machine away from the sewer, and making sure the oil level is in between the "low" and "high" written on the oil bin [1].

At the end of the last shift of every day, lift the machine and clean the bobbin area and the oil filter. Make sure to brush away all small scraps, making sure they do not fall into the oil pan.

If the machine has been idle for more than a week, run the machine at approximately half speed for 5 to 10 minutes in order to lubricate the machine with oil.

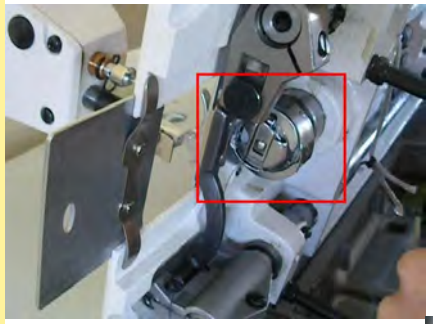
Removing and Installing the Bobbin Case

The first step to threading the bobbin is removing it from its case. The case is located on the left, underside of the machine and can be reached in many different ways.

The first way to access the bobbin case is b y tilting the machine backwards, as if checking the oil. The bobbin case can then be located on the left side of the machine (bobbin case outlined in red) [2].

The second way to access the bobbin case is to slide the metal cover left, and looking through the hole while working below the table to remove the bobbin case [3].

Once the bobbin case is located, it can be removed by lifting the lever on the case and pulling directly left. Once the



case is removed from the machine, the bobbin can be removed from its case. Installing the bobbin and case into the machine can be accomplished by reversing these steps.

Winding the Bobbin

Winding the bobbin can be done automatically by the machine. The threading mechanism is located on the right side of the machine. The first step to threading the bobbin is installing the bobbin on the mechanism. This is done by pushing an empty bobbin onto the black rod on the right side of the machine (outlined in red) [4]. Make sure to push the bobbin all the way on to the rod.

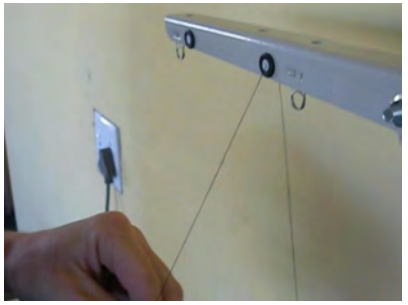
The second step to threading the bobbin is threading the cotton. Take the cotton from the right reel of the machine and thread it from back to front through the right hole on the bar above the reels [5].

Next thread the cotton from left to right through the hole next to the wheel on the

right side of the machine [6].

After threading the cotton through that hole, wrap the cotton around the back side of the wheel so that the cotton new comes forward from the bottom of the wheel [7].

Now wind the end of the cotton around the bobbin



tightly about 10 times. Next push the silver lever in front of

the bobbin down such that the end sits between the edges of the bobbin. [8]. The bobbin should now be threaded automatically with normal operation of the machine.

Once the bobbin is wound with cotton, it must be threaded in the case. To do this

insert the wound bobbin into the case with 5 to 10 cm of cotton

hanging free from the bottom. Take the extra cotton, and slide it through the narrow slot on the side of the case. There are multiple steps to the slot, and the cotton must be put through such that it comes out of the slot at the point closest to the closed end of the bobbin case. Once the cotton is threaded through the slot, the bobbin case is ready for sewing and can be reinserted into the machine.

INSTALLING THE NEEDLE

Installing the needle is a simple, yet crucial step to the set up of the machine. The needle gets inserted into the underside of the cylinder on the left side of the machine. The needle must be oriented with the hole going from left to right, and the flat side of the needle facing right. Once the needle is oriented correctly, ensure that it is pushed as far up as possible in the hole and tighten the set screw.

THREADING THE NEEDLE

Threading the needle is a multistep process that must be accurately completed for the machine to operate correctly.

The first step to threading the needle is taking cotton from the left reel and threading it through the left hole on the upper bar of the machine [9].

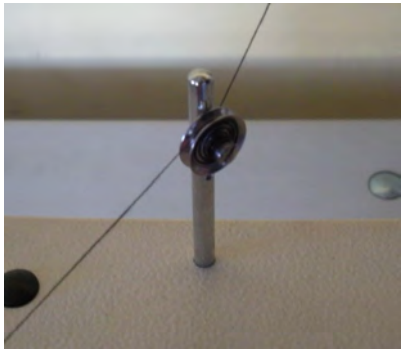
The second step to threading the needle is threading the cotton from the left hole down to

the post with a wheel on it in the center of the machine. The cotton must be threaded through the hole below the wheel from left to right [10].

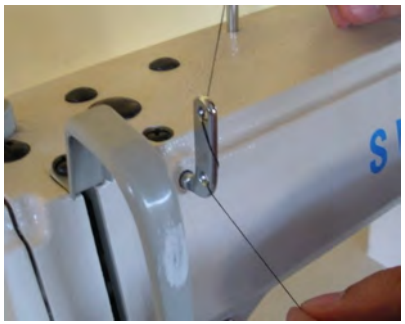
After threading the cotton through the post hole, the cotton needs to be wrapped around the wheel, from top to bottom and

back to front such that the cotton comes towards the front of the machine from the top of the wheel [11].

From the wheel, the cotton must be threaded through the two-holed bar on the front of the machine. The cotton goes



through top hole from right to left, then through the bottom hole from right to left [12].



From there, the cotton then must be threaded the square, metal loop above the wheel on the front of the machine [13].

After threading the cotton through the square hole, it must be wrapped around the wheel. The cotton should be wrapped from top to bottom, right to left

so that the cotton ends up going up on the left side of the wheel.

From the left side of the wheel, the cotton must be threaded through the interior of the wire loop on the left side of the wheel and pulled straight down [14].

After threading the cotton through the wire loop, it must go below the large metal hook directly to the left of the wheel [15].

From the hook, the cotton must be brought up to the lever

with a hole in it on the front of the machine. The cotton is then threaded from right to left through the hole. From the hole, the cotton is then threaded

downward through the left square, metal loop [16] .

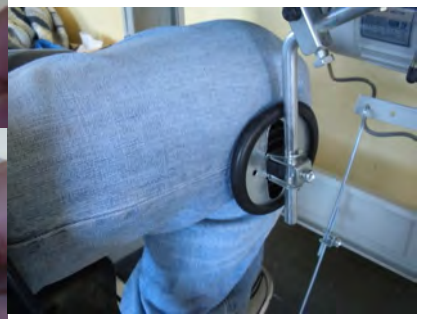
From the left loop, the cotton then must be threaded through the wire loop below the machine next to the needle [17].

After threading the cotton

through wire loop, it must be threaded through the hole on the front of the needle mounting device. The cotton must be threaded from front to back and from right to left [18].

From there, the cotton must then be threaded through the needle. The hole is very close to the tip of the needle, and the cotton must be threaded from left to

foot control up on the back of the machine. Once the foot control is up, the foot can be slid up on to the rod. Ensure that the foot is oriented so that the slot is di-



rectly under the needle. Once oriented correctly, tighten the setscrew to complete the mounting of the foot.

right through the hole [19].

Once the cotton is threaded through the needle, the needle set up is complete.

INSTALLING THE FOOT

To install the foot, first raise

the foot control by either moving the right knee out against the knee control [20], or flipping the

Communications

Chapter Seven Contents:

Authors:

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Marco Angulo
Matthew Perrone

Sponsor:

Shaster Foundation

Introduction

Communication is a crucial part of the redevelopment process, especially when the redevelopment process begins with the community.

This allows for a collaboration between the community, experts in respective fields, and us as students to establish a redevelopment plan that satisfies everyone's needs. Current informal settlement upgrading in South Africa has followed a pattern of demolishing existing shacks and replacing them with a pre-fabricated housing solution that was developed without community input.

These solutions are ineffective because much of the housing is left vacant and the sense of community, a valuable part of their culture, is lost. To change this ineffective cycle, the Indlovu Project is working to involve the community in the ecologically friendly development occurring in Monwabisi Park. In order to effective, this process has a need for communication among WPI teams, their sponsors, and the community.

Working with the six co-researchers proved to be a success, but learning to communicate across cultural and language barriers was a challenge. At the beginning of our work with the co-researchers, ideas were difficult to communicate. Silence was a common response to questions in the initial stages of our research. As trust developed and the co-researchers became more comfortable speaking consistently in English, communication increased.

Understanding and adapting to the nature of meetings and to the cultural and social behavior in Monwabisi Park was strenous for both WPI students and the community. This was eased by continual work with the co-researchers, since we both learner the best means to communicate not only with each other, but with the community as a whole.

The goals of our project were to:

- Begin a flow of communication throughout the process of redevelopment
- Understand how information about the redevelopment process should be shared with the community to include them
- Establish a capacity of local residents to share their goals for redevelopment
- Develop a co-researcher program with members of the community to build trust and increase interaction with the community while exchanging knowledge.

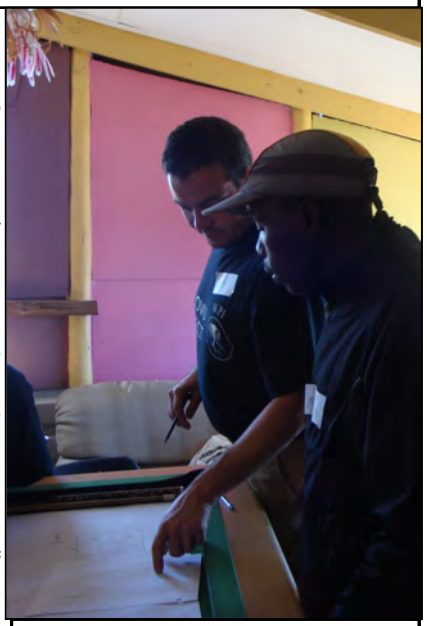
Through working toward these goals, we examined the difficulties of cross cultural communication and the social implications of redevelopment. The coresearchers worked with us in meetings, surveys and interviews to gain the community's opinion on redevelopment as well as to gather demographic information. These activities offered them a creative outlet through charette style planning, and a television show. We found the co-researcher program to be a crucial part of every team's work and extremely successful. By first working with the co-researchers and establishing trust, we were able to expand our communication to include more of the community. We learned that people were very willing to discuss their hopes for Monwabisi Park, and embraced the idea of expressing themselves through a TV show, an interview or a forum. Future students, potential sponsors, and other interested parties will be able to use this program, along with our interview and survey data, to learn about Monwabisi Park before arrival. Once there, the co-researchers will be a valuable resource; their capabilities in surveying and interviewing could be expanded to the needs of those future developers.

This report discusses the evolution of the co-researcher program from its beginning stages to a successful mode of communication, analyzing the process we took to identify the most successful means of cross cultural communication.

Co-researchers prepare for a day of surveying and interviewing.

Reviewing the interview session about job opportunities with the co-researchers.

A charrette with the co-researchers, WPI students and members of the



Working one-on-one on the details of an alterative housing design.

Co-Researchers: Establishment

The establishment of a successful co-researcher program was a process that evolved as WPI students and co-researchers from Monwabisi Park mutually learned about the projects and each other's cultures, and developed logistics for a program that was new to everyone involved.

The co-researcher program was planned as a means for the WPI teams to obtain valuable information from the community pertinent to the redevelopment process. The program was set up by the Communications team, in conjunction with the Shaster Foundation, who arranged six of the VPUU trained community members to work specifically with the WPI project teams.

The co-researchers themselves were responsible for different needs of the WPI teams. The different responsibilities involved providing guidance, helping in the interviewing process, working on gathering survey information from different parts of the informal settlement, as well as translating whenever necessary. It was important that the co-researchers effectively communicated the intentions and apolitical nature of our projects. They also explained that the effort would not propagate immediately, but rather laid the framework for a cohesive redevelopment plan.

Six community members involved in the co-researcher program.

All members directly involved in the co-researcher program. Marco Angulo (center), Amanda Jenkins (right), and Matthew Perrone (left) were the WPI students who organized the co-researcher program alongside Buyiswa Tonono (center).

Three of the co-researchers during the planning of the day's activities. (Left) Thobisa, Nodumo, and Anele enjoying the co-researcher experience. (Right)

Accomplishments of the Communication Program

- Establishing trust and recognition within the community
- Traveling safely through the community
- Soliciting the views of the community through surveys and interviews
- Translating from English to Xhosa
- Sharing stories informally
- Documenting the steps taken in the current redevelopment process
- Transferring skills

Tours And Surveys

WPI teams made use of the co-researchers in different ways for obtaining information about the informal settlement. Two such methods included taking guided tours within Monwabisi Park, and conducting surveys that encompassed the inquiries various teams had.

Tours

The co-researchers provided an opportunity for the WPI teams to tour through the park in search of the existing conditions within the community. They provided the guidance necessary for knowing what parts of the informal settlements to go through in order to gather the desired information.

The tours were the best means to establish the existing conditions of the park. This data was necessary in shaping the goals of each team. The overall goal of this communication process was to be able to achieve a mutual level of trust with the co-researchers.

There were numerous challenges faced with the guided tours. The first included clearly communicating what the teams wanted to learn and observe on the tours. Other challenges were found in addressing miscommunications and conceptual questions, both which needed to be approached in a more indirect fashion.

It was useful to plan with the co-researchers the activities for the day and then split into touring groups that would go to the different areas in the park. This showed the rich potential of the co-researchers, as well as introduced us to the flexibility and improvisational nature of the research process we were embarking on.

WPI teams meeting with the co-researchers to make plans for the activities they wanted to accomplish during the day.

Surveys

In order to gather as much data as possible for all of the WPI teams, we made use of the co-researchers by obtaining demographic data of the informal settlement through surveys.

We wanted to have updated demographic data representative of Monwabisi Park for the immediate use of the WPI teams and for later use of other entities involved in the redevelopment process.

The problematic aspects of the survey can be grouped as either difficulties formulating the questions and layout, as well as communicating the questions to the co-researchers. There were many questions to be asked, but, in interest of scale, distribution and quality, a shorter survey was opted for, leaving out questions for particular groups. The layout needed to balance an easy-to-use interface with clear objectives, as well as the need for more quantitative, rather than qualitative, questions. Familairizing the co-researchers with the survey took time, but once the idea and the process was communicated sucessfully, they were able to capture a very large amount of information in a short period of time.

As the problems cropped up, we saw the importance of organization and clear questions in a tight, concise layout. The potential for the information we gathered could be useful to establish statistics in question, many of which we had not found in research. The need for data entry was also seen, as the 380 survey completed needed to be captured and statistics extracted in an easily replicated way.

Groups of WPI students on tours guided by the co-researchers.

The Mapping Team utilized surveying to document various types of pathways. From the top down, a road (capable of carryng a vehicle), a largely traveled footpath, a normal footpath, and a smaller path between houses. (Right)

Personal Interviews

The need for interviews came from the idea that the community had a voice that needed to be heard, and mass conducted surveys did not include the personal element, or capture the spirit of the people of Monwabisi Park.

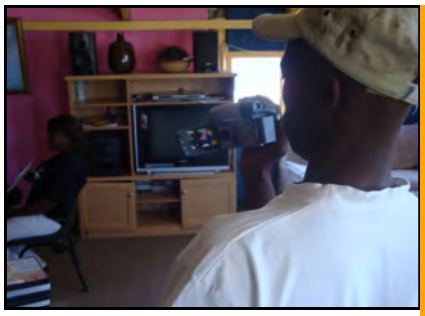
The interview process began as a way to express the views of the community in a more personal fashion compared to the overarching view that the survey provided. At first, individual teams would travel with co-researchers to inquire about problems in their area specific to their work. Short, factual answers were recorded, given that they did not require a creative response, yet they allowed for detailed information to be collected in a personal context.

The in depth interview process evolved from this, with a member of the communications team and two co-researchers traveling to peoples homes. There they would explain the purpose of the interview in a mixture of English and Xhosa, then conducted the interview, asking them about their lives and finishing with taking pictures of the interviewee and important things in their lives. This provided a look at peoples life stories; their reasons for moving to Monwabisi Park, where they came from, and how they felt about living in Monwabisi Park. These written life histories, combined with the photographs, gave powerful images of life in Monwabisi Park. By having the co-researchers take the lead with the digital cameras, it allowed us to gain their insight, and allowed them to increase their technical skills.

A priest and soup kitchen worker pose for a picture after an interview in the church that doubles as a soup kitchen in C section of Monwabisi Park.

Since the photographs added much to these personal stories, the idea of using video was introduced. Although we did not know how this would be perceived by the community, we discussed it with the co–researchers before visiting residents of Monwabisi Park in their homes. We found that people greatly enjoyed being interviewed on video, and that it was more effective to tape a conversation than to transcribe it in English while it was being told to the co-researchers in Xhosa. This way, none of the stories would be lost, and the elements of body language and vocal expression could be captured.

At first, WPI students from the Communications Team organized and filmed the interviews, while the co-researchers asked questions or translated from English to Xhosa. After a few interviews conducted like this, the co-researchers began experimenting with operating the video cameras themselves, as well as setting up shots and formulating questions. The transfer of the filming skills was gradual, as the co-researchers took turns operating the camera and asking the interview questions. Eventually, they began to conduct the interviews independently of the WPI students.



Yolisile getting experience behind the camera before heading out to examine the various shabeens.

A bricklayer's family, living in C section, explaining important aspects of their life in Monwabisi Park to one of the co-researchers in a videotaped interview.

Life Story

Nosipho

Nosipho has lived in Monwabisi Park since she moved there in 2000 to live with her mother. She currently lives with her siblings and their children, and her house is set up so that each family has a room, and they share the common areas such as the living room and kitchen. Usually she works one day a week and earns about 50 rand, which is not enough money to feed her family. Nosipho likes living in Monwabisi Park because of the feeling of community and sense of family among her neighbors, but wishes she could have electricity and better toilet systems. Below is a picture of Nosipho and her daughter in their family's shack.

EndlouviniTV: The Production

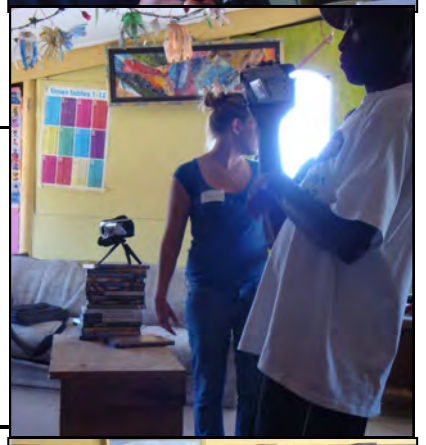
The production of EndloviniTV is the culmination of the entire process of working within the community. The skill exchange that happened with the technology involved was also important because it marked the complete hand-off of all aspects of the process. The coresearchers were able to choose the topics themselves, formulate questions to ask, operate the cameras and coordinate each other on the "set" of the Youth Centre. From this, three episodes have been filmed and put on DVD.

While the idea of a TV show came from internal ideas, the use of community television in redevelopment has been approached and used before, many efforts being seen in rural, low income situations. The opportunity to develop such a capacity in Monwabisi Park fulfils several goals. This effort is an ideal way in which the community has an outlet to share their opinions, express their concerns, and voice their insights to, potentially, the rest of the Monwabisi Park community. This avenue for community discussion is a valuable instrument in the redevelopment process, as the topics, chosen by the members of the community, are an insight that an outside researcher cannot gather with the clarity that it can in this fashion.

The use of the film captured has immediate research benefits in terms of data acquisition and gauging community feelings, but has exponentially more in terms of community involvement and representation in the redevelopment project as a whole, strengthening the effort.

	Episode 1: Community Safety; Awareness & Needs 	*Episode 2: Crime; Personal Instances in MWP* 	*Episode 3: Indlovu Centre Fire Documentary* 
Date Filmed	November 20th, 2008	November 25th, 2008	December 1st-December 5th
Guests Interviewed	Gernikhayk Somashini, Phumlani Yeye, Lizo Shebusukie, Olwethu Salukazan	Siyabonga, Yolosile, Nodumo, Thobisa	Various members of the community volunteering in the area around the Indlovu Centre
Host/Interviewer	Nodumo	Yolosile, Nodumo	Nodumo
Videographers	Yolosile, Siyabonga	Anele	Anele, Thobisa, Nodumo
Synopsis	With the VPUU training, the four community members selected from the charette were asked to discuss the role of the neighborhood watch, safety in the community, and their ideas in improving the situation. Run in Xhosa, with a short English summary to end.	Continuing with the subject of safety, we asked the co-researchers of specific instances of crime in the community. Thobisa's home was broken into that previous night, Yolosile was accosted waiting for the bus, and Siybonga walked into a morning hold up. Run in Xhosa.	The destruction of the Indlovu Centre buildings was rapid, but not as fast as the community response to clearing and assisting in rebuilding shacks in the area. Run in Xhosa, the three female co-researchers traveled about the site, asking anyone who would offer to talk to be interviewed, the first in-field production.
Production Notes	See Appendix	See Appendix	See Appendix

A chart showing the current TV shows that have been filmed to date, with further detail and elaboration to be found in their respective dedicated pages further on.



Top, Middle: *While the co-researchers were primarily responsible for setup. Layout design, and the actual course of the interview, WPI students still supported the effort and gave help in starter questions and overall supervision for the first episodes.* **Bottom:** *Over the shoulder of Siyabonga, one of two co-researchers filming the first EndloviniTV episode, targeting safety and the neighborhood watch.*

Indlovu Centre Fire Documentary

This episode takes place in the area after the fire that destroyed the four Indlovu Project buildings, and consists of various interviews. The unique aspect of this episode is that there was no WPI intervention whatsoever. After the fire occurred, Nodumo took up her camera and started videoing, and enlisted the help of Anele and Thobisa in order to assist in some of the more formal interview setup.

This, however, is proof that not only has capacity been built to do this, but the co-researchers acknowledge the value and importance of the need to capture the situation in a way that they could not previously. The quick response, without being told, caught the emotion right in the first moments of cleanup and rebuild, something that we, as outside researchers, could not have documented.

This capacity for on-site, readily-available documentation leads to film that is invaluable for research, and, if proper sustainability is achieved in post-production and dissemination, could be used by the community and shaped into a regular community broadcast.

Various pictures taken about twelve hours after the start of the fire that claimed the four Indlovu Centre buildings, as well as approximately twenty other edifices. Despite the tragic loss, people were contributing their time and effort into the cleanup and rebuilding process, working day and night. Students were able to assist, from shoveling ash to unloading timber, as well as share in the true sense of community that was present.

Working And Researching With Community

The ability to research in the community is the framework for all teams ability to gather data from the community. By starting with the VPUU training pool, preparation for working with our research group in English was started. A mindset was developed around increasing the safety of the community, focusing on the taking a stand to assist the community. Working with the co-researchers, a select group of these trainees, allowed us to start more in-depth, valuable research. The research capability increased as we spent more time with the co-researchers, progressing with surveying, interviewing, and EndloviniTV. With this progression, the amount of information communicated from one party to another grew, as well as the reach of our project work into the community, as seen in the table below.

VPUU Security Training

What:
VPUU training pro-gram for 50 English-speaking residents of Monwabisi Park, teaching them the skills of being part of the neighbor-hood watch.

Why:
The preliminary y training made possible the co-research program, as well as to plant the mindset of community involvement, in specific the nature of the community watch.

Co-Researcher Program

What:
Program based on the Security Training Program, by having six of the fifty trained to act as translators, guides, and chief consultants.

Why:
The WPI teams planned to have successful interaction with the community, in order to take into account their needs and wants into their designs, with the co-researchers enabling a bridge to any barriers present.

Surveys

What:
Surveys were per-formed solely by the co-researchers in order to pro-vide with basic demographic data over a large scale area, namely Monwabisi Park.

Why:
The overall demographics data of the informal settlement is useful for future redevelopment entities involved by providing with a base to plan for and work upon, as well as can be transformed into projected statistics.

Interviews

What:
Personal interviews with residents were performed by the Communications Team, alongside the co-researchers, who provided a sense of who to speak to and translation when needed.

Why:
The ability of broad-casting to the world the voice of the community, which also showed the community members the value of their individual voice and insights for the redevelopment process.

EndloviniTV

What:
The evolution of using video recording in the inter-viewing process, EndloviniTV is a group forum that takes the form of a TV talk show, progressing into an entirely self-sufficient process, using interest found through surveys for new guests.

Why:
The TV show aspect is the culmination of both our skill exchange and the opportunity to spread the community's voice.

Fire Documentary

What:
The third episode of EndloviniTV, this documentary comprised of interviews with community members during the clean up and rebuilding occurring after the Fire that destroyed the Indlovu Centre buildings

Why:
The Fire Documentary is a key proving point of our work; eight weeks prior, this response of using video to capture a crucial event in the community would not have occurred.

These pictures represent the various phases of research we progressed through, showing the need for a well organized, well established co-researcher program.