Flooding and Erosion Control in the Informal Settlements of Windhoek, Namibia

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NHAG
NAMIBIA HOUSING ACTION GROUP

Erosion and Flood Control in the Informal Settlements of Windhoek, Namibia

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EXECUTIVE SUMMARY

The informal settlements of Windhoek, Namibia are densely populated, low-income areas in and around the city. These areas have experienced extensive expansion since Namibia gained its independence in 1990. Residents of informal settlements often have trouble affording land and formal housing. Accordingly, many residents of these settlements live in shacks that have been erected on public land. In an effort to obtain land and formal housing, some residents have developed saving groups that allow members to pool their resources in order to achieve these goals. This has proven to be easier than obtaining land and housing on an individual basis. The Namibia Housing Action Group (NHAG) and the Shack Dwellers Federation of Namibia (SDFN) are two non-governmental organizations that assist these saving groups both logistically and financially, providing loans that can be used to buy land and build houses. Together, NHAG, SDFN, and the saving groups strive to improve the standard of living in the informal settlements across Namibia through community capacity building and self-help strategies. One vehicle for community capacity building is the Better Life programme, which is a group of people associated with SDFN who have been trained in a holistic approach to problem-solving in saving group communities. This holistic approach encompasses financial, social, and environmental issues.

Two major issues that confront the informal settlements are flooding and erosion, which occur during the storms of the rainy season. Despite Namibia's normally arid climate, the rainy season brings large volumes of water that can cause destructive flooding, wash away homes, and severely erode the land on which people live. The 2005-2006 rainy season was particularly destructive in Namibia, reaching record rainfall levels. In accordance with NHAG and SDFN's strategies, we, a team of students from Worcester Polytechnic Institute, used participatory methods to develop several rainwater control techniques with the people of the Otjomuise settlement in Windhoek. These participatory techniques were intended to provide the settlers with technical knowledge to supplement their own ideas, and to use their ideas to begin solving rainwater control problems. This approach was also intended to increase community capacity for problem assessment and solution development so that similar projects could be continued after our departure. The Ehirorujano and Dantago saving groups of Otjomuise were the main participants in this project due to the high levels of flooding and erosion that took place in the housing areas of these groups. From our work in Otjomuise, we intended to develop a means for building community capacity in other saving groups and to increase the technical knowledge and confidence level within these communities.

Rainwater Management Projects in Otjomuise

This project was completed in a series of phases to satisfy four objectives that we set forth. Our first objective was to establish the nature of the rainwater problems in the area by gathering information from the community. After spending some time establishing trust and relationships within the community, we held a series of community meetings to facilitate participatory discussion, both at a central meeting place and during walking tours. At these meetings, we first asked the settlers to assess their rainwater-related problems. We then asked the community members to identify both the causes and effects of these problems and where in the community the most serious problems resided. We found that language was a major challenge in communicating with the settlers; since few people spoke English, we asked members of the community to translate between

our team and the settlers. To address these communication challenges, we also implemented visual methods of communication, which we found to be quite effective. Some examples of these methods were showing drawings to the settlers and visually inspecting the problem sites. These visual methods seemed to be more effective than using words alone to accurately convey ideas both at formal meetings and during walking tours with the settlers.

Our second objective was to develop solutions with the community in a participatory manner to solve their rainwater control problems. The community was invited to choose locations at which to build demonstrations. Locations were chosen in the Ehirorujano and Dantago saving groups where the community felt there was the greatest need. After locations were chosen, our team asked the community to develop their own solutions in an effort to give the people ownership over the process and its results. Methods involving tyre walls and ditches were the most common suggestions from the settlers. After the settlers presented all of their ideas, our team introduced some visual representations of possible solutions combining both their ideas and some additional techniques that our team had discovered through research. In this manner, we attempted to ensure that the community was not unduly influenced by our own prior research, and our team was able to incorporate as many ideas that stemmed from the community as possible. After all ideas were presented, the community decided which solutions to implement at each of the previously chosen locations.

The next phase of the project was to implement solutions alongside the community. We intended to transfer knowledge to the members of Otjomuise regarding the technical details of how to implement rainwater control techniques by both working with them to implement different techniques, and by showing them examples of low cost solutions at the Habitat Research and Development Centre. Both the Ehirorujano and Dantago saving groups were encouraged to participate in all building sessions and to cooperate with each other in their work. SDFN policy prevented the building of demonstrations sites unless there was substantial community participation. Four demonstration projects were implemented throughout the Ehirorujano and Dantago saving groups, including tyre walls, soil-stabilising vegetation, and rainwater diversion channels. The community was then encouraged to teach others who were not present how to implement similar projects in other situations to achieve a broader impact throughout the nearby saving groups. Within two weeks of completing the demonstration projects, the community had initiated and completed twelve additional projects without our help, suggesting that the capacity building process had been effective.

Reflections on the Participatory Process

Based on the work done in Otjomuise, we were able to make several observations concerning the way the community members addressed their problems. One observation we made was that acquiring materials was often difficult due to the community's financial limitations. In these saving groups, members are often unable to afford construction materials without first saving money. For this reason, the choice of rainwater control methods was dependent upon what materials could be obtained for little or no cost. Our team petitioned the municipality for metal stakes, chicken wire, pipes, and tyres from the public landfill facility on behalf of Otjomuise, but we received permission for only a limited number of tyres. Even these proved difficult to retrieve due to miscommunication on the part of the municipality and other logistical problems. However, the members of Otjomuise were able to obtain tyres directly from private tyre distributors, who were more than willing to give the tyres away since it reduced their costs for transportation of the tyres to landfill sites.

Another obstacle that faced the settlers, in addition to obtaining materials, was overcoming what seemed to be an initial lack of confidence in their own ability to build reliable and practical solutions. Once everyone was ready to begin work, we found that the settlers were at first hesitant to try new techniques, but as we progressed the settlers seemed to gain more self-assurance and technical knowledge of how to build solutions for rainwater control for themselves. This was demonstrated by the settlers beginning to innovate and build solutions of their own without the presence of our team. Senior Lecturer of Land Management at the Polytechnic of Namibia, Carol Steenkamp, suggested that fear of failure may have played a major role in this initial lack of confidence (personal communication, 30 March 2006). In addressing this issue, we found that visual and hands-on methods of learning and communication were most helpful to instil confidence in the community and to communicate effectively to those who speak different languages.

A similar obstacle that we perceived was an initial reluctance to assume leadership roles within the community. Often when asked to assume control over a task, individuals shied away from volunteering, stating that they did not want to be the only person completing the project. In addition, our team observed that the community operated as a close-knit group; people were more likely to help in construction or participate in a meeting if they saw others doing the same. However, a few key community members consistently volunteered to assemble meetings, translate, and facilitate planning for construction. As the project progressed, more and more people began to exhibit leadership by organizing independent projects that involved the entire community.

In conclusion, our team found several key factors that helped us to arrive at successful solution with the community. Forming good relationships with the people of Otjomuise helped us to better understand and work alongside them. Establishing trust within the community seemed to help the people feel more comfortable with our presence and aid in getting the community more involved with the project. Furthermore, involvement of a large segment of the community facilitated the spread of knowledge and skills that the people of Otjomuise had acquired. By involving a large segment of their community, the people of Otjomuise were also able to consider many different viewpoints and ideas from a variety of individuals, thus fostering further exploration of new ideas. Finally, one of our strongest conclusions from reflecting on the process was that visual and hands-on demonstrations were effective in reducing the language barrier and appeared to give confidence to the people regarding technical knowledge. Our team found that alternative forms of communication such as visual representations, gestures, and hands-on demonstrations helped us to convey ideas more accurately to the community and seemed to increase their confidence regarding technical issues.

Beyond Otjomuise: Reaching Other Parts of Namibia

The final objective for this project was to achieve a broader impact beyond Otjomuise. Other informal settlements across Namibia have similar flooding and erosion problems and could benefit from the techniques implemented in Ehirorujano and Dantago. A broader outreach was attempted in two different ways: knowledge exchanges and an informational pamphlet. The heavy rains of the 2005-2006 rainy season affected many saving groups in the Windhoek area. Because these groups are relatively close to Otjomuise, SDFN was able to bring committee members from the Barcelona settlement and several other saving group members from throughout Windhoek to a knowledge exchange to see the structures that had been implemented in Otjomuise. During this exchange, the people from Otjomuise who were involved in building the rainwater control systems explained what they did and how it helped them. They seemed to take a great deal of pride in showing their accomplishments to others. In this way, the other communities could see and learn

about rainwater control techniques that they could use for themselves. At the time of publication of this report, four weeks after the knowledge exchange took place, no known projects had been developed in these other communities as a result of the exchange.

Because not every saving group will be able to see the work done in Otjomuise, our team developed a pamphlet to be distributed through SDFN and the Better Life programme to saving groups that experience similar erosion and flooding problems. This pamphlet was designed similarly to other pamphlets that have been successful in informal settlements in Pretoria and takes the form of an inspirational story following the progress of Otjomuise, embedded with technical information about how to implement several different rainwater control methods. In this fashion, the story was intended to provide both the knowledge needed to conduct rainwater management projects and the motivation to begin work. Additionally, the pamphlet was made to be highly visual with simple language that was presented in both English and Afrikaans. Photographs showing the people of Otjomuise working and their final products, as well as informative illustrations, accompanied each text block. The completed pamphlet's effects on other communities could not be determined since it was to be distributed by SDFN and the Better Life programme after our departure.

As part of the pamphlet design process, our team created a test pamphlet containing information for a single technique that had not yet been implemented in Otjomuise. The test pamphlet was distributed to the people of Otjomuise to determine if they could apply the new technique using only the pamphlet as a guide. The purpose of this test was to observe the effectiveness of the pamphlet and pinpoint problems before final publication. During a follow-up visit to the community we observed a group of people completing the technique described in the test pamphlet. This suggested to our team that the level of technical detail contained in the pamphlet was enough to adequately describe how to implement this technique. Based on our observations, we designed the rest of the pamphlet to follow a similar format.

Final Recommendations

Based on our findings from working with the people of Otjomuise and our experience with this project, we have produced the following list of recommendations. These recommendations may be useful for future community-based research efforts involving the informal settlements of Namibia.

We recommend that the Shack Dwellers Federation of Namibia (SDFN) identify people in saving group communities to be trained for the Better Life programme in order to instil confidence in both the leadership abilities and technical abilities of the people in informal settlements. This is intended to combat the perceived reluctance to assume leadership roles and the lack confidence in technical abilities. Training one member from each saving group through the Better Life programme would help to spread leadership and holistic management skills so that they may be applied in other communities.

We recommend that future initiatives primarily utilize the settlers' own ideas to promote a sense of ownership and validation of their abilities, rather than supplanting their ideas with foreign techniques. If the settlers feel a sense of ownership over the ideas that are used, they may be more likely to implement future initiatives. Positive reinforcement of the settlers' ideas can help to build the confidence of individuals within the community and may be utilized in future research projects. Once the settlers of Otjomuise had gained some experience and began to

see positive results, their confidence in their own technical ability seemed to increase. This was demonstrated through their initiative to embark on new projects without external assistance.

We recommend that the facilitators of future projects to combat flooding and erosion in the informal settlements strongly encourage the community find and gather material resources independently. The scarcity of materials that were available free of charge was an obstacle that impeded our progress to build demonstrations in Otjomuise and limited the types of flood control measures that we were able to implement. We also observed that when construction materials were readily available, the settlers tended to initiate more projects on their own. To overcome the scarcity of materials, the settlers could be more strongly encouraged to use their local knowledge about the environment and the resources they have at their disposal. If the necessary materials are not available free of charge, the community should seek low-cost alternatives that could be purchased. The widespread poverty in the informal settlements makes this option more difficult; however, there were settlers in Otjomuise who were willing to make a financial investment in the erosion and flood control measures.

We recommend that SDFN perform follow-up visits to Otjomuise to determine how well the implemented structures held up and whether more methods have been implemented to combat new problems. Given the short timeframe in which we carried out this project, we were unable to make long-term observations. Follow-up observations in Otjomuise would be a more effective way to measure the long-term effects of this project on erosion and flood control and community capacity building than merely basing conclusions on the short-term evidence that we observed. For these reasons, we suggest that the continuation of this project in Otjomuise be monitored periodically by SDFN and documented for future reference.

We recommend the further use of organized knowledge exchanges between communities to disseminate knowledge throughout the informal settlements of Namibia. Bringing inexperienced communities to view projects that had been done in the example community of Otjomuise promoted hands-on, peer learning and the transfer of knowledge and skills between the communities. Based on the evidence we observed at the first knowledge exchange we believe that the people of Otjomuise will be able to effectively transfer their knowledge to other people who are willing to listen. This is one way in to attain a broader outreach to other communities in the surrounding area.

We recommend that our rainwater techniques pamphlet be circulated in informal settlements throughout Namibia by SDFN, and that the success of the pamphlet be monitored by SDFN. The effectiveness of the pamphlet in communicating specific details and its success could be refined through feedback regarding the specific successes and failures that are observed. We therefore recommend that SDFN monitor the success of the pamphlet and adjust its content and method of deployment in order to improve its future use.

ABSTRACT

The settlement of Otjomuise in Windhoek, Namibia experiences flooding and erosion problems during the rainy season. The goal of this project, sponsored by the Namibia Housing Action Group, was to increase community capacity to solve rainwater problems, and was achieved using participatory methods to assess problems and develop and implement solutions. The results of this project showed evidence of sustainability for community-based initiatives in Otjomuise. A broader outreach was initiated using knowledge exchange meetings and an informational and inspirational pamphlet.

AUTHORSHIP PAGE

Nicole Labbe, Nicholas McBride, and Ethan Ray all contributed to the research and writing of this report. The following is a breakdown of how the report was written for this project.

Nicole Labbe contributed to this report by extending the executive summary and writing part of the introduction chapter, sections of the background chapter containing material on rainwater control methods, the first draft of Chapter 5, and part of the conclusions and recommendations chapter. Additionally, Ms. Labbe developed the test pamphlet and final pamphlet in Appendices C and D.

Nicholas McBride was responsible for the first draft of the executive summary, half of the introduction chapter, sections of the background chapter containing material on the history of Namibia and participatory methods, part of the methodology chapter, and half of Chapter 4. Mr. McBride also formatted the entire paper into a single cohesive document.

Ethan Ray wrote the sections of the background chapter concerning rainwater patterns and problems, half of the methodology chapter, half of Chapter 4, part of the conclusions and recommendations chapter, and meeting notes found in both Appendices A and B. Mr. Ray also contributed by organizing the slide show for the final presentation for this project.

In addition to writing individual sections of this report, Nicole Labbe, Nicholas McBride, and Ethan Ray all edited the paper for grammar, content, and flow as a group.

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Any community-based project is dependent upon the receptiveness of the host community, and so our team wished to express deep gratitude to the people of the Otjomuise settlement. Their receptiveness, their willingness to work with us, and their great enthusiasm to continue projects all allowed our team to complete this project. We could not be more pleased with the experience they have given us.

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TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

CHAPTER 1: INTRODUCTION

Shortly after Namibia gained independence in 1990, Windhoek experienced a growing influx of people migrating from the countryside into urban areas (Begu, 2003). Many of these migrants were impoverished families and individuals looking for work in the city. As a result, squatter villages, now known as informal settlements, began emerging in the area surrounding Windhoek. In 1995, an estimated 30 percent of Windhoek's population lived in these informal settlements. Although the migrants moved to the areas surrounding Windhoek to find work, unemployment rates remain high in the informal settlements. The most recently available official statistics indicate that 85 percent of the settlers earn an income below the minimum subsistence level for Windhoek (TRP Associates, 1995).

Because of their poverty, the settlers who came to Windhoek did not have the financial means to buy land or establish formal housing. Instead, they constructed shacks from scavenged materials on public land without securing tenure. In an effort to obtain land and formal housing, the inhabitants of the informal settlements began to organize themselves into saving groups in the early 1990s. In these saving groups, residents pool their resources and funds to collectively purchase property, which is easier than attempting to secure tenure on an individual basis. To assist the saving groups, the Namibia Housing Action Group (NHAG) was formed in 1992 as a voluntary association of several groups advocating for the poor (Commonwealth Association of Planners, 2000). Today, NHAG works as a non-governmental organization with a small full-time staff (NHAG & SDFN, 2005). The goal of NHAG is to improve the standard of living in the informal settlements (Commonwealth Association of Planners, 2000). Because NHAG serves a large number of settlements, one of its objectives is to develop a plan for informal settlements to independently address their problems. In accordance with this objective, NHAG believes that taking a participatory approach is more likely to yield a solution that will be accepted and supported by the community because community members are involved in all aspects of developing the solution.

In the late 1990s, the community members associated with NHAG began to see that the organization was focusing a great deal on procedure. As a result, the Shack Dwellers Federation of Namibia (SDFN) was formed in 1998 to focus on practical efforts to help the poor in conjunction with NHAG (Gold, Muller, & Mitlin, 2001). SDFN is a network of saving groups organized by residents of the settlements who save money to purchase and service land. The slogan of SDFN is "Poor people helping each other better their lives." One of SDFN's primary roles is to build the capacity of local communities, thus enabling the people to help themselves. Another primary role of SDFN is to negotiate with the municipality to obtain land for the settlements at low cost to the people. Public weekly meetings are held at SDFN headquarters to discuss issues within communities and to solve them in a participatory fashion.

According to the national coordinator of SDFN, Edith Mbanga, erosion and flooding are two major issues that face the people of the settlements (personal communication, 16 March 2006). A lack of vegetation combined with heavy rains often results in severe erosion and causes destruction of homes and property. Given the rainwater-related problems that are prevalent in the informal settlements, a process by which these water-related issues could be addressed and resolved directly by the affected communities would be in the interests of SDFN. One way to achieve this result is through a participatory process by which the community is involved in every aspect of the project so that the people develop a sense of ownership over its outcomes. NHAG also encourages a participatory process that utilizes input from members of the saving groups to communally identify causes and solutions to targeted problems and provide sustainable methods to solve those problems.

The goal of this project was to help members of saving groups in the Otjomuise settlement identify and implement rainwater control systems that would be useful and practical. A participatory method for planning and implementing rainwater control measures was developed in order to give the settlers ownership over the entire process and its outcomes. This participatory approach was intended to build community capacity for independent problem solving. Emphasis was placed on sharing skills and knowledge between the community and our team and making the most of the limited resources available. Our team also intended to help other communities in Namibia through the example of Otjomuise by giving them the confidence and technical knowledge to solve their own problems.

CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

The problem of flooding and erosion in the informal settlements surrounding Windhoek, Namibia is a significant concern of the people who live there. Heavy rains during the rainy seasons can cause destructive flooding, erode the land on which people live, and wash away homes (Shigwedha, 2006). In contrast, Namibia's climate is normally arid, making water scarcity one of the country's toughest challenges (Maletesky, 1999). In this chapter, we will describe the overall context and background of the informal settlements, as well as introduce some of the flooding and erosion problems that face the residents of the informal settlements surrounding Windhoek. This chapter concludes with a review of published literature based on similar research. This literature review suggests several community-based approaches that may be taken to resolve these types of problems effectively.

Windhoek's Informal Settlements

Windhoek is a city of 230 000 residents and the capital of the young nation of Namibia (Republic of Namibia, 2005). A survey conducted in 1995 reported that an estimated 30 percent of the city's population lives in informal settlements (TRP Associates, 1995). The settlements surrounding the city of Windhoek include squatter settlements, where many people live on land that has not been purchased or rented. Dwellings are often made of makeshift materials such as corrugated metal, and access to utilities, such as a potable water supply and sewer, are limited. The township that contains the largest number of informal settlements and low-income rented properties is called Katutura (Pendleton, 1993). After providing an overview of the history of the informal settlements in this section, we introduce a number of organizations and initiatives that are aimed at promoting sustainable development and improved quality of life within the settlements.

History of the Informal Settlements

The history of Windhoek's informal settlements has its origins in the days of the German occupation in the late 1800s. Following the three Herero Wars fought in the years 1904-1906 between the Germans and the indigenous African peoples, the indigenous survivors who did not flee the Windhoek area were deprived of the right to own property by the Germans. In 1913, the Germans forced all indigenous Africans living in Windhoek into designated areas called "locations," where separate, ethnically differentiated communities were formed. It was in these locations that the indigenous people resided when South African forces took control of South West Africa in the early days of World War I and later began to instate apartheid policies in the area. During the apartheid era, the South African government decided to move the black and coloured people living in the "Old Location" into a yet unfinished housing area outside of the city. The oppressed population gave this area gave the name Katutura, which means, "The place where we do not want to stay." The opposition between the people of the Old Location and the South African government culminated in the Old Location Massacre of 1959, in which 11 residents of the Old Location were killed by the South African forces. Following the massacre, around 3 000 residents were forced to move from the Old Location to Katutura under intimidation from the South African police and military (Pendleton, 1993).

After the abolition of apartheid and the independence of Namibia in 1990, Katutura and the other informal settlements surrounding Windhoek experienced a large expansion and rise in

population. Many people migrated to the city to find better jobs, better schooling, and a better social environment (Pendleton, 1993). From 1990 to 1995, Windhoek experienced a population growth rate of four percent per year. After 1995, the growth rate rose even higher to 5.4 percent. In the seven years from 1988 to 1995, the population of Windhoek expanded from 97 000 to 182 000 people (Dima, et al, 2002).

Many of the people who migrated to Windhoek searching for work settled in the informal settlements. For the most part, these people settled on council-owned land and built shacks because they did not have the financial resources to obtain formal residences (Pendleton, 1993). Despite the hopes of many to find work in the big city, the population boom led to a decrease in job availability, and as a result, unemployment rose substantially. In 1995, unemployment in the northwest area of Windhoek, where the most informal settlements are found, was estimated to be as high as 33 percent, and the estimated number of people who live in the informal settlements and are classified as poor was as high as 85 percent (TRP Associates, 1995). A study conducted by the World Bank in 2002 found that 50 percent of poor households in Windhoek had a monthly income of less than N$500, 15 percent had an income of N$500-N$800, and 20 percent had an income of N$800-N$1 340. Eighty percent of sampled residents had a monthly income lower than the primary household subsistence level of N$1 380 (World Bank 2002).

Because of the high population density in the communities surrounding Windhoek coupled with residents' limited resources, it has been difficult for the city to maintain adequate infrastructure and services in the informal settlements (Pendleton, 1993). The lack of proper infrastructure in some of the communities in these areas has been a hindrance to people's everyday lives and businesses (GRN News, 2001). In addition to these infrastructure issues, environmental problems, such as intentional vegetation removal and the pollution of the water sources in the settlements, are obstacles that the settlers face (Harper & Maritz, 1998).

Support for Sustainable Development

To address problems within the informal settlements, emphasis is being placed on methods involving sustainable development. Sustainable development involves having established methods of balancing the issues of environmental protection, quality of life, and economic prosperity. Communities that are in the beginning stages of developing holistic management strategies to solve environmental, social, and economic issues can benefit from adopting sustainable development practices.

Local Agenda 21 was drafted at the 1992 Rio Summit in order to incorporate environmental concerns into local planning throughout the world and has since been applied throughout Namibia to promote sustainable development. Through Local Agenda 21, environmental protection and quality of life issues such as land, water supplies, roads, and sewers are addressed in local communities to improve living conditions for current and future residents. In order to accomplish this, Local Agenda 21 provides a guide for towns and cities to follow that can be tailored to fit local needs. In this way, Local Agenda 21 generalises action for the entire world, but specialises action to address the concerns of each specific location, promoting more valuable results (Gold, Muller, & Mitlin, 2001).

In 2000, the City of Windhoek announced a new housing development strategy based on Local Agenda 21 that includes an incremental approach to the development and upgrading of low-income settlements. This approach incorporates a tiered system of development with seven levels of community infrastructure that are suggested based on income level. Through these new policies, the City of Windhoek has encouraged residents of informal settlements to participate in saving groups (Mitlin & Muller, 2004). Two organizations in Windhoek that support saving groups and

have adopted the philosophies of Local Agenda 21 are the Namibia Housing Action Group (NHAG) and the Shack Dwellers Federation of Namibia (SDFN) (Gold, Muller, & Mitlin, 2001).

For years, poor people in Namibia have sought to band together and help each other carve out a more comfortable niche in the world (Commonwealth Association of Planners, 2000). In the informal settlements surrounding Windhoek, groups of settlers known as saving groups have pooled their resources in order to jointly secure tenure on plots of land and develop communities. Security of tenure is defined as having legal recognition to the use of property (World Bank, 2001) and is necessary to ensure that residents cannot be evicted from their homes. Security of tenure can also bolster confidence for further development within saving groups.

In 1992, several saving groups joined together to form the Namibia Housing Action Group (NHAG). By 2005, 334 saving groups throughout Namibia were associated with NHAG (NHAG & SDFN, 2005). The main goal of NHAG is to assist these saving groups in securing tenure on land, building stable housing, and improving the standard of living within the communities. Because of its close association with the saving groups, NHAG consists of a variety of people from different backgrounds. Shack dwellers from the informal settlements, professional volunteers that provide consultation, and a non-governmental organization (NGO) branch that handles finances and leadership management within the saving groups all contribute to NHAG. NHAG is financially supported by a variety of groups from around the world including Homeless International of the United Kingdom, Misereor of Germany, and IBIS of Denmark (NHAG & SDFN, 2005).

A second non-governmental organization, the Shack Dwellers Federation of Namibia (SDFN), was established in 1998 when it split off from NHAG. This group was formed as a people's organization promoting community service, house construction, and other practical activities to its network of saving schemes. The mission statement of SDFN envisions the improvement of living conditions for people living in low-income housing and shacks (Shack Dwellers Federation of Namibia, n.d.). According to the national coordinator of SDFN, Edith Mbanga, SDFN also promotes knowledge sharing, community capacity building, and education. The organization receives an annual grant from the Namibian government, which goes towards funding loans that can be obtained by settlers for formal housing and services such as roads and running water. SDFN also has the ability to distribute personal loans; however, the settlers are encouraged to borrow money according to what they can afford to pay back (Edith Mbanga, personal communication, 16 March 2006).

Together, SDFN and NHAG assist the saving groups to work towards their goals (Steenkamp, 2001). In order to assist these groups, the two NGOs engage the communities in capacity building activities and promote self-help strategies that require cooperation amongst the settlers (Mitlin & Muller, 2004). Through these strategies, the communities are able to develop the ability to work together to achieve goals that would be difficult to accomplish on an individual basis.

In order to promote cooperation between communities, a program called the Better Life programme was developed by SDFN and NHAG. According to Simon Asser, a trainer for the Better Life programme, and Carol Steenkamp, Senior Lecturer of Land Management at the Polytechnic of Namibia, the Better Life programme is run by SDFN and trains individuals of saving groups to be leaders and to promote holistic management practices within their communities. Holistic management takes into account the three integral aspects of managing a saving group community: environmental, financial, and social management.

Since March of 2006, the Better Life programme has trained 30 people across Namibia, 20 of these people are from the Khomas district, which includes the Windhoek area. This core group of people has been trained in community leadership and community-based methods for dealing with environmental, financial, and social problems as they arise within saving group communities. Central to these methods of solving problems are the community's definitions of both a purpose

and an objective to set as its goal. Often this purpose is to improve the standard of living within the saving group. The program utilizes a combination of manuals containing pertinent information from SDFN and a system of peer learning in order to train people to achieve its goals. The Better Life trained people in the core group eventually become trainers of other people within their respective saving groups and in other groups. The Better Life programme hopes to have a trained representative in every saving group in Namibia in order to facilitate these saving groups to carry out holistic management processes with no outside support (Carol Steenkamp and Simon Asser, personal communication, 30 March 2006).

Flooding, Erosion, and Water Supply Issues

The relationship of rain, flooding, and water supply with the land are central issues in the informal settlements surrounding Windhoek. The lack of rain during the fall and spring months leads to water being a scarce and valuable resource. When there is little rain, the ephemeral streams and rivers that feed Windhoek's water supply dry up, leading to a stress on the water supply and higher prices (Morales, Cartwright, Rivers, & Nowill, 2005). In contrast, heavy rains become a problem during the rainy season from December to March, when destructive flooding and erosion can occur (National Oceanic and Atmospheric Administration, 1999). In the following sections, we will be discussing the problems that rainwater creates due to both a lack of rain and a devastating, yet less frequent abundance of rain. We will also be introducing some possible solutions to the erosion problems along with potential ways to harvest rainwater for later use.

Rain and Water Supply

One problem facing the informal settlements is a lack of rain during the dry seasons that leads to water issues such as low supply and elevated costs. In this section, we will discuss the water scarcity issue and some of the effects it has on the settlers.

Namibia is widely known as one of the most arid regions in Southern Africa, experiencing low rainfall, moderate temperatures, and high evapotranspiration (Drew, Foden, Hughes, Midgley, & Thuiller, 2005). Evapotranspiration refers to the total amount of water that is transferred from the ground into the atmosphere through a combination of evaporation from the soil and transpiration through the plants. In other words, when surface water and high levels of groundwater are present, water tends to evaporate quickly.

The water supplied to the informal settlements is collected from dammed reservoirs, wastewater reclamation, and a small number of boreholes in the Kuiseb and Omdel aquifers (Shigwedha, 2006). The dams are relied upon heavily to provide water, but many are supplied with water by ephemeral rivers or surface water that is present only in the rainy seasons (Gaomas, 2006). During the dry seasons, water levels at the dams decline steadily until they are refilled again during the rainy seasons. Groundwater in the aquifers is recharged by rainfall, but because of the high evapotranspiration rates, only a small amount of rainwater is absorbed into the aquifers (Drew, et al., 2005). Once the aquifers have been drained, it takes a long time for them to recharge.

NamWater is the company that supplies nearly all water to the informal settlements. Because of the arid environment, NamWater has very high operating costs, which translates to high water prices (Kastner, et al., 2005). Poor households in informal settlements often have trouble paying these high water bills, and failure to pay can lead to being cut off from the public water supply (Maletesky, 1999).

Flooding and Erosion

While droughts in Namibia are common, floods can have devastating effects on the country during the rainy season. People who live in the informal settlements of Windhoek are especially vulnerable to flooding, and have the potential to be adversely affected by it more than people in other areas (Napier, n.d.). The development of rainwater control strategies begins with consideration of the local hydrology and water runoff patterns. Some characteristics, causes, and real life examples of the flooding and erosion devastation in the settlements are described in this section.

Both natural and man-made geographic features affect local rainwater flow patterns. The natural paths that rain and floodwaters take create some areas that are more prone to flooding than others. It is undesirable to build homes in these floodplain areas. However, the informal settlements have no regulated housing patterns, and settlers usually take whatever land they can get to build shelters on. This haphazard organization of structures contributes to the flooding problem. Due to either a lack of foresight or lack of other options, homes are often constructed in high-risk areas and unstable hillsides (Napier, n.d.). Furthermore, the homes that settlers construct in the informal settlements are generally not rigid structures; they are temporary shacks made from inexpensive, recycled, and readily available materials. Accordingly, the shacks are not resistant to high lateral loads, making them vulnerable to collapse during flooding. Incidents have also been reported in which residents unknowingly purchased houses that have a high risk of flood damage due to their location (Bause, Jan 2006).

Although several characteristics of flooding lead to destruction, the most devastating quality of floods is the velocity of the floodwater. The velocity of the water creates an elevated abrasive effect, applying shear forces to the underlying soil and causing its particles to detach and wash away, leading to erosion. Debris can also be picked up and forcefully driven into structures or pieces of infrastructure, causing damage. Floodwaters can reach destructively high velocities when travelling down long or steep slopes. In such cases, methods to reduce runoff velocities and peak floods are important to consider (Green, Parker, & Tunstall, 2000).

The scarcity of vegetation in the informal settlements, deforestation of the surrounding areas, and sandy soil all contribute to the erosion problem. The main fuel source used for cooking in the settlements around Windhoek is timber; gathering firewood for cooking leads to deforestation problems around the settlements (Ogunmokun, et. al., n.d.). Deforestation results in increased susceptibility to erosion due to the absence of plant root material to anchor the soil. Another reason for the absence of plant material is that during the housing construction process, many of the native grasses and trees are intentionally removed (Harper & Maritz, 1998). Similar to the effects of deforestation, the removal of grass and trees in the settlements creates an elevated vulnerability of the soil to erosive forces.

In January of 2006, there was a series of particularly heavy rainfalls that created many hardships for the informal settlements. These floods took a toll on the villagers by sweeping away their personal belonging and even their homes (Christelis, 2004). Displaced residents in Katutura stated that flooding in their area had been caused by the construction of a new football stadium that diverted a riverbed too close to their homes (Shigwedha, 2006). This example shows how man-made interventions in water flow patterns can adversely affect the flooding situation in the settlements.

Flooding of homes and destruction of one's property is a subject that becomes very personal, making people passionate about the situation. Christelis (2004) writes that because of the poverty in the settlements, people tend to have only a limited number of possessions. When a

family's few possessions, such as cooking pots, are carried away in a flood, the family may be reduced to using a neighbour's house to cook food, causing significant hardship.

Erosion Control Techniques

Because erosion is a problem throughout the world, a number of techniques have been developed to prevent soil degradation on sloped surfaces. In this section, several methods that could be effective in areas around Windhoek are discussed. These techniques include seeding, tilling, mulching, retaining walls, terracing, and water control/diversion channels.

Seeding is one method regarded by Caraco (n.d.) to be the best method to prevent erosion. There are four mechanisms by which introducing plant life can reduce erosion caused by running water. One mechanism is root reinforcement, which is how a plant holds back topsoil by creating stabilizing friction forces against soil movement. A second way that plants prevent erosion is by soil moisture modification. Adding plants to an area removes soil moisture as roots soak up the water. This allows for more water to saturate the soil instead of creating surface runoff. A third mechanism is buttressing and arching, which entails plant stalks supporting soil to prevent slip and slowing runoff velocity. A fourth erosion prevention mechanism is surcharge, whereby plant mass can provide enough perpendicular force to reduce soil movement (Menashe, 2001).

Grasses and other plants can be used for seeding at relatively low cost by utilizing readily available indigenous species. Indigenous plant types have been found to outperform foreign grasses and plant life (Menashe, 2001). One disadvantage to seeding is that the area remains vulnerable to erosion for a period of time until the plants have taken root sufficiently to resist being washed away. Menashe (2001) concluded that care is needed to sustain new plant life for up to three years before the plants mature enough to be fully effective, thus making perennials the most effective plant type due to their more developed root systems. However, Caraco (n.d.) suggests that stabilization of soil can begin in as little as two weeks by only a small increase of root matter in the soil.

In addition to growing grasses, it is possible to use garden crops to further stabilize the soil. Simon Draper of the United Kingdom warns about the need to choose the right plants for effective erosion control. He states that growing crops that are harvested just before the rainy season can be ineffective. Instead, Draper advises farmers in areas of sandy soils and steep slopes of two options to prevent erosion: either grow different crop varieties that are harvested earlier, then grow green plants before the rainy season, or grow crops in bands across slopes to slow water (Macmillan & Buss, 2005).

Certain methods of tilling can also be used to control erosion and promote vegetation growth in garden beds. Two tilling methods, Nu-Till™ and Aqueel™, use patterns of soil impressions to control water flow. An example of an Aqueeled™ surface is shown in Figure 1. Through the creation of miniature water reservoirs in the soil, water is kept in the garden bed longer, allowing it to soak into the ground instead of running off (Norton, Chaudhari, & Flanagan, 2002). Through retaining some water in the garden, vegetation growth can be promoted in arid regions where it is often difficult to establish vegetative cover (Caraco, n.d.). An Aqueeled™ surface has the capability to hold one litre of water per reservoir, and can stop runoff for rainfall of up to 12 inches per hour on ground at a 12 percent slope. However, the usability of these tilling methods on sandy soil has not been tested. These tilling methods also allow soil to warm faster, which helps germination (Norton, Chaudhari, & Flanagan, 2002). These tilling methods use depressions to retain water and the same effect could be obtained on a small scale using rudimentary and homemade tools to make depressions in the soil.

Figure 1: Soil Tilled Using the Aqueel™ System
Image source: Norton, L., Chaudhari, K., & Flanagan, D. (2002). Erosion Control Using Soil Amendments and Other Low Cost Methods Prior to Establishment of Vegetation. 12th ISCO Conference, Beijing, 132-137.

Another erosion control method is to use erosion control blankets to both protect soil from raindrop impact and reduce shear forces on the soil due to water flows (Singh, et al., 2002). It is necessary to anchor the blankets using stakes or other methods since these shear forces are absorbed by the blanket material and stakes instead of the soil (Singh, et al., 2002). It has also been shown that shear forces on the soil increase as the distance between the soil and blanket increase, and that blankets that are well-fastened to the ground are more effective in preventing erosion (Singh, et al., 2002). Erosion control blankets can be made from a variety of materials such as straw, wood fibres, coconut fibres, or synthetic fibres (Caraco, n.d.; Wood, Day, Obree, & Thomson, 2003). Blankets made from organic materials and thick materials are preferred (Caraco, n.d.). One study found that waste paper and poultry litter proved to be an effective ground covering to hinder erosion, as well as add fertilizing nitrates into the ground (Norton, Chaudhari, & Flanagan, 2002).

Another method that is similar to erosion control blankets is mulching. Spreading mulch in erosion prone areas protects the soil primarily from raindrop impact (Caraco, n.d.), although mulches have been shown to reduce erosion on longer slopes more prone to high runoff volumes as well (Singh, Thompson, Wilson, Nguyen, & Hansen). These mulches can also promote plant growth when used in conjunction with seeding by preventing seeds from being washed away and by providing nutrients to the plants. Straw and fibre mulches are used most commonly.

Recycled tyres are an effective and readily available construction material for dams and walls due to their durability and lack of pollution, as well as offering a positive application for reuse. Because of their durability, used tyres are difficult to dispose of, making them an inexpensive material resource. In the United States alone, an estimated 100 million tyres were in need of disposal in 1996. One dam constructed from tyres in Brawly Wash, Arizona cost a total of US$6 500. Comparatively, the cost of a concrete dam for the same site was estimated to be US$70 000 (Hoenig, 1996).

When anchored and weighed down with stones, tyre walls and dams are highly effective in holding back sandy soil that is prone to erosion from rainstorms in normally arid areas. The example at Brawly Wash has completely prevented sand erosion in the area. In addition, plant and animal life have thrived because of rainwater that has been absorbed into the ground instead of flowing away (Hoenig, 1996). Blankets of tyres that are anchored and bound by steel cable or plastic

rope have also successfully prevented erosion. One example has been proposed in Nogales, Mexico using an anchored tyre blanket filled with small stones to prevent landslides near a school. The area had been experiencing severe flooding to the extent that eight deaths were caused by a sudden storm in 2003. The tyre blanket is expected to prevent the landslides from occurring again (Hoenig, 2004).

There are areas in the informal settlements that suffer from erosion of broad open slopes. One effective way to attack this problem is to use terracing. A terracing system is a way to turn a slope into a series of flat areas supported by retaining walls. When flat areas are created to eliminate slopes, it is possible to reduce water velocity and the volume of water that flows freely down the hillside, as well as encourage absorption of the water into the ground (Wheaton & Monke, 2001). The reduced velocity allows more water to soak into the ground and provide irrigation, rather than cause erosion (LUESA, et al., 2005). Because of these benefits, terracing can be used as an effective means of reducing erosion wherever there are steep, uninterrupted slopes.

Another inexpensive method for rainwater control is digging ditches. Digging ditches requires little more than a hand shovel for construction (Barnard, n.d.). Ditches can be made to carry water two different ways: either directly off of a hillside by going straight down, or across the slope to irrigate the landing a manner similar to terracing. Horizontal ditches should be dug so that the slope is very shallow, i.e. 1% grade, which will give the water time to soak into the ground, as well as keep the water speed low to reduce erosive forces (Barnard, n.d.).

Water Harvesting Technology

In arid and semi-arid regions tough out the world rainwater harvesting technology has been implemented to supplement existing water sources, often for irrigation purposes (Handia, Tembo, & Mwiindwa, 2003). The technology has a long history and has been developed extensively over the years (Mbilinyi, et al., 2005). Among the most prominent techniques used to collect rainwater are damming systems and collection pools (Hatibu & Mahoo, n.d.). Rainwater collection has proven to be a successful way to obtain water in areas where water scarcity is a problem.

Despite the widespread success of rainwater harvesting, projects to implement rainwater collection must be done carefully in order to provide a resource that is both useful and economically beneficial. Whether due to poor execution or abandonment, rainwater harvesting often does not live to its full potential to provide an effective source of water (Handia, Tembo, & Mwiindwa, 2003). Rainwater harvesting systems developed without planning for optimisation have led to the acquisition of expensive technology that is either not effective or left to disrepair by the disinterested beneficiaries. However, when the technology is tailored to its specific application, and the people it benefits have a vested interest, water harvesting has a good track record of success (Rajabu, 2005).

The simplest methods of rainwater collection to construct are often collection pools. Collection pools are simply large holes dug in the ground to collect runoff water. They have been implemented on farms in semi-arid regions for irrigation and watering livestock (Rockstrom, Barron, & Fox, 2002). While these pools are simple, their effectiveness is limited. The high evaporation rates common in arid areas cause collection pools to dry up quickly. These pools are often used as temporary water reservoirs to withstand short dry spells (Rockstrom, Barron, & Fox, 2002).

Other methods involve collecting rainwater runoff from hard surfaces. Yuan, Fengmin, and Puhai (2002) conducted a study in China showing that the efficiency of harvesting water from hard surfaces depends on the impermeability of the surface. Already existing hard surfaces that provide large amounts of surface area, such as roads and roofs, are locations where rainwater collection can be put into place. Rainwater can be collected form these surfaces and transferred to storage tanks for future use.

Harvested rainwater has the potential to be used in several applications, including personal uses such as drinking. However, studies in Zambia on collected rainwater showed that unless costly, high-quality plastic containers are used, and the water is consumed shortly after collection, the water will be unfit for drinking purposes (Handia, Tembo, & Mwiindwa, 2003). Similar studies in China also showed that the levels of fecal coliform in harvested rainwater do not meet World Health Organization requirements; the water would have to be boiled before personal use (Zhu, Zhang, Hart, Liu, & Chen, 2004). Because of the impurities, it is more likely that harvested water would be used for applications for which water quality is less of an issue, such as gardening or washings.

Rainwater management systems can be expensive to build, and cost is a major concern in informal settlements where people have limited resources. Hatibu, Mutabazi, Senkondo, & Msangi (2005) emphasized that one must ensure the benefits of the technology will outweigh the initial investment over the technology's life span. Cost-benefit analyses conducted on a rainwater harvesting project by Yuan, Fengmin, & Puhai (2002) showed that it was a theoretically profitable venture. However, the finances and time required to carry out the venture coupled with inadequate levels of planning can make a rainwater harvesting system unprofitable.

Handia, Tembo, & Mwiindwa (2003) found that the greatest variable in the cost of rainwater management technology is construction material. For example, rainwater harvesting systems have been constructed out of anything from recycled oil drums and metal roofs to sanitized plastic jugs. Their research has shown that while the plastic jugs yield a cleaner product that may be used for direct consumption, the expenditure for plastic may not be practical if the harvested rainwater is used for applications where cleanliness is not a factor. On the other hand, the contamination that can occur from using recycled oil drums may be great enough to severely limit the applications in which the harvested rainwater can be used (Handia, Tembo, & Mwiindwa, 2003).

Participatory Approaches to Rainwater Management

Researchers agree that in carrying out any sort of project that involves social/personal relationships, the possible interactions and reactions that people have with the project should be examined. Previous studies have shown that taking into account how communities contribute and respond to community-based projects has led to more successful outcomes. A project that gives something back to the people that the community values is likely to garner more support than a project that is viewed as a waste of time and resources by the people. Popular support is also important for long-term sustainability of community-based projects because they often require a certain degree of maintenance after completion. In this section, we will discuss three case studies that utilized participatory approaches to community-based research and projects.

Case Study: Indigenous Techniques

A study conducted in Tanzania by the Soil Water Management Research Group found that researching indigenous techniques of rainwater harvesting already in use by the villagers was an effective way to create a strategy for rainwater harvesting (Mbilinyi, et al., 2005). Participatory, rural appraisal was utilized in this study and included techniques such as focus group discussions, observations, and open-ended interviews. The indigenous rainwater harvesting techniques that were revealed included runoff basins, canals and ditches, and specific combinations of different techniques that were used to fit different situations.

Indigenous knowledge was useful in this study because indigenous harvesting techniques were compatible with local lifestyles, institutional patterns, and social systems (Mbilinyi, et al., 2005).

Using indigenous techniques as a base, it is possible to work alongside villagers and provide expertise to improve the existing techniques. For these reasons, it is important that any water control strategy take into account all of the social factors that indigenous techniques take into account.

Case Study: Community-Based Initiative to Combat Malnutrition

Oldewage-Theron, Dicks, Napier, & Rutengwe (2005) conducted a study that utilized participatory methods to address a problem other than water control. In their study, a strategic community-based initiative was developed to combat malnutrition in informal settlements in South Africa. In planning the initiative, the researchers met with local community leaders and government officials in a participatory workshop format that included lectures, brainstorming, and discussion. Participatory practices were used throughout the study, which resulted in a high level of cooperation between the various stakeholders involved in the project and a sense of co-ownership between all participants. Throughout all steps of the study, care was taken to ensure participation and approval from the local community.

The results of the study were recommendations for several strategies to combat malnutrition in the settlements. These strategies included improved agricultural methods and dietary education. It was recommended that training be carried out simultaneously with intervention strategies in order to help the local communities sustain their reforms. Ongoing feedback to and from each community was stressed as being vital for success. This study strongly supported a participatory approach that involves the community in all steps of planning and carrying out the project, as well as the benefits of the resulting sense of co-ownership of the project.

Case Study: Long Term Sustainability of Community-Based Projects

Another pressing issue that affects projects in developing areas is how the local community will continue the project following implementation. A study conducted in Tanzania utilized participatory problem analysis to solve the problem of rainwater harvesting equipment degradation and to help improve the long-term function of the system (Rajabu, 2005).

At the beginning of this study, the local people were asked to describe the most important problem with their individual rainwater harvesting system. The majority of these rainwater harvesting systems involved runoff that was diverted and stored behind dams. Following the problem description, an on-site evaluation of the dams was conducted in which the local people worked alongside trained technicians to identify the specific causes behind their problems. Rajabu (2005) stated that because the local villagers were able to participate in the problem analysis and generation of the solution, they were able to learn a great deal and feel as though they were better able to handle the technical issues that they faced.

One interesting finding of this study was that after the villagers saw that the solutions were successful, the technical process that the villagers had learned began to spread quickly through the community. In this way, the knowledge gained and the solutions to the villagers' problems were propagated through local knowledge sharing (Rajabu, 2005).

CHAPTER 3: METHODOLOGY

The goal of this project was to help members of saving groups in Otjomuise, and ultimately other communities, identify and implement practical rainwater control systems using a participatory method to define problems and develop solutions. We used a participatory approach to involve the settlers in every step of the process and to give them ownership over the process and its results. We offered our knowledge and the methods that we had researched to assist the settlers throughout the process. The following is a list of objectives that we set in order to accomplish the goals of this project:

1. Introduce ourselves to the community to gain their trust and understanding, and encourage them to assess their rainwater problems.
2. Use a participatory process to encourage the community to define the problems that they face, elucidate the problems' causes and effects, and develop solutions that originate from the community.
3. Oversee and assist the community in implementation of solutions to give the community members practical experience in building rainwater control systems and to provide examples of these systems for others to follow.
4. Build community capacity in other saving groups across Namibia by drawing on our experiences in Otjomuise to develop a way to empower these saving groups to assess and solve their own rainwater problems.

This chapter describes the participatory approach that we took to carry out this project and achieve these four objectives.

Meeting the Community

Numerous studies have shown that projects involving a foreign influence on a local community require extra precautions to ensure that the community does not mistake the foreign presence as an invasion (Mbilinyi, et al., 2005; Oldewage-Theron, et al., 2005; Rajabu, 2005). Otherwise, the project might fail due to lack of interest or lack of respect. The formation of personal relationships with members of the community has been shown to ease the implementation of projects because the community members develop a personal interest in the project. For these reasons, our team's first concern in entering the settlement of Otjomuise was to introduce ourselves to the people by explaining our project and to try to establish a trusting relationship with the community. This section explains the manner in which we formed relationships with the people.

We eased our entrance to the settlement by forming relationships with established and respected organizations that work closely with the saving groups. The Namibia Housing Action Group (NHAG) and the Shack Dwellers Federation of Namibia (SDFN) are two organizations that are influential in the informal settlements of Namibia. Since NHAG and SDFN have implemented many projects similar to ours in the past, we felt it was important to establish relationships with their

directors and acquire information from them that would be relevant to our project. Interviews were held with the director of NHAG, Anna Muller, and the national coordinator of SDFN, Edith Mbanga. During each interview, we discussed the operations of their respective organizations, as well as the logistics of this project.

These well respected community officials also acted as liaisons between our team and the community. Simon Asser of SDFN and the Better Life programme aided us during our initial meetings with community members. Tate1 Simon had worked closely with the people of Otjomuise in the past, allowing him to personally introduce us to many people who had been affected by flood and erosion problems in the area. We also hoped that our relationship with Tate Simon would show the settlers that we had a genuine interest in helping them, and would allow our team to be viewed as friendly and non-invasive by the settlers.

Tate Simon also served as a translator between our team and the community. The people of Otjomuise speak Oshiwambo, Afrikaans, and a variety of indigenous languages; few people are able to fully understand English. Throughout the project, Tate Simon and individuals from the Otjomuise community who understood English performed translation. Our team also utilized visual demonstrations and body language to improve the level of understanding between the community and our team.

The use of translators can complicate any project by increasing the risk of bias and miscommunication. Because we relied on other people to convey our messages, communications were subject to bias both on our part, and on the part of the translators; the translators may have consciously or unconsciously introduced bias into the information that they relayed between our team to the community in favour of options that they were partial to. In addition to these biases, the language barrier compounded the problem of cultural bias, which may have caused either our team or the community to misinterpret the original meaning of a statement.

After initial introductions, our team desired to continue building our relationships with the community. We decided upon two ways to do this: playing with the children and providing refreshments at a community worksite. By playing with the children we intended to show the settlers our genuine interest in their well-being and to further develop relationships with the adults of the community. By providing refreshments at a worksite during community project implementation we intended to encourage everyone to take a much needed break and to provide time to talk and attempt to form bonds with individuals within the community.

Problem Assessment

The next step of our project was to encourage the people of Otjomuise to assess the rainwater problems within the community. Before we held community meetings, we wished to gain understanding of the rainwater problems in Otjomuise for ourselves. To do this, we solicited help from the settlers, who brought us to some problem areas in the community. This was intended to give our team a better understanding of the direction the community might need to take to address its problems. In addition, we intended the walkthroughs to help establish a context upon which to build an environment of participatory problem solving at community meetings. Both written records and photographs were used to document these walkthroughs for future reference.

Following the walkthroughs, we held meetings to which all members of the Otjomuise settlement were invited in an effort to motivate the people to assess their rainwater issues. These

1 Tate and Meme are traditional Oshiwambo titles of respect referring to an adult man and woman respectively.

meetings with the Otjomuise community were modelled after the weekly meetings held at the SDFN centre. The meetings at the SDFN centre utilize a highly participatory process in which people are called upon to explain work they have already completed and to contribute their ideas and opinions. In a similar fashion, our team strove to encourage the community to identify the rainwater problems and damages themselves in order to establish a direction for the project.

The problem assessment goals for the community meetings were to encourage the community to identify rainwater problems, characterize the causes and effects of these problems, and to identify purposes for taking on these problems. This was done through community mapping, open discussion, and question and answer sessions. Open discussion was encouraged at all gatherings so ideas and comments from all participants could be heard. The community members were also encouraged to ask questions throughout the entire process to help them gain a greater understanding of what we were trying to convey during the community meetings. Community meetings were planned for the evenings to increase attendance, since most people worked during the day. Our team led the discussions, but encouraged active participation and questions from all settlers.

One method for promoting group participation that we used was community mapping. Community mapping involved a large topographic map of the Otjomuise settlement that included the housing plots and planned sewage lines. Using the topographic map was intended to involve people in the process and motivate them through visual feedback. Settlers were asked to mark places on the map where there were flooding, erosion, and other rainwater problems. We then talked with the settlers about the problem areas that they had identified and inspected these areas during on-site discussions with the members of the saving groups. At each meeting, one member of our team documented the proceedings and later transferred the notes into formal meeting minutes, which can be found in *Appendix B*.

Solution Development

Because of the participatory nature of this project, solution development within the community was designed to be a highly dynamic process that required flexibility and a willingness to adapt to circumstances from all participants, including our team. Accordingly, we didn't expect solution development by the settlers to follow a highly structured format or methodology. Some general guidelines that were used to get the settlers involved in the process and thinking in terms of flooding and erosion solutions are described in this section.

After specific problems were defined, the people were encouraged to brainstorm ways their rainwater problems could be solved using recycled, readily available, or low-cost materials. All participants were asked to contribute their ideas. Apart from verbal translation, we used drawings and other visual representations of ideas to further communicate design concepts. These means of communication were used because they were not as dependant on translation and were easy to amend as the settlers offered new suggestions. The settlers were encouraged to think of the different design elements of each solution, such as materials, methods of installation, function, and effectiveness.

After community input was considered, our team offered ways to build upon the designs that the community had offered, as well as some new design ideas. These alternatives that we offered were based on our background research on flood and erosion control measures. We then discussed different ways to combine all of the ideas to arrive at several design alternatives that could be implemented in different situations. We hoped that by using this hybrid approach, we would

create an environment of knowledge sharing among the setters and an opportunity for the people of the community to learn about different rainwater control measures.

The community was then asked to decide on which specific problem sites to use as demonstration sites in each saving group based on where they would be most effective and which saving groups had participated in the meetings. The community members decided which designs to implement for each specific problem area and what materials could be used in order to minimize the cost. These decisions were arrived at by open debate and consensus within the community. An open debate format was employed in order to help the settlers think about the strengths and weaknesses of each design in relation to the specific circumstances of the problem area. Once designs and sites had been chosen, the community was free to move on to the implementation stage of the project.

Solution Implementation

In order for the projects to successfully be implemented, a high level of community involvement and a great deal of organization were required between the community and ourselves in order to coordinate events at the worksites and relay information to all community members. We asked for volunteers to be part of organizational teams within each saving group. These organizational teams were intended to act as liaisons between our team and the saving group communities by acting as a communication network through which we would be able to reach the community members. These teams were created on a volunteer basis from each saving group that participated. In addition to the organizational teams, we asked for volunteers to take part in teams that would secure materials for construction. We stressed participation from all groups in order to foster a sense of community learning and building together even though we had only a small timeframe in which to work.

Once the settlers had secured materials and decided upon the locations of the demonstration sites, we were able to begin construction. We planned to complete four demonstration sites due to material limitations and time constraints. The settlers were asked to be present at the demonstrations and to participate in the actual building process. The intentions of this were to both increase their technical knowledge and give the settlers further ownership over the solutions. Our team demonstrated methods of construction as examples. The people then continued the construction conjointly with our team and were encouraged to construct additional rainwater control measures in other problem areas around the settlement without our supervision. This was done in an attempt to transfer knowledge between the settlers about rainwater control methods to those who did not attend the work sessions. Our team continued to monitor the status of rainwater control projects in the community, both to gauge the success of the four demonstration sites, and to see if any independent initiatives occurred.

Broader Outreach

During this project, our team worked only in the Otjomuise settlement, but flooding and erosion problems are prevalent in many informal settlements throughout Namibia. The techniques that were used in Otjomuise could also be applied in these other communities. Therefore, one goal of our project was to find a means to continue the learning process about flood and erosion control methods into a broader frame of reference and in a manner in accordance with SDFN and NHAG procedures.

One of the principles of operation for both NHAG and SDFN is to encourage communities to initiate self-help strategies that lead saving groups to become more self-reliant in their efforts to attain land or install services in their communities. In order to continue this self-help trend with other communities, our team wanted to produce a method of attaining a broader impact that would have the ability to inspire other community members to assess problems that they face and develop their own solutions. The community-based processes that had been developed by SDFN and the Better Life programme served as models for the community-based processes that we wanted to encourage through our own broader outreach method. This method needed to be designed to be something that could be easily understood by people with a wide variety of language backgrounds and could be used in other saving groups across the whole of Namibia, especially to communities that would be unable to visit Otjomuise to learn from the settlers there. This broader outreach was intended to promote community-based approaches within saving groups, as well as to reduce the saving groups' reliance on NHAG and SDFN. To decide on and develop this broader outreach method, we drew upon our experiences of working in Otjomuise.

CHAPTER 4: COMMUNITY RAINWATER CONTROL IN OTJOMUISE

Throughout our work in the Otjomuise settlement, we strove to be flexible in our approach and to adapt our methods based on the needs and wishes of the community. We did this in order to provide a more participatory environment so that the settlers would be able to claim ownership over the project and its results. In this chapter, we will describe the ways in which we interacted with the community: how we encouraged the people to assess their rainwater problems and develop solutions, the details of how these solutions were implemented by the community with our team, and how the people began to implement their own solutions independently.

Assessment of Otjomuise and Initial Interactions with the Community

To give a general understanding of the area in which this project was carried out, we provide a description of the Otjomuise settlement in this section, followed by a profile of the community and a discussion of our initial interactions with the people who live there. The Otjomuise settlement is located in a valley on the western side of Windhoek. A view of Dimbokro Street, the main road through the area where we carried out our project, is shown in Figure 2.

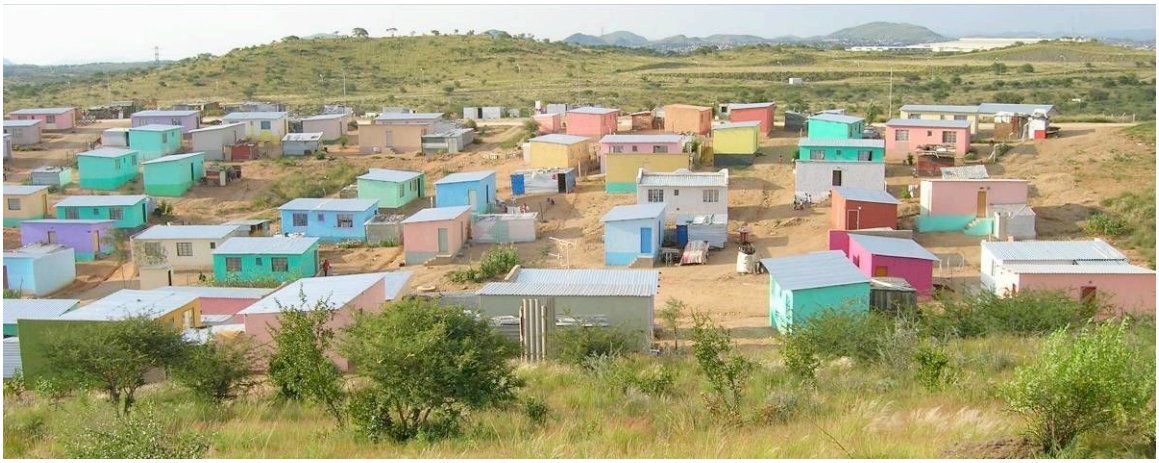

Figure 2: Dimbokro Street, Otjomuise Settlement

The area is located in the outskirts of the city and is surrounded by sparsely populated hills. From Figure 2, it is possible to see that the region of Otjomuise that we worked in is situated between two ridges that channel and localize rainwater into the settlement. These hills are steep enough for ground rainwater to achieve velocities that are destructive to the housing plots. The destruction is compounded by the fact that many of the housing plots have been stripped of vegetation during the building process, leaving the soil bare and unprotected.

The settlement consists of four saving groups named Ehirorujano, Dantago, Omusati, and Longa Shoye that have already built 99 new houses with the help of SDFN. There are also many people in this part of Otjomuise who still live in shacks, either because they have not yet built houses, or because they prefer to live where they are. These shacks are typically made from pieces of corrugated metal that are connected to wooden posts using nails with beer bottle caps for

washers. This method of building homes makes them more vulnerable to damage from flooding and erosion than the formal housing. There are no floors in these unfurnished shacks so the residents sleep on the ground, sometimes without beds. Because of this the people can often find themselves sleeping in puddles when it rains.

In order to improve their living situations, the saving groups have regular weekly meetings to discuss new developments within the community. While there are no designated leaders within the saving groups, we observed that some people take on community leadership roles when necessary. Two individuals in particular took on these leadership roles in several instances. A man named Joseph from the Dantago saving group was very helpful in completing construction tasks, as well as developing new and effective methods for project implementation. A woman named Edlagh Ujava from the Ehirorujano saving group was also very helpful by showing us around the community and assisting us with translation.

Communication

Language was a challenge for us because our team did not speak any of the local languages. Although English is the national language of Namibia, most people do not speak it as their first language, and this is especially true in the informal settlements. The primary languages spoken in Otjomuise include the indigenous African languages of Oshiwambo, Damara, and Nama; the people of the informal settlements also speak Afrikaans and a limited amount of English as a second or third language. Most people do not fully understand English. Because of this, it was sometimes very difficult to communicate with the people through words alone, especially without the help of a translator who was fluent in English.

Meme Edlagh, whom we had met previously, volunteered to translate for us, and other people from the community were able to help us with translation when she was unavailable. This method worked to a certain extent; however, because of the limited English ability of Meme Edlagh and the other settlers, we sometimes had trouble understanding each other. Often the translators did not understand certain words or did not know how to translate ideas exactly. Our team struggled to understand what was being said between the community members, and sometimes we were unable to get a full or accurate translation of all conversations. These gaps in communication occurred when many ideas were being discussed between the settlers and increased the possibility of miscommunication between the settlers and our team. To further the challenge of communication, the settlers often responded with nods of understanding, when it later became clear that they did not understand what was being said. During our first meetings with the people, we assumed that their nods of approval meant our statements were being understood, and we proceeded with our discussion. It was not until we asked the community members to repeat ideas to us and they were unable to that we realized the full extent of the communication gap.

In order to overcome this language barrier, our team began changing our communication styles. When speaking to the group, we used simpler language to make translation easier for the settlers. We also used different visual techniques to help us convey our ideas, especially to those who did not understand English. We used hand gestures, body language, and eye contact to demonstrate concepts that we were trying to convey to the people. We believe that these methods led to a better understanding between our team and the community. Our team perceived that the settlers were beginning to understand us more fully, which was demonstrated in their ability to repeat ideas more accurately.

Initial Visits to the Community

During our first visit to Otjomuise we wanted to observe some of the erosion problems and casually introduce ourselves to the settlers who were at home at the time. To accomplish this we walked through the settlement accompanied by Simon Asser, our liaison with SDFN and facilitator of the Better Life programme. Tate Simon introduced us to a few of the settlers and assisted us with translation as we gave them a preliminary description of what we were doing there. It was on this first visit to Otjomuise that we met Meme Edlagh, who later became our principal translator and contact within the community. As our project progressed, we met more and more of the community and came to feel comfortable in their presence. We strove to always be friendly and outgoing with the settlers, and to greet them with a smile and a wave if they did not understand English. On one occasion, a woman said hello to our group, but we did not hear her due to another conversation that was taking place at the time. Insulted, she stopped walking, got our attention, and asked why we had not responded to her greeting. This encounter showed us the importance that the community placed on introductions and the reciprocation of greetings when they were offered.

The national coordinator of SDFN, Edith Mbanga, attended our first formal community meeting. Meme Edith is a well-respected and authoritative figure amongst the people involved with SDFN, and her presence at our community meetings seemed to help us earn acceptance and lead to cooperation from the settlers. Tate Simon also accompanied us on many of our visits to Otjomuise. We found that with the assistance of these two SDFN members, much of the community was receptive to us. In contrast, it was much harder to gain the attention of the community during our initial visits when we entered the community alone.

From the beginning, the children of Otjomuise were very friendly and curious as to what we were doing. Often when we arrived in Otjomuise in the late afternoon, the children were the only people around because all of the adults were still at work. One afternoon as we were sitting and waiting for people to arrive for work, the children started to work instead of playing. They followed the example that they had seen when the adults had been working, and began to fill a garden with soil. This showed us in a tangible way that even the children were being influenced by the projects. Apart from working, the children also enjoyed playing with the tyres that were acquired for the project and having their pictures taken. Bonding with the children was helpful in establishing relationships with the adults in the community; they often served as a means to start a conversation with an adult.

Another way we attempted to bond with the community was by bringing soft drinks to one of the work sessions as refreshment after the community had been digging for several hours. The refreshments seemed to be well received by the community and gave us a chance to relax and socialize with the people on a more personal level.

Problem Assessment

After our first introduction into Otjomuise, our team began the process by which we wanted to achieve our goals for this project. The first step of this process was to get the settlers to assess for themselves the rainwater control issues that were present in the settlement and decide which issues to address. To get an idea of how to frame our meetings with the community in Otjomuise, our team attended a meeting at SDFN at the community centre in which members of SDFN discussed plans for sewer lines and house placement for a new settlement that was in development. At this meeting, Anna Muller of NHAG assumed the role of facilitator and proceeded to elicit ideas and opinions from the community. Ms. Muller asked questions of the community members that led

them to think about aspects of their plans that they may not have considered before. The result of these questions was that the people from the community performed a thorough examination of the matter at hand and they were able to feel that they had ownership over the process and the plans that it had produced. Even though Ms. Muller often dictated the direction of the discussion, our overall impression was that the people develop their own plans for placement of the houses and sewers. The participatory nature of the meetings came through very strongly during this meeting, and it encouraged us to take a similar approach in Otjomuise. We also felt that it would be effective to include some of the techniques that we had observed at the SDFN meeting in our own meetings with the people.

Levels of Participation

In order to identify rainwater issues within Otjomuise, our team organized meetings with the community that used a format similar to the meeting we observed at the SDFN centre. In our meetings, one member of our team assumed the role of facilitator, whose task was to encourage participation from the community and direct the discussion of the meeting using questions. At first, the people showed reluctance to assume the role of community leader or facilitator. This was evident when we asked volunteers to be "team leaders" that would organize the community into work teams and facilitate the implementation of projects in the community. The community did not like this idea, expressing the concern that only the people who had been appointed leaders would participate in the work. Instead, they offered contact information for many people so that we could inform many of the people from Otjomuise of future meetings and plans for work. Additional evidence supporting the community members' reluctance to assume leadership roles in Otjomuise was that the community members, with whom we worked frequently, asked for our approval and advice before starting any project, rather than making decisions independently. This reluctance may have been due to a lack of confidence in their own ability to carry out the technical details of the actual methods that they had chosen, as suggested by Carol Steenkamp, Senior Lecturer of Land Management at the Polytechnic of Namibia.

To fulfil our role as facilitators during these community meetings, our team had to overcome this reluctance in order to gain participation from the community and proceed with the project. Initially, we wanted to gauge the extent to which the people of Otjomuise had knowledge of the rainwater issues that faced them as a community, as well as an understanding of their causes. We also wished to discover whether this knowledge was widespread, or if the community members only knew about the problems that occurred nearest to their homes. To give the entire community and our team an understanding of both the extent and causes of the rainwater issues, our team facilitated discussions concerning these issues as they occurred surrounding people's homes, and in the broader scope of the community as a whole. In these discussions, community members were called upon to share their individual problems with the group and to discuss and comment on the other issues that had been brought up.

At first, most members of the community did not participate freely in the meetings. This could have been due to them feeling uncomfortable with our presence, or because of the language barrier that existed between us. Often when we asked a question, the only reply we received was silence. During these first few meetings in which we experienced difficulty encouraging participation, our team spent the majority of our time explaining ourselves and eliciting responses from the settlers. In addition to our efforts, SDFN representatives such as Tate Simon and Meme Edith helped to encourage people to contribute to the discussion. As time went on and our team established relationships with community members, participation came more freely, and the

community seemed to feel more comfortable approaching us with problems on their own and to ask for advice.

Community Mapping

In addition to the verbal and visual communication methods already described in the *Communication* section, one visual method that we used to communicate during our discussions with the settlers at these meetings was community mapping. We took the idea of community mapping from the SDFN meeting that our team had attended in which maps of the saving group were used to get the settlers to participate in the planning of their own community. These maps were used for discussions regarding the layout of roads and sewer lines. Based on the infrastructure set up, the saving group members were able to approach the map and place paper cut-outs where they believed the different pieces of new infrastructure belonged. For our own purposes, our team utilized similar maps of Otjomuise that were obtained from NHAG, and allowed the community to draw and map out where rainwater problems occurred within the settlement. The result of the mapping session is shown in Figure 3 and provided our team and the community with a document illustrating the locations of problem areas. These problem areas corresponded with natural land contours, showing that the settlers understood what we were asking because of the correlation between what they drew and what was shown by the map. In this way, the community mapping exercise seemed to be an effective session in defining some problem areas in the community.

Figure 3: Map of Otjomuise with Rainwater Problem Areas Highlighted

On-site Discussions

Following our initial community meetings, we were able to use the community map that had been generated by the settlers to identify problem areas where we could hold on-site discussions. This visual inspection of the problem areas also held the promise of bridging the communication gap and stimulating involvement of more of the community. In order to do this, our team gathered the people of Otjomuise for another meeting in which we walked around the settlement together stopping at the places that had been highlighted during community mapping. Our team facilitated the discussion of causes and effects of the rainwater problems. Four specific locations were inspected that were later used as demonstration worksites for the development of rainwater control measures. These four worksites and some of the observations we made during the demonstrations will be described in detail throughout the rest of this chapter.

In Figure 4, the four specific worksites are labelled with circles and arrows, in addition to showing the Ehirorujano saving group in blue on the right side of the map and the Dantago saving group in green on the left side of the map. The community determined these locations to be some of the areas that experienced the worst flooding and erosion. In the following descriptions, the worksites will be referred to by the numbers shown on the map.

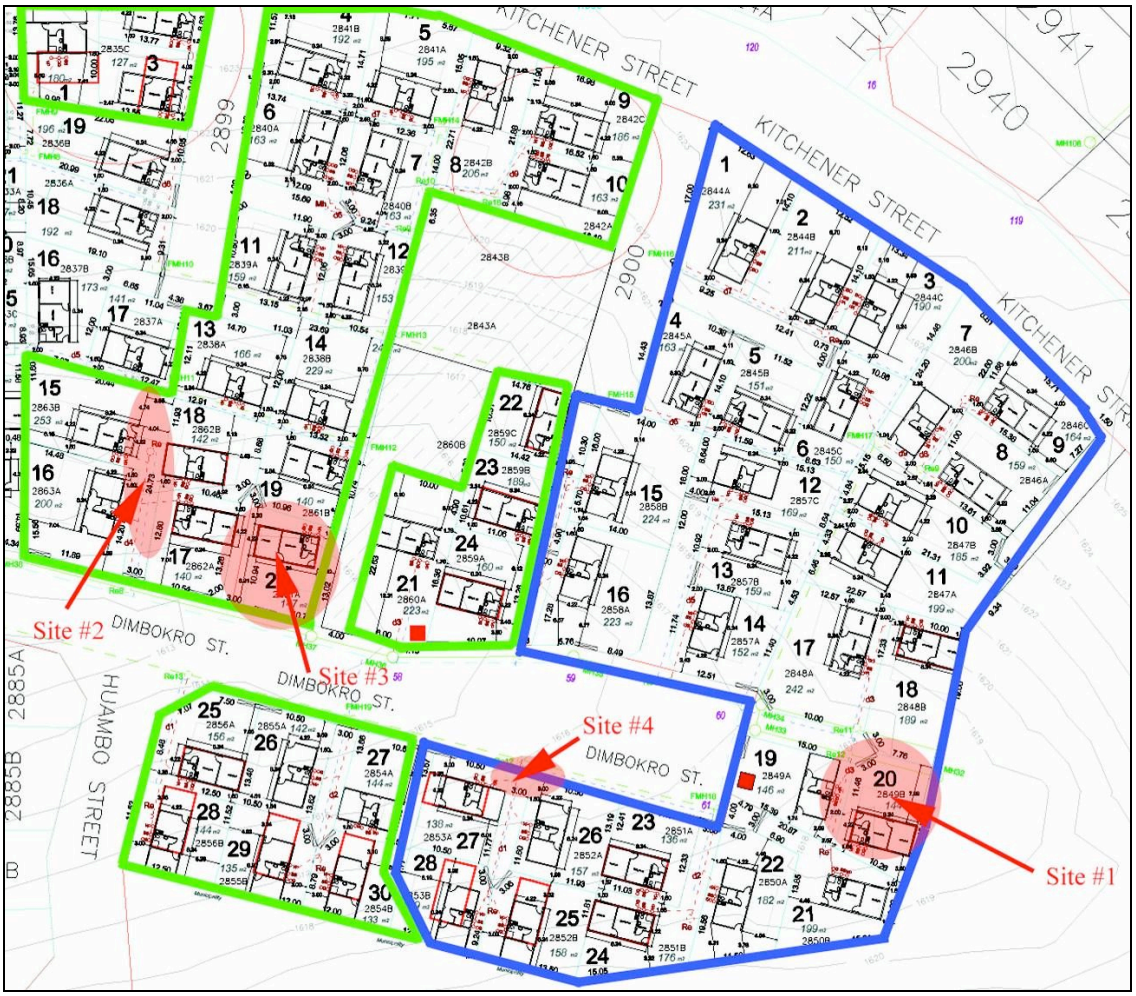

Figure 4: Map of Worksites in Otjomuise

Site #1 that we inspected with the community members was a house at the bottom of a large hill. The woman who lived there was named Kandanga, and she complained that runoff from the hill was collecting at the side of her house and penetrating through the foundation. When asked where the water was coming from Meme Kandanga was able to identify the runoff from the hill and the fact that it was pooling next to her house as the causes of this problem. Since the other community members were able to see this as well, a platform was created upon which we could discuss the causes of problems in other areas. Following our first on-site discussion, the settlers began to show more willingness to participate and share their thoughts and experiences.

Site #2 was a steep hillside located between two rows of houses. In this area, the people were concerned with ruts in the ground that had been created by rains, and the soil that had been washed down the hill into the street. When we asked the settlers what was causing this erosion, they replied that large volumes of water ran through the area in times of rain. We then asked the settlers where this water was coming from and several settlers pointed uphill. This question and answer technique appeared to be a useful tool to elicit thought and discussion from the people about possibilities for upstream solutions, rather than solutions that only help one affected area.

Site #3 that was inspected by the settlers was a garden where rainwater runoff had repeatedly washed away the plants and soil. Helena Ntoni, the woman who owned the garden, said that a large volume of water flowed from between her house and her neighbour's, and also from the ditch next to the road, and that this water was cutting through her garden. Meme Helena also voiced frustration at the fact that she had begun the garden because she had been told that plants would stop the erosion, but that this effort had not been successful. She wanted to find another way to keep the water from washing away the plants and soil in her garden.

Site #4 was a house next to Dimbokro Street on top of a steep embankment of bare soil. The owners complained about the difficulty of climbing the embankment to reach the house. This was especially a problem when it rained because of the high volume of water that flowed through the path next to the embankment, making the surface of the embankment unstable and treacherous to climb. The settlers wanted to find a way to both stabilize the embankment and make it easier to traverse.

Solution Development

The next step of our process was to begin to develop solutions that could be used to solve the rainwater problems that we had discussed with the settlers and to choose which sites to focus on for construction. During the on-site discussions, we asked the settlers for ideas of how to solve the erosion and flooding issues in each area. The settlers came up with a number of different suggestions for the problem areas that we visited together. During these solution development discussions, it was easy for the settlers to keep the discussion broad instead of focusing only on singular problems, as had been the case at the community meetings where many people seemed to only care about the problems that affected them personally. Since the effects of the erosion were easily visible during the on-site discussions, the people were eager to begin thinking of ways to solve the problems and develop solutions. In this section we will describe how we worked with the people to develop different techniques for flooding and erosion control, and then developed specific solutions for particular problem areas.

Preliminary Solution Development

In addition to the conversations that we had had with the settlers during the on-site discussions, our team wanted to give the settlers a firsthand view of some flooding and erosion control techniques that were already in use. Through our contacts at NHAG and SDFN, we learned that there were examples of erosion and flood control measures that used recycled materials displayed at the Habitat Research and Development Centre (HRDC) in Windhoek. We were able to obtain a lorry (flat-bed truck) from NHAG and a driver from SDFN to take approximately 25 members of the Otjomuise community on a field trip to view these examples and to discuss how similar methods could be implemented in Otjomuise. The number of people present on this trip far exceeded what Ms. Muller, the director of NHAG, expected from the groups based on previous attempts at a similar trip. A variety of people from the community went, including males, females, elders, middle aged adults, and some children. The children were not included in the attendance count, although their presence was noted. The large number in attendance showed us there was a high level of interest in gaining knowledge amongst the group including people of all ages and genders. The group of settlers viewed an example of a retaining wall made out of recycled tyres, a terraced slope, a gutter system for collecting and saving rainwater from the roof, rocks retained by chicken wire, and an area where tyres were buried vertically to stabilize the ground with gravel filling the space between the tyres. The settlers said that they particularly liked this last example because of its aesthetics. They suggested using it to reduce rutting caused by water falling off roofs in the settlement.

The visit to HRDC allowed the settlers to see some flooding and erosion control methods firsthand, and several of them remarked that the trip had been inspirational; they claimed that it had helped them gain a better understanding of how the tyre walls and other rainwater control measures worked. This trip was further confirmation that visual learning was a very effective tool for the transfer of knowledge.

To aid in the visualisation of design concepts, our team created concept drawings of some of the methods that the settlers had suggested, as well as some of the techniques that we had researched. We introduced these drawings after the community had already suggested a number of different techniques so that the solutions would be more a product of the community rather than ideas from our team. The drawings were very well received by the community and they expressed satisfaction with vivid representations of the techniques that we had discussed. The level of technical detail in these drawings was intended to help the settlers understand the methods clearly. The drawings also helped to elicit critiques of the proposed methods and showed the settlers that we were taking what they had to say seriously. The enthusiasm that the settlers had for our drawings further supported the helpfulness of using visual aids when communicating with and helping the people. Figure 5 shows one such drawing: an example of a tyre wall used to retain soil in a garden, with a diversion channel lined with flat rocks to carry away excess water with less erosion to a ditch next to a road. Figure 6 shows an example of terracing on a per-house basis, where retaining walls of tyres and backfill have been used to level the ground on each individual plot of land. Terracing is one method that our team introduced to the settlers, but that had not been adopted before the end of this project. The settlers liked the idea of terracing, but thought that it would be difficult to implement because of its large scale and the need for large quantities of backfill material, which can be expensive and difficult to find. Figure 7 shows an example of a gutter system that could be attached to a corrugated roof to collect rainwater and prevent it from impacting the ground and creating runoff while harvesting it for later use. This method was also not implemented before the end of this project. This technique required complex and expensive materials, which made it less practical for the community to implement during this project. The people expressed a great deal of

interest in this idea because it offered the opportunity to obtain extra water at no cost, but given the complexity and expense of the design, the community members decided not to implement this technique.

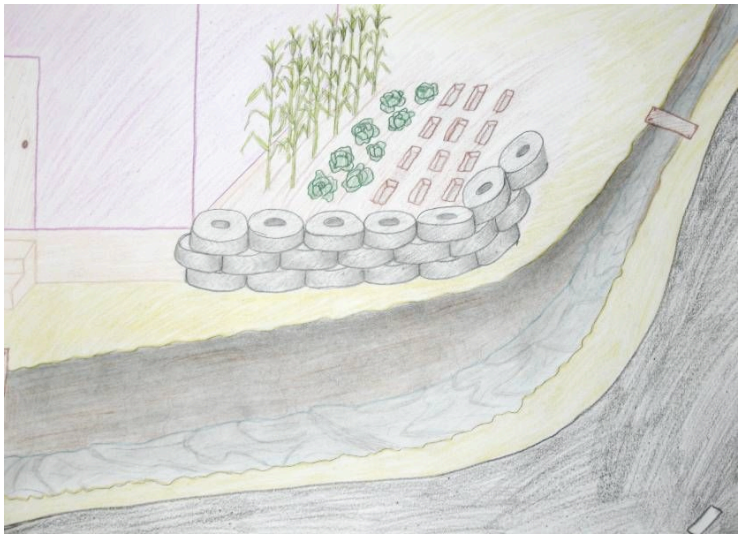

Figure 5: Drawing Used to Illustrate a Tyre Wall and Diversion Channel Lined with Flat Stones

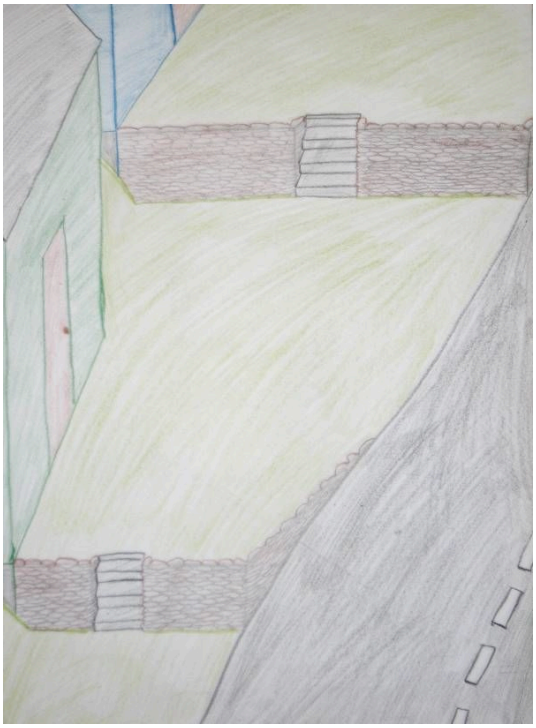

Figure 6: Drawing Used to Illustrate Terracing

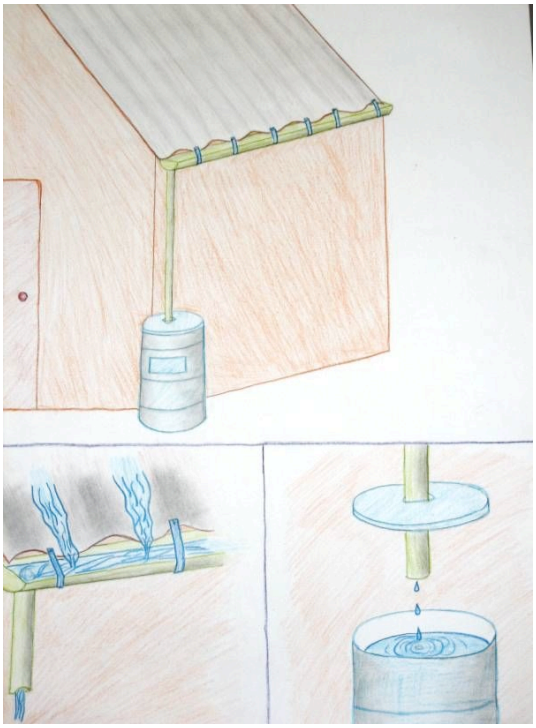

Figure 7: Drawings Used to Illustrate a Gutter System

Worksite Selection

In order for the community to choose where we would begin work together, we solicited the opinion of those present at the community meeting. The community members decided upon the areas highlighted in Figure 4 by popular consensus. The community members also decided to work only in the Ehirorujano and Dantago saving groups, because only members of these two groups had attended the community meetings and on-site discussions. The most likely reason that the Longa Shoye and Omusati saving groups did not attend was because they are located further down the valley where the ground is relatively level, making erosion a minor concern for them. The decision to work only in Ehirorujano and Dantago was made during the second community meeting, and by the third meeting the people had already discussed at which locations they wanted to work so we were free to begin developing solutions for these specific worksites. Two worksites were chosen for demonstrations in each saving group. This was meant to encourage participation by members from both groups.

There was one location, in addition to the four sites described above, where the settlers wanted to keep water from flowing down a hill behind the last row of houses into the settlement. They had an idea for building a wall approximately one meter high to retain the water behind the hill outside of the settlement. We decided to use this idea to demonstrate the importance of evaluating causes and effects to the people in a participatory fashion. We asked the settlers where the water would go if it were blocked by the wall and they replied that it would flow down towards the road. Upon further questioning, we found that the runoff path from the wall to the road contained several houses. Eventually the settlers acknowledged that the owners of those houses would not appreciate the water being redirected through their homes and that a different solution should be chosen. We then explained to the settlers why it was important to consider not only the causes and effect of the problem, but also the effects of the possible solutions. We asked the community to try to use this same process of analyzing the causes and effects in creating solutions for the other sites so that the solutions would have only positive effects and few, if any, negative effects.

Development of Specific Solutions for Worksites

The next stage of our process called for the community to pick and develop an appropriate solution for each of the demonstration sites that had been chosen. There were a variety of different possible solutions that the community members considered for each site. In this section, we will describe the process of developing these solutions, what they were, and the final implementation for each demonstration site.

At site #1, the settlers suggested using a tyre wall to protect the house against the water flowing down from the hill behind the house, but the settlers also expressed dissatisfaction that they were unsure of the proper way to build a tyre wall. We discovered from the settlers that there had already been a lot of discussion about using tyres for erosion control. Some tyres had even been delivered by SDFN, but no one seemed to know what to do with them. This lack of technical knowledge seemed to be one possible reason for the limited adoption of erosion control methods before this project was carried out. Together, the community members along with us decided to dig a ditch next to the house about one tyre's width deep, and to build a wall of overlapping tyres against the side of the house. The settlers wanted to know how to keep the tyres in place, so we suggested filling the insides with rocks, especially between the sidewalls, and filling around the tyres with soil. This wall was to be coupled with a system of diversion channels to keep water from pooling near the house.

At site #2, the settlers considered both tyre walls to keep rainwater flows away from houses and a diversion channel to contain the rainwater and direct it into areas that were more desirable. The settlers suggested several different methods for stabilizing the rainwater diversion channel. These included lining the sides and bottom of the ditches with tyres to prevent erosion and slow down the flow of water, lining the ditch walls with large stones or with small stones bound together by chicken wire to prevent erosion of the walls, and digging the ditches deeper and wider so that they could contain all of the rainwater. The settlers decided to create a diversion channel that went directly down the slope rather than including meanders, which are bends or curves in the path of the channel that are intended to slow the water. They also wanted to reinforce key points of the channel and houses with tyres using similar techniques to what was done at site #1. At our suggestion, the settlers included plans to terrace the diversion channel by digging out flat sections that would slow down the flow of water through the channel as an alternative to creating meanders in the channel.

At site #3, the settlers suggested the idea of a tyre wall around the garden to protect it from erosion, very much like the solution illustrated in Figure 5. Tate Joseph, previously cited for exhibiting leadership in the Dantago group, was adamant in planning the exact spots for the tyres before digging began. We used Tate Joseph's ideas along with plans from the owner of the garden, Meme Helena, to plan and map out on the ground were the tyres would be placed. At this particular site, the settlers were careful to plan the project thoroughly in order to avoid digging near water and sewer lines that were located in the area. Unfortunately, there were no materials available to bind the tyres securely together or anchor them into the ground, so a system was developed to anchor the tyres by filling them with large stones and packing the soil tightly around the lower layers of the wall. The people expressed that the amount of stone used to fill the tyres would be sufficient to anchor the tyres against movement during heavy rain. Both Joseph's persistency in mapping out the project and the decision to anchor the tyres using only rocks suggested to us that the settlers were beginning to feel ownership over the process and gain the necessary knowledge and confidence required to carry out similar projects by themselves.

Planning of the tyre steps at site #4 was done almost entirely by the settlers alone. They decided to place rows of two tyres in a step-like structure up the side of the embankment to both prevent erosion of the embankment and allow easy access to the houses built on the land above. This was a duplication of a project that the settlers had initiated independently after completion of the demonstration at site #2. By this point in the project, the settlers were showing initiative and beginning to plan and build other structures to control flooding and erosion without our presence. This seemingly new initiative to complete extra projects seemed to lead to the improved completion of independent projects, particularly when materials were readily available to the people within the community.

Solution Implementation

Once plans were developed to implement water control methods in the informal settlements, the next stage of our work in Otjomuise was to assist in the construction of the different solutions in order to help transfer technical knowledge to the community. The sites that we worked on together with the community were intended to serve as demonstration sites. Once these demonstration sites were completed, our intent was to encourage the community members to implement similar methods in other parts of Otjomuise independently from our influence. The methods of completing these tasks along with both written and visual descriptions of some of the observations we made during the solution implementations stage are contained in this section.

Obtaining Materials

Before we were able to begin work, the settlers needed to gather building materials, which we found to be one of the greatest challenges of this project. The communities of the informal settlements have very limited financial resources, which makes purchasing materials difficult for the community. Materials were supposedly available free of charge from the Municipality of Windhoek, but the members of Otjomuise expressed frustration in their dealings with the municipality because of the large amount of time and paperwork that was required to obtain materials such as old tyres and soil. We encouraged the settlers to organize themselves into material gathering teams in order to obtain the necessary materials. This approach was successful to a certain extent, but hampered by the fact that not many settlers are at home during the day. In addition, transportation could only be arranged on the availability of a driver from SDFN and a lorry from NHAG.

Old tyres were identified as one material resource that was readily available. The reason for using tyres was based on suggestions from NHAG and SDFN. The community also liked the idea of using tyres for these projects. Old tyres are abundant in Windhoek, and can be obtained at no cost from a variety of places. One resource for tyres was the Municipality of Windhoek through their solid waste facility. However, permission must be granted before attaining materials from the facility. In order to receive permission for collection, written consent from a host organization and technical details have to be provided to ensure that the used tyres will not be put back in circulation. While we were able to write a letter to the municipality for tyres, once we left, the community would be unable to attain additional tyres from this source in any sustainable capacity without a large amount of outside assistance. Because the municipality required letters of confirmation from both project advisors and project sponsors, individual settlers, or even entire saving groups who want to complete projects on their own would have to find some sort of sponsoring agency willing to endorse the projects and provide technical details of the project written in English, which is a formidable set of obstacles for the people of the informal settlements. Furthermore, after we obtained permission to obtain 220 full size tyres and 100 half cut tyres, only 16 tyres were collected after two visits to the municipality's waste site due to miscommunications on the part of the municipality. In order to avoid all these obstacles in the future as well we sought other sources of materials.

We were more successful in our attempts to acquire old tyres from private tyre distributors. Some of these distributors ship old tyres to the municipal solid waste facility on a daily basis, while others do it on a weekly basis. These private distributors were quite willing to have their old tyres picked up and used for community improvement projects because it eliminated the cost of transporting the tyres for disposal. Tyres for this project were obtained free of charge from companies such as Dunlop and Continental in addition to other local tyre distributors.

For any additional materials, we found that networking and establishing personal contacts with individuals within the municipality were more useful than going through the official channels of obtaining materials from the municipality and led to obtaining more materials than we had previously thought were available. Through our contacts at NHAG, we were able to obtain several truckloads of soil that were delivered by the municipality to Otjomuise to be used as fill. Metal stakes and rope were also obtained through similar means. These methods of obtaining materials would be possible for the settlers by contacting NHAG or SDFN and providing reasons why the materials are needed.

Construction at Specific Demonstration Sites

Construction of a tyre wall against the side of a house at site #1 is shown in Figure 8. This was at the first demonstration site and many people from both saving groups showed up to help. This high turnout suggested to us that the people were willing to take part in the process and were interested in learning. The high turnout also provided evidence that the people felt an obligation to help their neighbours solve problems. In addition to noting the turnout at the first site, we observed that once a particular technique was demonstrated, the people were quick to take over the process and seemed to grasp the ideas that we had introduced. This quick acquisition of knowledge was evident throughout the implementation process. For example, once the hole was dug for the tyres, our team demonstrated one way to place the tyres to push them snugly against each other and the house. Next, we suggested to the settlers that the tyres could be filled inside the sidewalls with large stones, and then the centres of the tyres could be filled with more stones. Once the people witnessed this step, many of them began to fill the rest of the tyres. We believe that this indicated the settlers needed to feel confident that their actions were beneficial, and once they had gained this reassurance, they were eager to perform the tasks by themselves. This can be further seen in Figure 8, where the settlers are filling the tyres without the assistance of our team.

Figure 8: Construction of a Tyre Wall at Site #1

Construction of the diversion channel with tyre reinforcements at site #2 is shown in Figure 9. The techniques used at this site were intended to reduce the widespread erosion and the amount of water that spilled over into the nearby housing areas. Again, we observed a large community turnout to work at this demonstration site. The high attendance level indicated to us that the people liked what had been done at site #1 and now wished to learn the technical aspects of other methods.

Tate Joseph took on the task of constructing the tyre wall. At one point during construction, he seemed to become dissatisfied with the way that the sidewalls had been packed with the rocks and began to use a pickaxe to pry up the sidewalls, enabling him to more efficiently pack the tyres full of stones. Tate Joseph's initiative showed us that once the method was demonstrated to the community, the people were able to understand why certain things had to be done and were able to develop effective and appropriate new ways to do them. Further development of methods also showed us that the community was taking ownership of the process and the methods utilized therein.

Another method that was used at this site was terracing of the ditch to slow the flow of water down the hillside. When we introduced this idea to the people, everyone nodded their head as if they understood. However, once the people began to work, it was apparent that they had not understood what we had tried to explain to them about terracing. In an attempt to help, we dug out two example terraces in the ditch and used gestures to show what we meant. By showing the community members what we meant in a visual way, the community members seemed to better understand what we were trying to convey. As work continued, we found that the settlers still did not choose to include terracing in the ditch. We believe that this could be due to either the fact that the idea of terracing did not originate from them, or that they were still unsure of the reasons behind terracing and did not realize its benefits.

Figure 9: Construction of a Diversion Channel Reinforced by Tyres at Site #2

Figure 10 shows the erosion damage before construction began at site #3, in this location high water flows had washed away a large section of the garden. Since the beginning of our

interactions in Otjomuise, this location had received a lot of attention as a place that needed erosion control, and the settlers were very interested in working at this site. The decision on the part of the community to work at one particular location showed us that the people were dedicated to working as a community, regardless of group affiliation, and to help other people solve the problems that they had. Construction of the tyre wall to prevent erosion at site #3 is shown in Figure 11. This method was similar to the wall that was built at site #1, and at this point, the community appeared to be getting comfortable with the method of building a tyre wall. Figure 11 shows the people packing the tyres with rocks using the method that Joseph had developed to anchor the tyres more securely. In addition, in Figure 11, there are many people working on different tasks in order to complete the job quickly. One day's work at this site yielded a product that was not quite finished although our team felt it was a quite impressive result for only one day of work. Because the wall was not finished we encouraged the settlers to continue construction without us later. After several days, the settlers had finished the wall on their own and put more soil in the garden. This suggested to our team that the settlers possessed more confidence and motivation to follow through with projects on their own than they had had at the beginning of the project. A picture of the completed tyre wall around the garden is shown in Figure 12. Figure 13 shows the construction of tyre steps at site #4. Members of the community conceived everything that was done at this site without assistance from our team. When we showed up on this particular day of work, it became apparent that the settlers had already chosen a site for work and were just waiting for people to get home from work to begin, rather than waiting for our arrival. This further convinced us that they were taking ownership over not only the building process, but also the problem assessment and solution development steps of the process. Figure 14 shows the finished steps, allowing easy access to the plot of land located above the embankment. The quality of workmanship at this site was quite high, and the steps were quite firm and stable when work had been completed. This high quality of work indicated to us that the people were taking pride in what they were doing and producing solutions that would endure over the long-term rather constructing the quick fixes for immediate problems. The high level of pride also suggested to our team that the people would continue to carry out these projects without our influence.

Figure 10: Erosion Damage at Site #3 Before Construction

Figure 11: Site #3 During Construction

Figure 12: Finished Tyre Wall at Site #3

Figure 13: Construction of Tyre Steps at Site #4

Figure 14: Completed Tyre Steps at Site #4

Follow-Up Visits to Worksites

Given the fact that our implementations of the rainwater control techniques took place at the end of the 2006 Namibian rainy season, we had an opportunity to observe and question the settlers about how the structures held up during heavy rains. One of the weekends after all four work sites had been implemented, Otjomuise received 80 millimetres of rain, which was enough to test the structures that we had built. In this section, we will describe how the settlers reported the structures held up during the rainstorms.

We talked to Meme Kandanga, the owner of the house at site #1 where water had been running down the hill and penetrating up through the foundation. She told us that during the rain no water had come up through her floor. This indicated that the tyre wall the community members had constructed next to her house had succeeded. Our team observed evidence that a small pool of water had been sitting in the ditch alongside the tyre wall after the period of heavy rains, and Meme Kandanga confirmed to us that there had been a pool of water sitting in the ditch. To address this problem, the homeowner stated she would dig the ditch deeper to make it slope downhill continuously. Other than this minor pooling, no problems with the tyre wall were reported by the settlers or observed by our team.

According to the people, the diversion channel at site #2 had also worked to keep water away from the houses during the heavy rains. On a follow-up visit, our team observed that the channel had begun to fill up with small stones and rubbish after the rains. This showed us that the channel was controlling water but that it would require maintenance by the settlers to keep it from filling with debris and becoming too shallow. At one point, the channel had not been dug deep enough and there was evidence that water had run over the side. Upon visiting Otjomuise several weeks later, our team found a woman widening the ditch. After talking to her we found out that she was planning to construct a tyre wall next to a house to help reinforce the channel. This demonstrated to us that the people were still innovating and continually improving the designs that we had implemented together.

At site #3, the tyre wall around Helena Ntoni's garden, Meme Helena told us that she was very happy with how the wall had held up during the rains. She excitedly showed us that the soil had been retained in her garden and that none of the plants had been washed away. Our team also observed that the flow of water had been diverted around the garden in a favourable direction.

At site #4 we asked the people about the effectiveness of the tyre steps; they told us that the steps had been very effective at both making the slope easier to negotiate and reducing erosion of the embankment. Our team observed that after the rains the tyres were still quite firm underfoot and did not feel as though any fill had been lost from inside the tyres. However; our team took note of some erosion beginning to occur underneath the bottom tyre, probably due to water flow on the side of the road.

Given that all of the systems had held up during the rains, our team believed that these solutions would continue to be implemented by the people in problem areas around the community. This was confirmed by Edlagh Ujava of the Ehirorujano saving group, who stated that as long as the implemented solutions worked, the people would continue to build and use them.

Turnout

It seemed evident through our work with the people in Otjomuise that the most important factor in encouraging people to show up to do work at the demonstration sites was informing the people of our intention to begin work. We also observed that it was best to begin the work even if only a few people were present because others would see them working and come over to help.

Since there are no land phone lines and few people have cellular phones, communication about meetings and work times was done primarily by word of mouth. By calling to other members and knocking on doors, we were able to find an initial group of workers. Such a system seemed to make assembling people in the community easy and fast; community members were able to walk from door to door, gathering people to help until a large enough group had been gathered to begin work.

In our meetings with the community, SDFN representatives stressed that every saving group must show up and participate with all demonstrations, regardless of which saving group was the focus of the day. The representatives also emphasized that a large turnout was necessary so that many people could gain the knowledge and experiential training. We found that it was best to begin our activities at 17h00 so that people were able to take part in them after returning from work. Table 1 shows the attendance at a sampling of the worksites by members of the specific saving groups. In each case, there was an increase in attendance by members of the saving group in which the work was being carried out; however, the amount of increase was comparatively small.

Table 1: Work Session Attendance by Saving Group

Site	Description	Site Location	Ehirorujano Attendance	Dantago Attendance
#1	Tyre wall built against the side of a house.	Ehirorujano	11	13
#2	Drainage channel reinforced with tyres.	Dantago	8	17

One problem that arose halfway through this project was the end of daylight savings time. When the clocks were turned back one hour, we lost an hour of sunlight in which to do work. We would begin work at 17h00 when the people returned from their jobs, but we would only be able to work until it became dark at approximately 18h30, rather than 19h30 when daylight savings was in place. The limited day light severely constrained the amount of time that the community members had to organize themselves and begin work before darkness fell. Despite the darkness, people still showed up to do work, and since there was a large turnout, a great deal of progress was made due to the number of hands at work. At site #4, approximately 15 people showed up at dusk and worked into the darkness to complete the tyre steps. This illustrated to us that the community was committed to the work and thought that it was a worthwhile use of their time.

Initiative to Participate

Despite the settlers' seeming enthusiasm and dedication to the work on the rainwater control project, we often came across a seeming lack of initiative from the people of the community to begin work on their own. After completing the first tyre wall, our team encouraged the community to start implementation of a second tyre wall at another location using the same techniques. Due to work schedules and hesitance to complete projects without our team present, no work had been done when we arrived the next day. Similarly, one project to construct a water diversion channel was not finished before nightfall, so we asked the people in attendance to finish the ditch in our absence. When we returned later in the week, a little bit more work had been done, but the channel remained unfinished.

The hesitance to work on their own led us to believe that the people needed some way to gather enthusiasm to start work independently. It often happened that people would not start work until we arrived, but once we did, they were eager to begin. Carol Steenkamp, Senior Lecturer of

Land Management at the Polytechnic of Namibia, suggested that culturally, the people were good followers, but that they lacked the confidence to assume leadership roles. This could explain our perception that the community often lacked the confidence to try new ideas on their own without the presence of a leadership figure. This apparent lack of confidence had to be addressed before the community would be able to demonstrate the initiative to complete rainwater control projects of their own accord. We attempted to boost the community members' confidence in their own ability to make decisions by reinforcing the settlers' efforts with constructive comments and congratulations. These encouragements along with the success of the implemented rainwater control methods seemed to be effective at helping the people gain confidence, and as the project progressed, the settlers began to show greater initiative and express more of their opinions regarding planning and implementation techniques.

Community-Initiated Projects

By helping the settlers implement the four demonstration projects, we had intended to build the confidence of the community members regarding both their solution development skills and technical abilities. Gradually, people began to independently develop solutions and implement other projects throughout the community. As of the publication of this report, the settlers of Otojuimse initiated and completed a total of twelve independent projects to address rain water problems and other issues throughout the settlement. In this section, a sampling of these community-initiated projects will be described.

The first of these projects was a series of steps up an embankment meant to improve accessibility to the area above during the rains. This was a modified version of a tyre wall, and had been conceived by the settlers independently of our community discussions. This showed us that the people possessed the ability to use knowledge that they had gained and apply it to other projects of a different nature. This method was the model used for site demonstration #4 and is shown in Figure 15.

Figure 15: Independently Developed Tyre Steps

Another site done independently of us was a buried tyre wall similar to the one constructed at site #1. This suggested to our team that the people approved of the solutions that had been implemented and felt that they were effective. Our team believed that since the community seemed to think the methods were effective that they would be likely to use them in the future.

The house of Tate Joseph served as yet another example of this community implementation. He had had pioneered the construction of tyre reinforcements to stabilize the embankment on which his house was built. In Tate Joseph's tyre wall, some modifications to the design were included such as using metal stakes to anchor the tyres to the ground and boards to help retain the soil and stones that filled the centres of the tyres. His house is shown in Figure 16, complete with the tyre wall that he had constructed. An improved level of confidence and initiative seemed evident from both the planning and follow-through that were necessary to complete this independent project. The novel modifications that he had implemented also indicated an elevated level of confidence in technical abilities and initiative.

Figure 16: Tyre Reinforcement of the Embankment Around Joseph's House

The final independent project that we will describe in this section was at the house of a man named Sem Petrus Iyanbo. Tate Sem lived on the side of a hill, and had experienced a lot of runoff from the hill running into his house and through his yard. He built a wall out of concrete and large stones that he had collected from the hillside. A picture of his concrete wall is shown in Figure 17. By talking to him we discovered that after he was done building the concrete wall he was planning to dig a trench and line it with rocks that were cemented together in order to transport the water directly down the hill. This showed our team that the people were considering the causes and effects of solutions before they were implemented in independent projects. The fact that Tate Sem was willing to purchase cement for this solution suggested to our team that the people of Otjomuise

were gaining confidence in what they had done, and were willing to make a substantial investment into independent rainwater control projects.

Figure 17: Independently Developed Wall of Concrete and Stones

According to Meme Edlagh, people from both Ehirorujano and Dantago had participated in the construction of many of these independent projects, demonstrating increased community capacity and cooperation between saving group members. Through the completion of these independent projects, our team was encouraged to believe that the community was successfully taking ownership over the process of problem assessment, solution development, and solution implementation.

CHAPTER 5: BEYOND OTJOMUISE—CAPACITY BUILDING FOR RAINWATER CONTROL IN OTHER COMMUNITIES

In Namibia, flooding and erosion problems are prevalent not only in Otjomuise, but throughout the entire country. Because of time constraints, our team focused on promoting rainwater control techniques only in Otjomuise, but we also desired to create a broader impact by promoting flooding and erosion control in other informal settlements throughout Namibia. One way in which we observed the potential for a broader impact was through a knowledge exchange in which the people of Otjomuise explained what they had done to solve their rainwater problems to other communities. Additionally, we developed a method for disseminating information through the Shack Dwellers Federation of Namibia (SDFN) that would contain material on rainwater control techniques and community-based processes in order to help others who experience similar problems. In this chapter, we will describe our observations at the knowledge exchange and how we decided on and implemented a method for distributing information to other communities.

Knowledge Exchange

In order to spread the knowledge and skills that the people of Otjomuise had developed through their experiences in solving their flooding and erosion problems, a knowledge exchange was organized by SDFN between the community members of Otjomuise and the members of the Barcelona settlement. People from other settlements around Windhoek and members of the Better Life programme also attended. A total of 51 people attended this knowledge exchange in which the people of Otjomuise were able to explain in detail what they had done to alleviate their problems. Although our team was present at the knowledge exchange, the settlers did all of the explaining on their own, not once deferring to our team. Tate Asser and Ms. Muller translated the proceedings of the knowledge exchange to us so that we were aware of what was being said and the level of detail that the people were conveying to their visitors. When the people described what they had done, they exhibited a great deal of enthusiasm and were very eager to explain the process, as can be seen in the body language of the man in Figure 18. The level of detail that the people of Otjomuise

Figure 18: Community Member Explaining Methods at a Knowledge Exchange

included in their descriptions of planning and constructing the rainwater control measures confirmed to us that they had learned a great deal through their experiences and also that they understood the reasons behind the details of the designs. The level of understanding that the settlers demonstrated indicated to our team that they would be able to continue to make changes and modification to the designs as the need arises. In addition, the explanations that the settlers provided indicated that the level of confidence in their own technical ability had progressed a great deal since the beginning of the project when they had asked us for advice at nearly every step.

The settlers appeared very proud of what they had done and glad to have the opportunity to show and explain it to others. The pride exhibited by the community members demonstrated to us that they had taken ownership over the process and the projects that they had completed. Although the people of Otjomuise had to explain their efforts in both Oshiwambo and Afrikaans, there was a much lower language and cultural barrier due to similar backgrounds than there was during our communications with them. This allowed the people of Otjomuise to explain what they had done much more efficiently and effectively to their visitors than our team would have been able to. The visitors, in turn, seemed quite impressed with what had been done in Otjomuise, and many of them took note and said that they would look into doing similar things within their own communities. This positive response led us to believe that the knowledge exchange was one way in which the knowledge and skills gained by Otjomuise could be transferred to other saving groups and communities in the Windhoek area.

Having experienced the usefulness and power of visual and hands-on learning techniques in Otjomuise, our team felt that the knowledge exchanges provided a good way for other settlers to see the physical products of a community-based effort to improve flooding and erosion problems. The visual nature of the knowledge exchange had the potential to stimulate interest and inspiration in the visiting settlers and create a better understanding of the techniques that were used, thus increasing the likelihood of further implementation.

Methodological Development for a Broader Impact

Although the results we observed at the knowledge exchange were encouraging, our team wished to create an additional way to achieve a broader outreach to communities with similar problems. To do this, our team used our experience in the Otjomuise settlement to develop plans for a technical and inspirational pamphlet designed for distribution through SDFN. This section explains process by which our team came up with and developed the pamphlet idea.

Our team established several criteria to decide on another method through which we could achieve a broader impact with our project. One criterion was to convey information about community-based processes, while another was to introduce some technical information about rainwater control techniques. We intended to spread this information to other communities so that they would be able to implement techniques without external assistance. In keeping with this self-help strategy, we decided that our main audience should be the people of the communities that suffer from rainwater control issues similar to those in Otjomuise. As our final criterion, we wanted to impact as many people as possible from our target audience.

One idea that our team developed was to use the Better Life programme to facilitate the implementation of rainwater control techniques in other communities. We felt that because the Better Life members lived in saving groups, they could easily gain support for projects within their respective groups. Because of the way in which the Better Life members are trained through organized training sessions, we believed it would be easy to integrate rainwater control techniques into one of these training sessions. However, the usefulness of this idea was limited by our team's

short stay in Namibia and the difficulty of scheduling training sessions within the time constraints of this project. Ultimately, we decided that we should develop an informational resource that could be widely distributed after we had left the country.

Another idea that we had was to develop a pamphlet that contained the information we wished to convey to the other communities. When we first entered Otjomuise, one common complaint that the people had was that they were unable to begin projects on their own because they did not have the required technical knowledge. The distribution of a pamphlet throughout the country could make technical information about rainwater control techniques readily available to a larger number of people.

Among the biggest challenges in designing a pamphlet for use in the informal settlements were the related issues of language and literacy. Within the settlements, several different languages are spoken, including a variety of indigenous languages that are not widely spoken throughout every informal settlement. Due to government-run school systems, many people know either English or Afrikaans, although these languages are not used exclusively. According to Edlagh Ujava of Otjomuise, Oshiwambo is also spoken very commonly and is the most prevalent indigenous language in Namibia (personal communication, 12 April 2006). Additionally, those who speak English, Afrikaans, or Oshiwambo do not necessarily have the ability to read in these languages. These issues of language and literacy would have to be resolved before a pamphlet could be produced for circulation in the informal settlements.

The idea of a pamphlet was first presented to Carol Steenkamp, Senior Lecturer of Land Management at the Polytechnic of Namibia, and to Simon Asser of SDFN and the Better Life programme. Ms. Steenkamp was particularly enthusiastic about the pamphlet idea. She felt that allowing the communities to solve their rainwater control problems independently would correspond well to the work she had been doing with NHAG to encourage holistic management within the communities. Tate Simon also agreed that the pamphlet would be beneficial since a pamphlet would give the community the confidence to begin rainwater control projects independently. The pamphlet idea was then presented to Anna Muller, director of the Namibia Housing Action Group (NHAG). Ms. Muller had a different opinion, suggesting that the pamphlet would have little impact on the communities and would be discarded unless it was written as an inspirational story that focused on the people. Our team took all of this advice into account in our attempt to produce an effective broader outreach.

In order to achieve efficient circulation of the pamphlet, we wished to employ SDFN to distribute the final product. Because SDFN works closely with all of the saving groups in Namibia, the organization would be a good vehicle to channel the pamphlet to the communities that could benefit from the information it contains. SDFN could also be effective at targeting distribution of the pamphlet to the communities that are at the level of development where rainwater control projects would be practical. The Better Life programme, which works closely with SDFN, would also be able to distribute the material and facilitate the projects in the Khomas district. Tate Simon stated that the Better Life programme would make an effort to integrate the pamphlet and the information it contains into Better Life training to further encourage rainwater control projects in communities that are involved with Better Life. In this way, the Better Life trained members would become familiar with the techniques and the community building processes described in the pamphlet in order to facilitate project implementations in the communities involved.

Pamphlet Creation

The design specifications for the pamphlet, such as language, level of illustration, size, and genre of writing, had to be determined before production could begin. Many of these specifics were dictated based on the suitability for the audience—the people of the informal settlements in Namibia. Layout and design ideas from other pamphlets that had been used in the informal settlements were used as a guide. We designed the pamphlet to be similar to these because they had already proven to be successful in the informal settlements of Pretoria according to Ms. Steenkamp (personal communication, 4 April 2006).

To address the issue of language, our team chose to use many illustrations in the pamphlet so that the text would not necessarily be needed to understand what was being conveyed. Another reason for doing this was that illiteracy is widespread in the informal settlements. Previous documents that have been circulated in informal settlements have also been heavily illustrated. We chose to emulate this so that people from the communities who are not sufficiently fluent enough in English or Afrikaans could still learn from the illustrations and visual representations in the pamphlet.

Because this pamphlet was intended to impact as many people as possible, we decided that the text should be in both English and Afrikaans, which are the languages taught in Namibian schools. The text was initially written in English by our team and later translated into Afrikaans by NHAG. We were unable to find a translator to translate the text into Oshiwambo by the end of this project, but we left the production materials necessary to alter the pamphlet with Ms. Steenkamp and NHAG.

The level of language used in the pamphlet was influenced by an example booklet published in the Look 'n Do series through the Department of Agriculture of Pretoria entitled, "Let's Make Compost." This booklet and several others that are similar were circulated in informal settlements in Pretoria to help settlers perform gardening tasks (Pretoria Department of Agriculture, 1995). In the booklet, a level of language reminiscent of an advanced children's book was used. Because of language limitations, our group followed this example as a guide for the level of language that we used in our pamphlet. One concern our team had was that we would insult the people by using such simple language, making our message seem condescending. Since previous pamphlets with a similar level of language had been successful in the past, we opted to use simple language while trying to keep an adult tone to reduce the possibility of insult. Ms. Steenkamp, who has a great deal of experience working with people from the informal settlements, also helped us to edit the text to keep the language simple, but to make sure it did not appear condescending.

Another consideration for the pamphlet was the layout design. The determining factor in choosing a layout design was the fact that the pamphlet should bring confidence to settlers wishing to start a project on their own. It would be easy to overwhelm the reader by putting too many concepts on each page in an effort to save paper. However, using a smaller format would increase production costs. We decided, with assistance from Ms. Steenkamp and the example pamphlets, that it would be easier to follow a storyline in a landscape orientation rather than a portrait orientation since fewer rows would be used per page. The example booklet "Let's Make Compost" (Pretoria Department of Agriculture, 1995) was done using a landscape orientation on A5 paper (148 x 210 millimetres). Our pamphlet was designed to be the same size and printed in black and white to reduce costs.

The last criterion that we decided upon was how to develop the storyline of our pamphlet. As mentioned previously, Ms. Steenkamp believed that the pamphlet should contain technical and community capacity-building information, including step-by-step instructions to implement several water control methods. This was intended to increase the settlers' confidence level by giving them

new and useful knowledge. Ms. Muller felt, on the other hand, that the lack of inspiration in the settlers to begin projects on their own was a major challenge that the pamphlet would have to address. She believed that the pamphlet should be written as a story that focuses on the people so that others may be inspired. In this way, other settlers would be able to identify with the people in the story and feel that they too could improve similar problems around their own homes. Keeping both of these viewpoints in mind, our team decided to design a storyline that centred on the experiences of the people from Otjomuise, and embedded technical information within the story. We believed that this would be an effective way to convey the desired information to the settlers in a way that they would find motivational.

The final version of the pamphlet included information on how to complete six different water control techniques as well as information on community processes. This information was meant to be used to solve similar types of problems. The community processes described in the pamphlet are similar to the process taught through the Better Life programme. The final version of the pamphlet spanned 24 pages and is shown in *Appendix D*. An example page from the pamphlet is also shown in Figure 19 below.

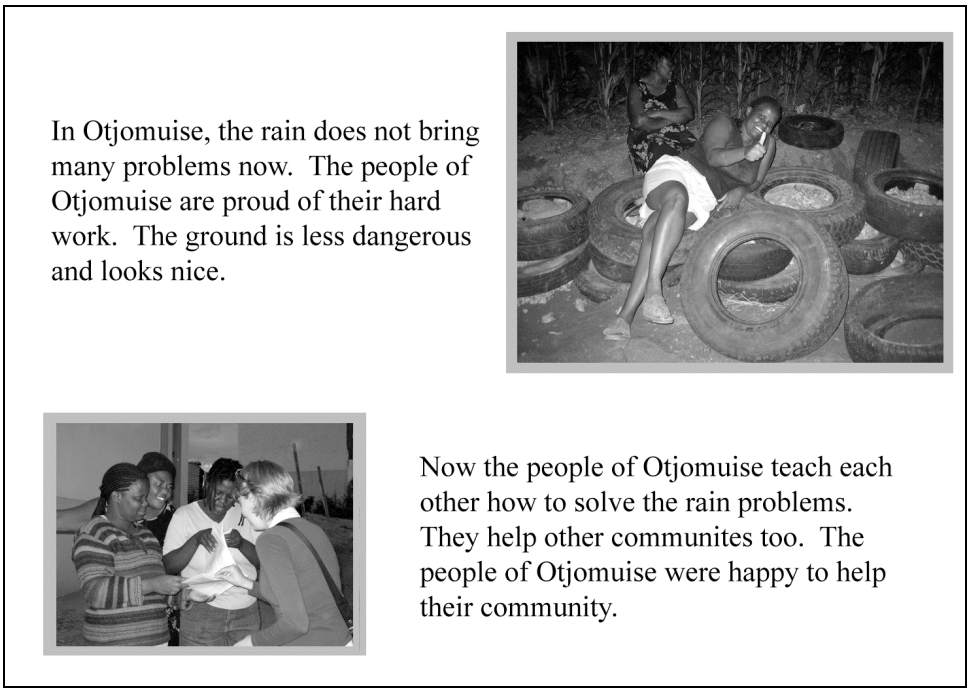

Figure 19: Example Page from the Informational Pamphlet

Testing the Pamphlet

Because the pamphlet would not be printed before our departure, our team decided to test a preliminary example of the pamphlet with the people of Otjomuise. This example pamphlet contained an abbreviated version of the story and illustrated one rainwater control technique that had not yet been implemented in Otjomuise. We first viewed this method in use at the Habitat Research and Development Centre; it involves tyres buried upright to reduce water impact damage from roof runoff and to stabilise the soil. The example pamphlet that was distributed in Otjomuise

is shown in *Appendix C*. Four copies of the example pamphlet were printed and distributed to Ehirorujano and Dantago community members. We wanted to determine whether the settlers would be able to implement the new rainwater control technique based on the information in the pamphlet.

During a follow up visit to Otjomuise, we found four people carrying out the method described in the test pamphlet. This was evidence to our team that the pamphlet contained the appropriate amount of technical detail necessary to assist the settlers in carrying out the tasks included in the pamphlet. We did not have time to translate the example pamphlet into Afrikaans before distributing it, and had only given them an English version. Although this did not allow us to get feedback about the text, it suggested to us that the pictures and illustrations contained enough information to convey the necessary technical data.

One thing that the test pamphlet did not help us determine was whether the pamphlet could increase community capacity for problem solving. Because we had been working in the community so closely for the previous two months, there was no way of telling if the pamphlet was effective in helping the community come together to complete these projects. Despite the lack of evidence of community capacity building our team remains optimistic that the pamphlet will be inspirational to the people in other communities and help them to come together to solve their problems.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

Our team has found evidence to suggest that the rainwater control projects implemented in Otjomuise will be sustained due to the community's sense of ownership over the projects. In this chapter we present a list of key factors that contributed toward achieving positive results. Additionally, our team has developed a series of recommendations that are intended to help guide organizations working with the informal settlements in Namibia and similar communities.

Evidence of Sustainability

From our observations in Otjomuise, we feel there is reason to believe that this rainwater project has created a positive impact on the community and shows promise of maintaining sustainability into the future. Despite the short period of time that we had to assess the impact of this project in Otjomuise, several key pieces of evidence support the existence of a substantial impact. The independent implementation of additional rainwater control measures, as well as a perceived sense of ownership that the settlers had over this rainwater project both indicated that the people had developed the capacity within their community to identify rainwater problems and create solutions for them.

The primary evidence supporting this conclusion was that the people of Otjomuise began implementing their own rainwater control methods independently after the demonstration sites had been implemented. These self-implemented rainwater control methods were based on principles taught during building sessions with our team, but had been modified according to the needs of each individual construction site. One example of this is how the community modified the tyre wall design to serve as a stairway along the side of a road. By the time our team had completed our field work in Otjomuise, twelve of these independent projects had been observed around individuals' houses and in the community.

Additional evidence of the impact this project had on the community was that the settlers seemed to have a strong sense of pride for their work and a broad understanding of the techniques they had implemented. We observed this during a knowledge exchange where Otjomuise community members showed visitors from other saving groups what they had accomplished in their community to prevent flooding and erosion. This exchange was intended to transfer the skills and knowledge that the people of Otjomuise' had gained to other communities. By observing how the Otjomuise community members explained particular construction techniques and the great level of details that they included, we confirmed that the people of Otjomuise had learned the methods well enough to pass on their knowledge to others. Furthermore, they were able to explain what they had learned in such a way so that the information was useful to the visitors, by including enough details and instructions for construction techniques so that the visitors would be able to implement them. The sense of pride and attention to detail that we perceived suggested that the community had developed a sense of ownership over these rainwater projects.

We hoped to increase the sustainability and overall impact that this project will have on the informal settlements of Namibia through the production of the pamphlet that can be found in *Appendix D*. This pamphlet was intended for distribution by the Namibia Housing Action Group (NHAG) and the Shack Dwellers Federation of Namibia (SDFN) and contains information on both initiating community-based projects and constructing flooding and erosion control measures. In this way we hope to promote the spread of the knowledge and skills that were learned in Otjomuise to other saving groups and settlements across Namibia.

Although we were not able to evaluate the dissemination of this pamphlet, our team was able to observe some favourable outcomes based on a test pamphlet that was distributed to Otjomuise. The people were able to use this test pamphlet to implement one method that the people of Otjomuise had not done previously. This led our team to believe that the pamphlet contained an appropriate level of technical detail to assist the people to complete the project, and could contribute to sustainability of community-based initiatives in the future.

Lessons Learned in Otjomuise

As we implemented the process described in our methodology, there were several key aspects that proved to be especially helpful in attaining our goal of developing a community-based problem solving strategy. Three of the techniques that contributed toward achieving this goal are described in this section.

Forming good relationships with the people of Otjomuise helped us to better understand and work alongside them.

Although we expected this outcome, we found that developing friendly and trusting relationships with the people seemed to be very helpful throughout the duration of our project, especially during the implementation phase. We attempted to develop these relationships by taking a personal interest in the settlers' lives, conversing with them on a routine basis, and acting in a friendly and open manner with them as equals. One way in which the relationships we established helped us to proceed was that we could ask individuals with whom we had established relationships to inform others that we were organizing a meeting. In this way, we were able to gather larger segments of the community to participate in discussions or building sessions. Another way in which these relationships helped us was with communication; those who knew us personally were more inclined to take what we had to say seriously and make extra efforts to understand us despite the language barrier. Additionally, we found that after relationships were formed, it was easier to offer suggestions to the settlers since they were more likely to be viewed as friendly, constructive suggestions, rather than condescending demands. For these reasons we believe that developing relationships with the community members helped to increase the project's acceptance within the community, as well as its overall impact.

Involvement of a large segment of the community facilitated the spread of knowledge and skills that the people of Otjomuise had acquired.

During our experience working in Otjomuise, we observed that the community operated as a close-knit group. People seemed more willing to participate in discussions, offer criticism, and help with construction when others were participating as well. Accordingly, as more people participated, we received a stronger overall response from the community. Thus, a snowball effect for participation was achieved, resulting in an increasing number of people willing to help. For these reasons, our team and SDFN representatives stressed to the community the importance of individual saving groups working together to achieve common goals.

By involving large numbers of people in the project, we were able to transfer skills and knowledge to a significant segment of the community. Based on attendance to the work sessions for the Ehirorujano and Dantago saving groups, we estimate that 35-50 percent of households in these two saving groups participated in this project. Those who were present during the building sessions were, in turn, able to teach others who were unable to attend and encourage them to implement similar projects to improve their own living conditions. This peer learning process was

observed during the knowledge exchange in which those involved in building rainwater control measures in Otjomuise explained to other communities how to implement the methods that had been used. This evidence suggests that encouraging high levels of community involvement from the target community was beneficial in creating a broader impact for this project.

Visual and hands-on demonstrations effectively reduced the language barrier and appeared to give confidence to the people regarding technical knowledge.

Because of the language barrier, people sometimes had difficulty understanding us and similarly, we had trouble understanding them. This was not only because the settlers and our team spoke different languages, but also because those who did speak English and were able to translate for us had only limited English skills. During our project, we employed several different types of visual representations to convey what we were trying to explain to the settlers in order to supplement our verbal communications. Examples of these visual techniques are the contour map of Otjomuise that was used to pinpoint problem areas, drawings of possible solutions, physical demonstrations, and on-site mapping of building plans on the ground as described in *Chapter 4*. When interacting with the people, we found that these visual methods were more effective in conveying our message than using words alone.

Similarly, we emphasised visual communication techniques in the pamphlet so that a greater number of people would be able to understand it. These visual methods helped to overcome the literacy barrier in the informal settlements, allowing those who can not understand or read English or Afrikaans to still glean the general ideas described in the pamphlet. Settlers of Otjomuise who had used the preliminary test pamphlet stated that the illustrations helped explain how to dig foundations for burying tyres.

Recommendations for Future Initiatives

As a result of the observations and analysis that we conducted throughout our project with Otjomuise, we were able to make some recommendations for the continuation of community capacity building in the informal settlements in Namibia and in similar communities elsewhere. In particular, these recommendations may be helpful to the NHAG and the SDFN, who work with the informal settlements of Namibia. This section presents a list of recommendations resulting from our experiences in Otjomuise:

We recommend that the Shack Dwellers Federation of Namibia (SDFN) identify people in saving group communities to be trained for the Better Life programme in order to instil confidence in both the leadership abilities and the technical abilities of those communities.

The people trained through the Better Life programme would be able to spearhead community-based efforts and initiate development of community-based solutions. At the beginning of the rainwater control project, the community seemed to demonstrate a reluctance to provide the leadership necessary to initiate projects on their own; in contrast, we also observed that the settlers were quite willing to join in once the group had begun work. This reluctance was especially evident before the settlers had gained experience in building flood and erosion control measures. Once the settlers were able to gain some experience through working with a team of facilitators, they began to show more initiative and leadership in organizing independent community-based projects.

We recommend that future initiatives primarily utilize the settlers' own ideas to promote a sense of ownership and validation of their abilities, rather than supplanting their ideas with foreign techniques.

In addition to the reluctance to assume leadership roles that we perceived in Otjomuise, we also perceived a lack of confidence that the settlers had in their own technical abilities, which may have contributed to the perceived lack of leadership. This lack of confidence in technical abilities was shown to us during a meeting when one settler mentioned that they were willing to work to fix the problems but that they needed the knowledge of how to fix them before they could begin. Over the course of this project we attempted to increase the settlers' confidence making use of their own ideas and helping them to find effective means for construction. Once the settlers had some experience and began to see positive results, their confidence in their own technical ability seemed to increase. This was demonstrated through their initiative to embark on new projects on their own without external assistance. Future projects may utilize positive reinforcement of the settlers' ideas in order to build the confidence of individuals within the community.

We recommend that the facilitators of future projects addressing flooding and erosion in the informal settlements strongly encourage the community to find and gather material resources independently.

We found that the exuberance the settlers showed for building did not necessarily carry over into the gathering of materials and supplies to be used for building. The scarcity of materials that were available free of charge was an obstacle that impeded our progress to build demonstrations in Otjomuise and limited the types of flood control measures that we were able to implement. We also observed that when construction materials were readily available, the settlers tended to initiate more projects on their own. Once the community had received a large number of tyres with which to construct flooding and erosion control measures, and had some hands-on experience with construction, we began to see many instances around Otjomuise where people used these tyres to build tyre walls, stabilize embankments, and build steps into steep slopes.

To overcome the scarcity of materials, the settlers could be more strongly encouraged to use their local knowledge about the environment and the resources they have at their disposal. If the necessary materials are not available free of charge, the community should seek low-cost alternatives that could be purchased. By encouraging communities or individuals to save money and make a financial contribution toward this type of project, the range of materials that would be available for use would increase substantially. The widespread poverty in the informal settlements makes this option more difficult; however, there were settlers in Otjomuise who were willing to make a financial investment in the erosion and flood control measures, as exemplified by Tate Sem's construction of a concrete wall.

We recommend that SDFN perform follow-up visits to Otjomuise to determine how well the implemented structures held up and whether more methods have been implemented to address new problems.

Because of the seven-week timeframe for this project, we were unable to observe any long-term effects in Otjomuise or a broader impact into other settlements. Despite this, our team was able to observe evidence that suggested a positive impact in Otjomuise, and rainwater control measures that will benefit the community for a substantial period of time into the future. Follow-up observations in Otjomuise would be a more effective way to measure long-term effects than merely basing conclusions on the short-term evidence that we observed. Observations of how the community-developed solutions endure during the next rainy season would be of particular interest

in gauging the success of this project. For these reasons, we suggest that the continuation of this project in Otjomuise is monitored periodically by SDFN and documented for future reference.

We recommend that programmes seeking to disseminate knowledge throughout the informal settlements of Namibia organize knowledge exchanges between communities.

Bringing inexperienced communities to view projects that had been done in the example community of Otjomuise promoted hands-on, peer learning and the transfer of knowledge and skills between the communities. The turnout and interest of the visiting communities during the knowledge exchange held in Otjomuise was impressive, and many of the visitors made note of techniques that they might be able to use in their own settlements. Although we were unable to observe any tangible effects in the visiting communities before the conclusion of this project, we believe that promoting an increased awareness of community capacity building, rainwater control, and environmental issues will be of benefit to the other communities that attended the knowledge exchange.

Through this knowledge exchange, the visiting people saw how the flooding and erosion control techniques had been carried out. In addition to learning about the technical details, we hoped that the visitors would be inspired to also begin community-based projects on their own. The visiting communities were able to learn what measures the people of Otjomuise had constructed and how they had constructed them. This peer learning technique of organizing knowledge exchanges allows people from other communities to learn about rainwater control measures through visual and hands-on methods, which we found to be an effective means of enhancing confidence and building community capacity.

We recommend that our rainwater techniques pamphlet be circulated to informal settlements throughout Namibia by SDFN, and that the success of the pamphlet be monitored by SDFN.

Because of time constraints, our team was unable to work directly with communities outside of Otjomuise. However, other saving groups throughout Namibia experience flooding and erosion problems similar to those of Otjomuise. One goal of this project was to achieve a broader outreach to other communities that may also be in need of flood and erosion control measures. One way our team hopes to accomplish this is through the publication of a pamphlet containing technical information on water control methods. The pamphlet that our team designed utilizes a story format to describe how flooding and erosion problems may be controlled using a community-based strategy similar to what was done in Otjomuise. The purpose of this pamphlet was to enhance the level of technical understanding in other communities in order to build their confidence, and to serve as a story that these communities will be able to relate to that will inspire them to develop independent rainwater control projects. The need for increasing technical knowledge was originally motivated because the settlers of Otjomuise had complained that they did not know the specifics of how to solve their rainwater problems.

Since the pamphlet was to be deployed after the completion of our project in Namibia, our team did not have the opportunity to observe the effects of the pamphlet, thus making it difficult to gauge its success. The effectiveness of the pamphlet in communicating specific details and its success could be refined through feedback regarding the specific successes and failures that are observed. We therefore recommend that SDFN monitor the success of the pamphlet and adjust its content and method of deployment in order to improve its future use. This monitoring could be done by simply checking in on communities where the pamphlet has been distributed to see whether any rainwater control techniques have been implemented. Furthermore, follow-up on the pamphlet

could demonstrate whether improved community capacity to solve problems could be achieved without the direct involvement of external facilitators.

There is evidence to suggest that this project had a positive impact within the community of Otjomuise, both to prevent flooding and erosion problems, and to build the capacity of the community to address other problems in the future. Additionally, the distribution of the pamphlet, coupled with knowledge exchanges with the people of Otjomuise, has the potential to produce a sustainable impact upon the informal settlements of Namibia that will promote community-based problem solving initiatives. Taking all this into consideration, we are hopeful that this project has made a modest contribution to improve the standard of living in Otjomuise and that its outcomes will live on to help the communities of other informal settlements throughout Namibia to better their own living situations through the strength of community cooperation.

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APPENDIX A: LIASON AND SPONSOR MEETING PROCEEDINGS

Meeting with Edith Mbanga 16 March 2006

1) Edith Mbanga is the National Coordinator of the SDFN.
2) She belongs to the People's Quey saving group.
3) SDFN is a network of saving schemes that are organized by the people who collect and organize the savings.
4) There are 3 treasurers in each saving scheme who collect and manage the money.
5) SDFN handles money from the saving schemes.
6) SDFN negotiates with the municipality to obtain land for the settlers.
7) SDFN as a community puts in services like roads and sewers. Sewers go through the middle of rows of houses and branch out to the houses.
8) Once land is obtained they can begin to build houses.
9) The Build Together Programme is funded by a N$1 million grant from the government.
10) 13,500 people are organized by SDFN.
11) The people can obtain loans for services, homes, and buying land from the municipality.
12) SDFN actively tries to help the sick (AIDS) and elderly people. They use 10% of their resources to help these people but they are still required to pay it back; they more time to do so.
13) The personal savings funds of the groups can be used for work uniforms or personal things but the money has to be replaced.
14) SDFN encourages people to borrow money according to what they can afford to pay back to the federation monthly.
15) There are 350 saving schemes in all of Namibia and 147 of these schemes are in Windhoek.
16) Together, they have assisted in producing N$3 million in savings.
17) Loans are also available for income generation, but at a higher interest rate.
18) Rural people tend to try to gain income before building houses; the reverse is true in the cities.
19) Erosion and flooding are major problems.
20) She says that the people can solve problems such as water from roof deterioration.
21) Products such as silicon and caulking can be used to stop leaks on roofs.
22) Foundations should be higher than the soil to prevent flooding of homes.
23) Methods to kick water away from houses can be effective to keep water from going inside.
24) Ditches, tyres, and trees can be used to control water.
25) She thinks terracing is a good idea, especially for houses that have not yet been constructed.
26) Some common materials are tyres, trees, gardens, rocks, bags of sand, and corrugated tin (which can be expensive and is increasing in price quickly).
27) There is encouragement from SDFN to not cut grass and trees in yards.
28) The Better Life programme sponsored a workshop to explain methods of erosion control.
29) She thinks we need to get the community involved in doing the actual work rather than doing demonstrations for the community.
30) The municipality does not help after land is purchased.
31) Roads belong to and are maintained by the municipality.
32) Municipality would likely not oppose the installation of drainage systems along roads, but would want to know about them. The municipality takes a long time to do anything.
33) SDFN is an open space for everyone to take part in. Communication is typically by mouth.
34) The weekly meetings also foster communication.

Advisor and Liaison Meeting 30 March 2006

35) Professors Rick Vaz and Chrys Demetry, Carol Steenkamp of the Polytechnic, Simon Asser of SDFN, and all student team members attended.
36) *Better Life* holds workshops to train in holistic management. Holistic management is the integration of environmental, economic, and social aspects of management.
37) Environmental impact assessments (EIA's) will be required for new buildings in the settlements. This is something that the people have not had to deal with before.
38) *Better Life* teaches about the importance of trees in the settlements.
39) They have produced a framework in which they come up with objectives/a purpose (usually to improve the standard of living). They then determine the resources available to complete the objective and how to manage those resources.
40) The core group of *Better Life* trained people is 20 in Windhoek (the Khomas district) and 30 people in all of Namibia.
41) There are 133 saving groups in Windhoek.
42) One problem right now is that not every group has a *Better Life* trained person.
43) Tate Simon is a volunteer for the *Better Life* programme
44) 99 new homes have been built in Otjomuise recently.
45) Saving group programme seems to work because they have ownership over the process although it takes a long time to save money because the people are poor.
46) One reason why the saving groups work is because of the stipulation that if you don't go to the community meetings, you won't get a plot of land.
47) People can save money to purchase things (i.e. pipes) through NHAG.
48) The lack of motivation to begin work without us could be due to them not knowing the process. They tend to focus on immediate problems, while ignoring longer-term issues.
49) Also the settlers are great followers but they might not take initiative, they need to identify a leader. – *Carol Steenkamp.*
50) Meme Edlagh can get people motivated and has been identified as a possible candidate for *Better Life* training.
51) NHAG should give technical support to the people and help them to obtain materials.
52) We should take the proposed pamphlet to the community.
53) Carol thinks that the pamphlet is a good approach. It will work if we use mostly drawings and other visual things. Use words sparingly in both English and Afrikaans.
54) Possibly leave some blank pages at the back of the pamphlet for community ideas to make the process even more participatory.
55) Include some information about organizational aspects for the newly developing communities.
56) People prefer doing projects to only having meetings to talk about them.
57) Most effective method of distribution would be through SDFN and *Better Life*.
58) The pamphlet should include the importance of leaving vegetation – it is ok to trim vegetation, but not to remove it completely.
59) The people sometimes plant new trees that require lots of water after removing indigenous plant species.
60) Tate Simon will make appointments to for us to visit groups to peddle our wares.
61) The people chop down trees for firewood, leading to deforestation problems in some settlements.

Advisor and Sponsor Meeting 5 April 2006

1) Anna suggested that when making the pamphlet to make it in a story format so that other communities will be able to relate to it.
2) Bring in a human dynamic, do this by using names.
3) The pamphlet will be available to the better life people but it will not be a part of their training.
4) NHAG is waiting for grant money that can be used to publish the pamphlet.
5) People will be inspired by the pamphlet because others have done it.
6) Key issue: inspiring or confidence. It should be both; the story will inspire, the technical will give confidence.
7) This should be a peoples process, not a technical process
8) For the recommendations section we will want to include how the settlers can get materials.
9) We should document every place we worked for possible future projects and for ourselves.
10) There will be a Sunday trip at 14h00 to Otjomuise for another community to come see what has been done. Hopefully the people of Otjomuise can explain and we will have to only observe.
11) We should exclude ourselves from the pamphlet.
12) It would be a good idea to perform a test run of the pamphlet in Otjomuise. It is always good to pre-test on your intended audience if given the chance.
13) The people should be responsible for getting materials on their own rather than saving as a group or going through NHAG. The materials should be fairly cheap and the people in these groups (Ehirorujano and Dantago) are not the worst off; they have some money.

APPENDIX B: COMMUNITY MEETING PROCEEDINGS

Walk Through of the Otjomuise Settlement 14 March 2006

1) The Otjomuise settlement contains four saving groups named Ehirorujano, Longa Shoye, Omusati, and Dantago.
2) The first group visited was named Ehirorujano (Promised Land).
3) Ditches had been dug to prevent floodwaters coming into houses. The ditches were reported to be effective in very heavy rains.
4) In some cases water came in through the doors of the homes, additional roofs were erected to combat this problem.
5) The yards were full of holes and ruts due to rain coming off the roof.
6) Tyres had been used to block the flow of water, but many of these attempts had not been very effective.
7) The settlers had been taught by the SDFN and the Better Life programme to let the grass grow to maintain soil, but many yards are still barren.
8) In some cases water goes through the ground and up through the floor of the shack.
9) Water cuts the ditches deeper.
10) With unfinished toilet systems, the flood waters can enter the home via the open pipes on the sides of the houses.
11) Flooding and erosion affect about 50% of the households.
12) The municipality placed a culvert under the road in one location.
13) The Longa Shoye group has 30 people in it.
14) Flooding is considered a problem when the water flows into the houses
15) Brooming and mopping were used to remove water from the houses.
16) Water from the roofs is the main problem for the Longa Shoye group.
17) The poor quality of the buildings is a problem during the rain/flooding.
18) Houses with low foundations experienced more flooding that the others due to water flowing inside.
19) The main problem for the Omusati group is water entering from the roof.
20) They say that the ditches help the water run all in one direction.
21) Holes from the roof are from damage.
22) Sometimes the doors of houses expand during rain and will not shut very well.
23) They want us to help them develop the knowledge that they need.
24) We will be reporting back to Anna which groups are willing to participate in the activities.
25) We must give them the knowledge so that they can continue.

Meeting of the SDFN 15 March 2006

1) Large room with many people sitting and standing. They were dressed nicely (probably just came from work).
2) Anna Muller led the meeting once she arrived.
3) We introduced ourselves and everyone seemed very supportive.
4) The people had been working on mapping possible places for roads and storm drains in Otjomuise.

5) The people are unsure about how sewers work, so Anna described it, which seemed to help. They are just simple gravity sewer systems.
6) Someone asked if they could run the pipes in the rivers, Anna said no and gave some reasons.
7) Anna then publicly compared a couple of the maps and gave suggestions on what to do, such as locations for sewer hook-ups. She also explained what contour lines are.
8) ~76+ people attended the meeting.
9) They wanted to know how they would get connections to the sewer because it is expensive to connect every plot. Anna gave the suggestion of having pipes run between houses and branching off to connect the homes.
10) The people were concerned with placing too many plots on the land because it would be hard for the children to go out and play.
11) The land is valued at around N$25/square meter.
12) Anna poses the question of whether or not they want a community centre instead of leaving space between houses.
13) The settlers think that the roads are too close to the rivers.
14) Anna posed common sense questions for the settlers to answer to give them ownership of the answers. E.g. "Is it better to have the sewer line on the outside of a row of houses or in between 2 rows?" The settlers are encouraged to think about it and produce an answer, "Outside of the rows would double the cost."
15) Mapping with sticky notes is easy to manipulate and change as well as being quite visual.
16) Anna made sure that everyone knew why they were going through the process and enforced that it was not a waste of time but that the final map plans will be handed over to the contractor.
17) Anna brought up that fewer roads make the houses without access to roads feel more like a community.
18) They want us to plan for financial constraints and ease of maintenance.
19) Anna asked for a way to get people to participate in the planning and mapping but because of the language barrier I have no idea what was said. She wants everyone to go back and get all members involved in their own particular groups.

Meeting of Settlers in the Otjomuise Settlement 20 March 2006

1) ~43 people from all 4 groups present.
2) Edith Mbanga of SDFN emphasized that all the people MUST work on the project with us.
3) One lady's house (at the end of Dimbokro St.) was experiencing water flowing into her house and she wanted to see some different techniques that she could use to control the water flows. She presented the idea of laying pipes in the existing ditches to help channel the water.
4) One person is waiting for sand and tyres to arrive and stated that she wants to find out how to use them correctly.
5) Almost all people experience rain entering though the door of their homes. They have tried things like putting mats in the door jams to keep the water out, but it has not really worked.
6) One man's house was located next to a road. When it rains the river becomes a river and soil is washed away from his plot of land.
7) The community showed a lot of interest in going to the HRDC to view the exhibit using tyres to prevent erosion. It was decided that the best time would be on the weekend, preferably a Sunday afternoon if the centre were able to open.
8) Another idea is to use rocks (manya) and cement to channel water. This option can get expensive due to the cost of cement.

9) Gardening has been tried in the past, but the gardens have been washed away and the people don't seem to think gardening is a good way to prevent erosion.
10) One man in the group encourages everyone to participate, he said that he has observed past events where people got very excited about something, but that the next day they were not willing to put in the actual work to finish.
11) Once materials are available we can start on building the actual systems.
12) At the next meeting we will be getting the specific sites for work as well as a team to help coordinate us and the people we will be working with at the various sites. The Better Life programme will be involved in selecting the teams.
13) A meeting to look at the areas that need help and to form the teams was scheduled for Thursday night at 18:00.
14) Figure 20 is an idea from the settlers that Nicole says she planted in their brains at the last visit to Otjomuise. The water flows off the roofs down a gutter and into a bucket so that it can be used later.

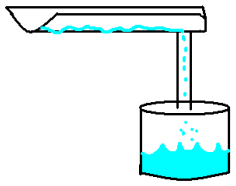


Figure 20: Suggested Gutter System

15) The settlers wanted to know how to use the tyres to control erosion because they have heard a great deal about them, so we did our best to give them a preliminary explanation.

Meeting of Settlers in the Otjomuise Settlement 23 March 2006

1) Members of saving groups that attended: Ehirorujano (15), Dantago (18), Omusati (0), and Longa Shoye (0).
2) Teams of contact people were formed for both Ehirorujano and Dantago:

    a) Ehirorujano
        i) Kaarina Nehoya
        ii) Naftaline Zakaapi
        iii) Bertha Shiimbi
        iv) Lena Kambaraa
        v) Selma Shifotoka

    b) Dantago
        i) Elizabeth
        ii) Helena Ntoni
        iii) Hilde
        iv) Joseph
        v) Sara Jager

3) Meme Edlagh translated with help from Tate Simon.
4) Entire group toured the settlement to observe and discuss rainwater problem areas.
5) Location 1: House at base of hill with garden.
    a) Asked Community what needed to be done
    b) Community suggested a wall of tyres to block water flow from down the hill, but didn't know how to use the tyres correctly.
    c) The lady who owns the house is having the problem of water entering through the floor. She wants tyres but doesn't know how to use them.
    d) The municipality owns the hill behind the house from which runoff originates, as well as the roads, so work cannot be done there without permission: all work must be done on land that is owned by the saving groups.
    e) Possible solutions that were discussed involving channelling of water:
        i) Tyres in a line to slow water.
        ii) Line walls with rocks to prevent erosion (demonstrated by Tate Joseph).
        iii) Make channels deeper and wider.
        iv) Line channels with rocks wrapped in chicken wire or fencing.
    f) The community recognized the importance of plant life, though frustrated by past failures.
6) Location 2: Pink house with foundation erosion.
    a) Suggested channels near house and by road to move water from the house
    b) Problem coming mostly from roof runoff with additional water coming from neighbouring house and the hills
    c) Suggested a wall of tyres or brick to surround the problem areas of the foundation
    d) This location would be ideal for a gutter to barrel solution.
7) Location 3: Slope along north end of settlement.
    a) Discussed building a wall above the houses across the slope with holes and channels for water release.
        i) Benefits
            (1) Could prevent water from flowing downhill into houses and roads.
        ii) Problems
            (1) Wall needs to be strong or it will collapse.
            (2) Water will go around the sides of the walls and destroy homes at either end.
            (3) Building a wall would be expensive.
    b) One settler suggested flattening area with tyres and sand to decrease erosion.
    c) One settler brought up the problem of sewer pipes that still need to be installed in the problem area.
    d) The community decided that areas where sewer lines need to be installed would not be worked on until installation of sewers has been completed.
8) Location 4: Channel along road that has been eroded down to stone layer.
    a) The channel cannot be dug any deeper.
    b) Good area for stones bound with chicken wire.
    c) Settlers wanted to build up the sides of the channel with stone or tyres to prevent spill over into the road.
    d) Settlers wanted to grow grass around the channel to help with erosion and for aesthetics.
9) Location 5: Eroded garden
    a) Deep channel had been made around the garden
    b) Suggested a wall of tyres to line channel and prevent further erosion of the garden.
10) Location 6: Open land and curved road area

a) The municipality will be paving a road in the area.
b) The area is public land with no plans for housing.
c) Terracing was suggested by us to improve the erosion problem; the community will see an example of terracing at HRDC on Sunday.
d) One woman suggested layered tyres and sand to even out the land.

11) Some shovels, pick axes, and such are available within the community.
12) We will meet Sunday at 2:00 P.M. to leave for a tour of HRDC.
13) The community will meet after the tour to finalize locations to work and teams to organize the materials.

Visit to the Habitat Research and Development Centre (HRDC) 26 March 2006

1) Approximately 25 settlers from Otjomuise attended.
2) SDFN provided a lorry (flat bed truck) for transport.
3) Looked at a tyre retaining wall first.
4) The tyres had plastic supporting the soil inside so that it wouldn't spill out through the gaps in the wall.
5) There were plants growing in the tyres.
6) We showed the people an example of terracing.
7) We also saw an example of a roof-to-barrel gutter system for rainwater harvesting.
8) The people liked the gutter system but realized the high costs associated with it.
9) There were sections where rocks were put at the base of gutters to reduce the impact of falling water on the soil below.
10) We saw a place where tyres were buried vertically with small rocks filled in-between them. Only the surface of the tyre showed above the ground. These tyres were meant to stabilize the ground. The people were really impressed with this method; they thought maybe it could be used for under the roofs to reduce rainwater impact damage and rutting.

Construction at Site #1 in Otjomuise 27 March 2006

1) Nick and Ethan went to the municipality with a few of the settlers from Otjomuise in an SDFN lorry to obtain tyres.
2) The municipality was unhelpful and said that we needed a letter from our host institution explaining why we needed the tyres including technical descriptions of our designs. This was not a problem for us but it would be impossible for the settlers to do on their own.
3) Next we went to some private tyre distributors and obtained about 50 tyres. We also determined some possible pick-up times for more tyres.
4) When we got back to Otjomuise people started to congregate. The turn out was somewhat disappointing at first, but more people arrive as they returned from work.
5) We decided to work on the house in Ehirorujano that had been discussed the most at the meetings. For this house water had been running down a hillside behind the house, flooding the ground outside the house, and coming up through the floor. Together we decided that it would be good to make a tyre wall up against the house to encourage the water to continue flowing down to the street.
6) The settlers we were able to obtain two of shovels and a pickaxe. We set to digging the trench for the first layer of tyres.

7) We dug the first couple of shovels full and then people from the community helped out once they saw what to do.
8) As time went on more and more people started showing up and taking turns digging the trench. More tools appeared as the work continued.
9) Once all the digging was done we BUSTED OUT the ice cold Coca-Cola as refreshment for everybody and to provide a chance to take a break from work.
10) Next the tyres were put in. We showed them how to lay the tyres flat and then explained that the middles needed to be filled with rocks. Everyone helped with these steps.
11) Once the tyres were filled with rocks we visually showed that the tyres could be filled the rest of the way with soil by throwing it onto the tyres.
12) This same process of laying tyres and filling them was done for three layers of tyres.
13) After all tyres were placed and soil was replaced we asked what could be done to help prevent further erosion of the soil. Some ideas were brainstormed… placing rocks along the side as well as planting grass or flowers were discussed and the woman who owned the house said that she would try planting on top of the tyre wall.
14) After the construction we walked to the next proposed site in Dantago. This site was a garden that had been eroded away due to the water coming from the hill. For this method we needed tyres, stakes to anchor the system, clean fill, and rope. We did not have some of these materials so we decided to try a different site.
15) Next we walked up to another site in Dantago where the water was flowing down between a couple of houses and washing away all of the soil. Together we decided that it would be best if we made a channel that went down the hill with tyre reinforcement in some places.
16) We asked the people to start construction before we came back the next day at 17h30 so that we could check up on progress and locate another place for work.

Construction at Site #2 in Otjomuise 28 March 2006

1) We returned to Otjomuise at 17h00 with Carol Steenkamp expecting to see some progress on the site we had located. There were no people and no progress on the construction.
2) We proceeded to show Carol the site of our first construction. She was happy with it.
3) We then showed her the garden that will be worked on and explained the ideas of how to fix the problem.
4) We went up to the next site to show her what we had in mind and there was still no one there. We explained to her what was planned to do and at this time people slowly started showing up.
5) When we obtained some tools we started to show people where we thought the ditch was going to go. Some of the people were quite adamant in a different placement the channel. Since it was their project we went with what they wanted but suggested some ways to improve it.
6) One way to improve their design was to insert tyres at some of the corners of the houses to keep the water out as was done in the first house. Another suggestion we gave was to terrace the ditch. This concept took a little while for the people to understand but through physical examples it was comprehended.
7) Tate Simon came by and brought a bunch of the *Better Life* people to observe and help.
8) When we left we asked the people to finish the ditch system and that we would back on Friday. We also requested that they collect some rocks for other projects.
9) The *Better Life* group was asked to come back on Friday as well.

Construction at Site #3 in Otjomuise 30 March 2006

1) When we showed up at 16h00 there where no adults present, but children were.
2) Around 17h00 some parents started showing up.
3) Meme Edlagh, Tate Joseph, and Meme Helena, who owned the garden plot, planned where the tyre wall was going to go. This was an important step because there was a small water line and a sewer line that we had to keep from hitting while digging.
4) Before the digging started Tate Joseph made sure that the plan was very clear and laid out the tyres in the places where they would be laid and then started pick-axing like a fiend.
5) The ditch was dug in such a way that the wall would be flat across the top even though the ground was sloped. At first this concept was a little difficult for the people to understand but once we described it more and demonstrated, it was better understood.
6) Many people showed up to help once they got back from work even though it was the end of the month, which happens to be payday and usually a time for boisterous celebration.
7) Once we the trench was dug, everyone started helping in the process, and all we had to do was to help collect rocks.

Construction at Site #4 in Otjomuise 3 April 2006

1) When we showed up we had no plan of where we were going to work.
2) We caught up with Meme Edlagh and she said that she had asked some people down in the village to show us where they wanted to work.
3) They wanted to work at a place where it was hard to climb up the bank to the houses and it was getting eroded by the ditch next to the road.
4) The settlers had done a similar project at a place just up stream from where they wanted to work so they got right to it with out any input from us.
5) The finished product looked good and seemed like it would resist erosion better than what was there and it would make it easier to get over the bank.

Knowledge Exchange at Otjomuise 9 April 2006

1) Anna Muller attended the session.
2) The Better Life programme trained people were there and the people from Otjomuise explained in detail what they had done to the visitors.
3) Although the exchange was in a combination of Oshiwambo and Afrikaans, Tate Simon and Anna Muller translated for us so that we knew what was taking place in the meeting.
4) People from the Barcelona settlement came and the people from Otjomuise explained what they had done again to these people.
5) The people explained the methods with a lot of enthusiasm and seemed quite proud of their accomplishments.
6) The exchange started at site #3 and the people from Otjomuise explained the exact processes down to a very precise level, even explaining why they put plastic bags inside the holes of the tires.
7) Next the people went to site #1 and the people of Otjomuise again explained what they had done to help combat the flooding problems.
8) We had to leave after this but it looked like everyone was going to observe site #4.

9) Anna Muller expressed to us her joy at the enthusiasm of the settlers about everything they had done.

Deployment of the Test Pamphlet in Otjomuise 12 April 2006

1) We brought 4 copies of the test pamphlet.
2) We distributed the pamphlets to the groups; 2 went to Dantago and 2 went to Ehirorujano.
3) We explained that this was part of a bigger pamphlet that we wanted to distribute to other saving groups and we wanted to see if it contained an appropriate level of technical detail for the projects.
4) The people immediately started flipping through the pages and looking at the pictures.
5) We gathered around 10 people together and further explained what the pamphlet was and why we were giving it to them.
6) We told them we would be back in a couple of days to see if the pamphlet was able to help them produce the method presented.

Follow-Up Visit to Otjomuise 25 April 2006

1) When we first showed up we noticed that there had been some more community-implemented projects. One was a tyre wall and ditch system to keep the heavy waters from washing into a garden and destroying it.
2) After walking around we found Meme Edlagh and 4 other people working on the method that we had described in the pamphlet.
3) After looking through the pamphlet the people decided to try and cut some tyres in half. This proved to be difficult because of the steel belting around the bead of the tyre, but the settlers had been able to successfully cut 2 tyres.
4) Since it had been hard to cut the tyres in half they continued with full tyres.
5) They only did the method to about 1/3 the length of the house because the sewer lines were going to be put in and they didn't want them to get dug up.
6) When they were done putting the small rocks around the tyres they were very happy with the way it looked.
7) Upon further exploration of the settlement we found another house that had built tyre steps to the door.
8) We also found a house where a wall had been made of rocks and concrete. When we talked to the owner we found out that it was to divert the water from going into his house and through his yard. We also found out that he wanted to purchase cement to make a lined channel that carried the water to the end of the hill and into the ditch next to the road.
9) We found out from talking to the people that they like to eat dogs. This kind of scared Nicole and made her cry. Nick loved it; he now wants to eat lots of varieties of dog.

APPENDIX C: PRELIMINARY TEST PAMPHLET

How the People of Otjomuise Stopped the Erosion Together

by Nicole Labbe, Nicholas McBride, and Ethan Ray

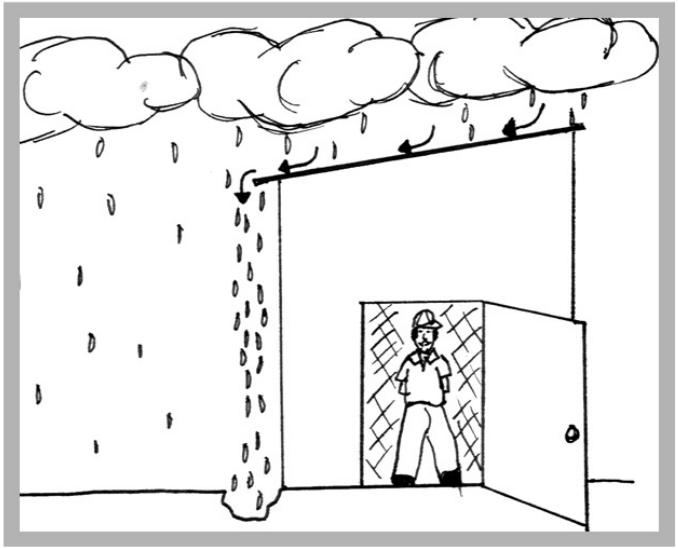
The Better Life Programme

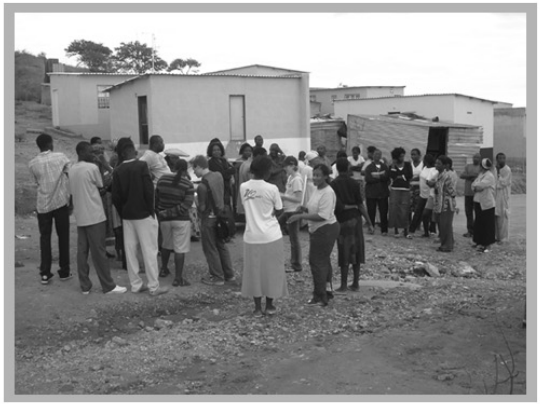
NHAG
Namibian Housing Action Group

SDFN
Shack Dwellers Federation of Namibia

The Day the People of Otjomuise Stopped the Erosion Together

In Otjomuise, it rained very hard in the summer. The rain came off the roofs and made holes in the yards. The people thought the holes were dangerous. The people wanted to solve this problem.

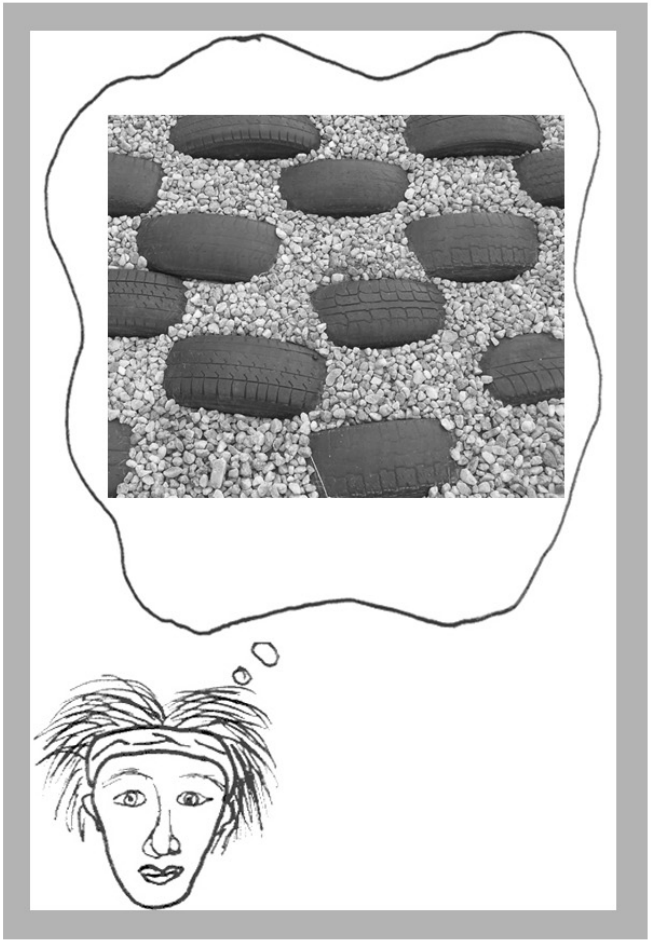




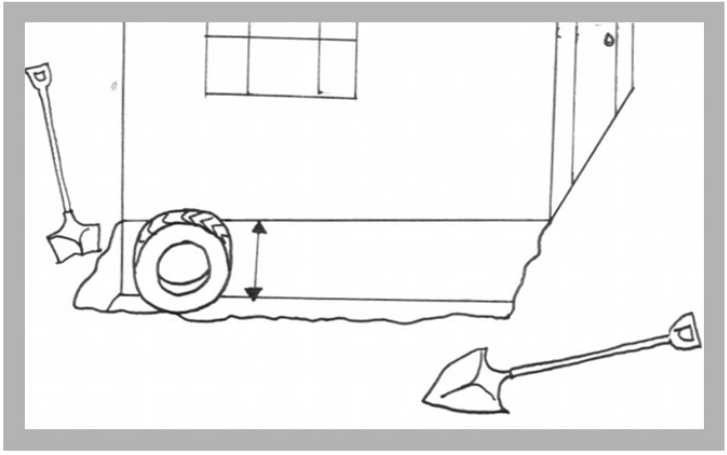
Otjomuise had a meeting. The saving groups named Ehirorujano and Dantago came. The Better Life Programme came to help too. They had many ideas.

One woman had this idea:

- The people could dig a deep trench.
- Then they could fill the trench with tyres and rocks.
- This would solve the problem.
- They could even plant around the tyres.

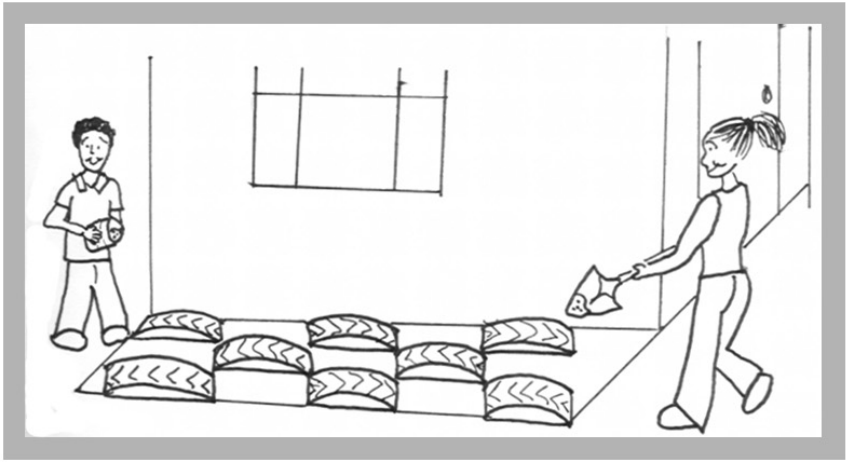


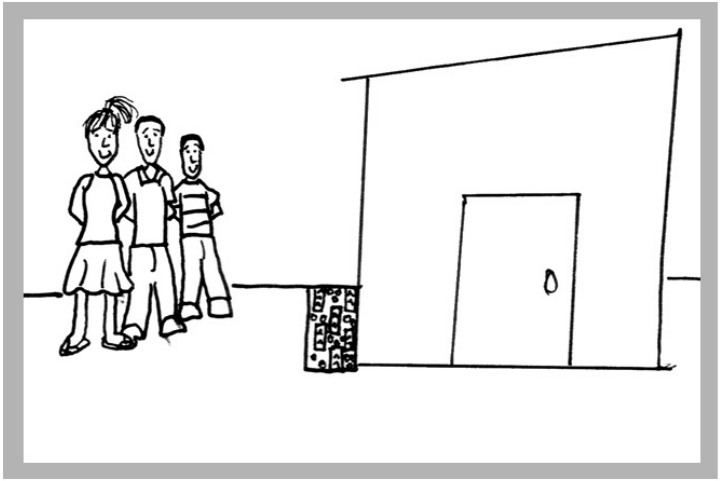
The people from Otjomuise collected a lot of tyres. The people gathered a lot of stones.



The people from Ehirorujano and Dantago dug a trench next to the house. They made the trench deep enough to put the tyres in.

Both groups helped put the tyres in the trench. The groups buried the tyres. You could only see the tops of the tyres.





They filled the open spaces between the tyres with small rocks. The job was quickly done because many people helped. Now there were no more holes. The yards were safe and looked nice.

APPENDIX D: FINAL PAMPHLET DESIGN

How the People of Otjomuise Stopped the Erosion Together

by Nicole Labbe, Nicholas McBride, and Ethan Ray

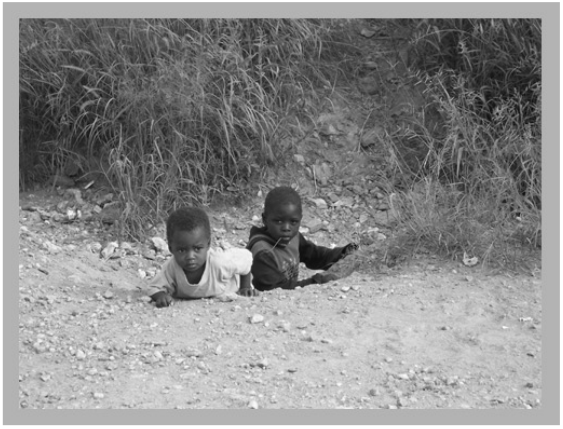
The Better Life Programme

NHAG
Namibia Housing Action Group

SDFN
Shack Dwellers Federation of Namibia

How the People of Otjomuise Stopped the Erosion Together

In Namibia, it rained very hard in the summer. The rain washed away the soil. There were rivers and holes everywhere.



The people thought the rivers and the holes were dangerous. It was hard to walk home with all the holes.

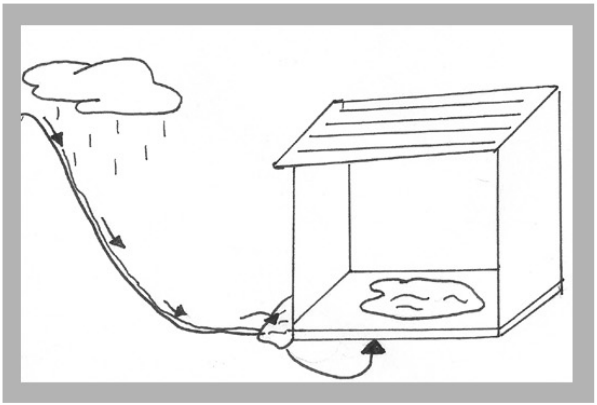
The people of Otjomuise were not happy. The people did not want the rain to make any more problems. They wanted to solve the problems.

Otjmuise had a meeting. The saving groups named Ehirorujano and Dantago came. The Better Life Programme came too.

Together, the people discussed what the rain problems were. The people talked about what caused the problems and how to fix the problems. They had many ideas.

The people used a map to draw where the problems were as a group. Everyone could see where the problems were in their community.

At the meeting, the saving groups decided to work together. This way they could learn together. There would be more people to do work also.



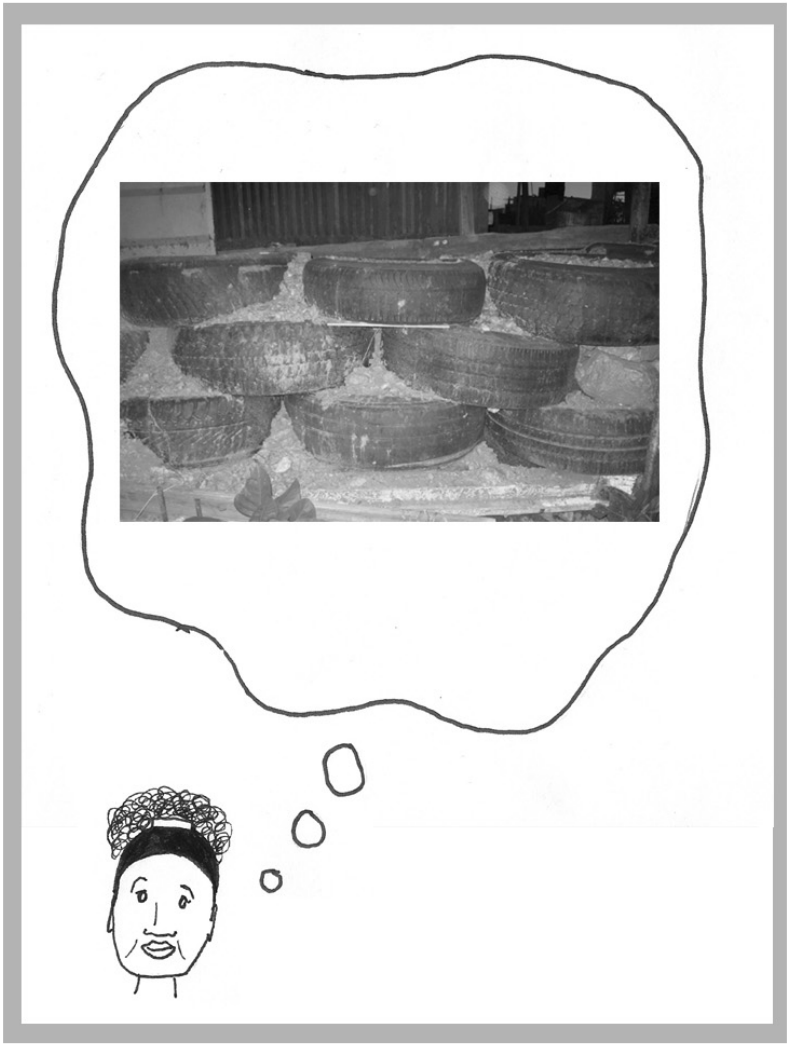
At the house of Meme Kandanga, water came down a hill and into her house through the floor. She needed help. The people of Otjomuise decided to work at Meme Kandanga's house.

One person had an idea about how to help Meme Kandanga:

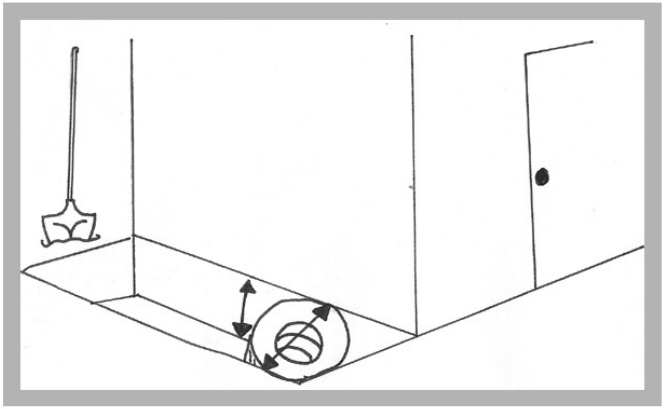
- They could build a wall of tyres next to the house.

- The tyres would block the water from going into the house.

- The water would go around the wall instead.

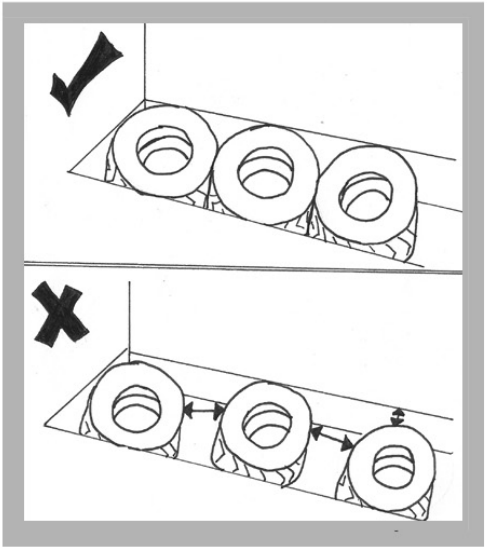


The people gathered a lot of tyres.
They got old tyres from tyre shops.
They used the lorry from the Shack Dwellers Federation to collect them.
They gathered stones too.



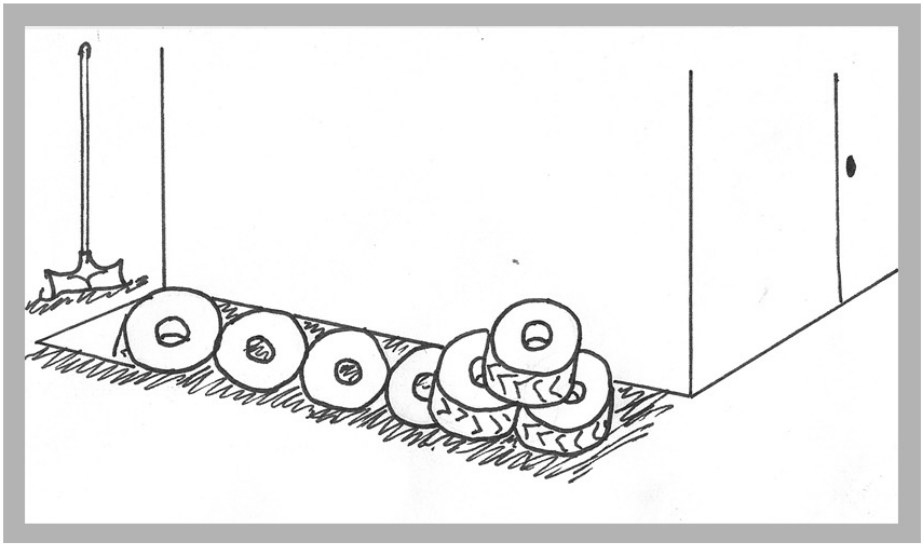
The community dug a deep trench next to the house. The trench went to the bottom of the foundation. The trench was deep enough to put a tyre in.

The community put the tyres in the trench. The people made sure the tyres had no spaces between them. The tyres were pushed up against the house.



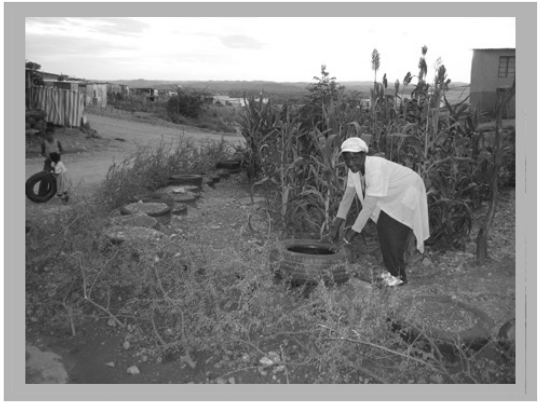
Then, the people filled the tyres with stones and soil. They filled the sides of the tyres too. There were no empty spaces in the tyres. Now the tyres would not move.

The people filled the trench with soil. You could only see the tops of the tyres. The people placed another row of tyres on top.



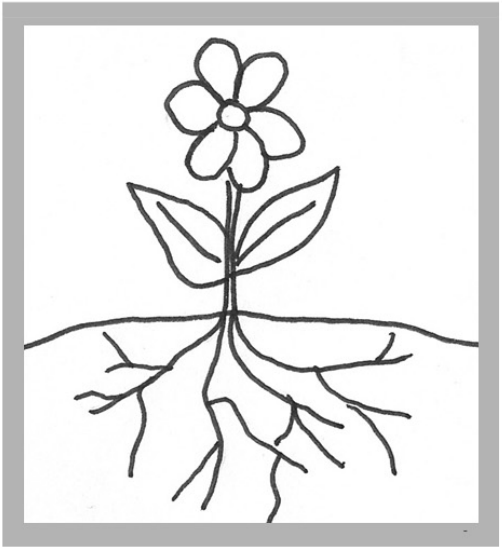
They filled the new row of tyres with rocks and soil too. They put plastic in the tyres so the soil did not fall through the holes. Soon a wall was made.

Both saving groups helped with the work so the the job was quickly done. Everyone learned how to build tyre walls. Everyone was happy because Meme Kandanga's house was dry.



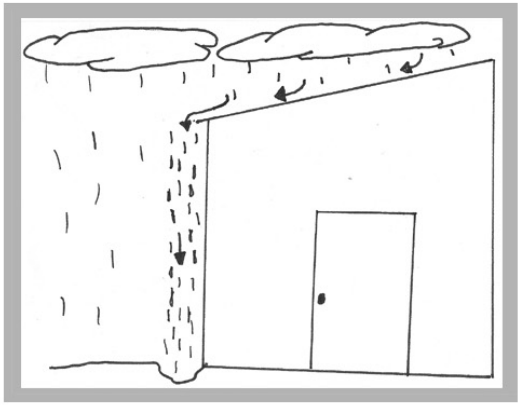
Meme Helena learned how to build the tyre wall at the house of Meme Kandanga. Meme Helena also wanted a tyre wall to protect her garden. The community helped her build a tyre wall too.

Meme Helena's garden was good. The plants held the soil in place with the roots. The water could not wash it away. She had vegetables to eat too.



Many other people saw how the plants stopped the rain from washing away the soil. They started planting around their houses.

The community liked the tyre walls and plants. They wanted to solve other problems from the rain also.



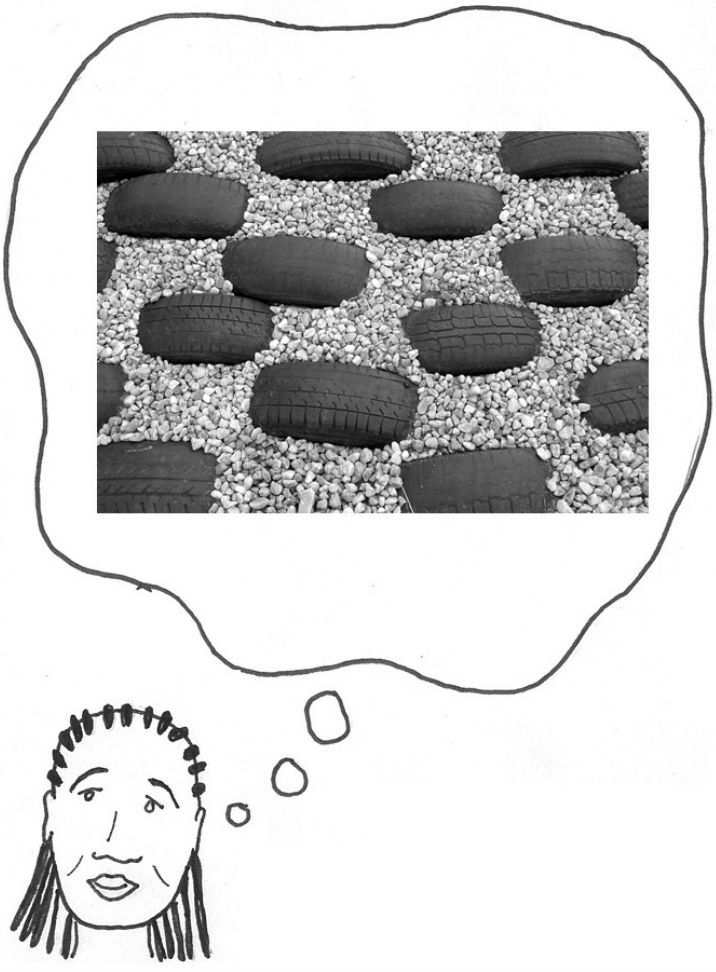
At some houses, the rain came off the roofs and made holes in the yards. The people thought the holes did not look nice.

One woman had an idea:

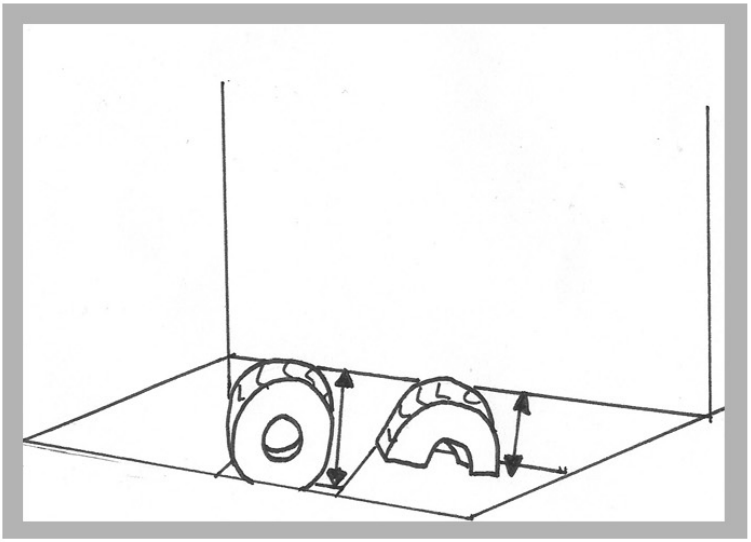
- The people could dig a deep trench.

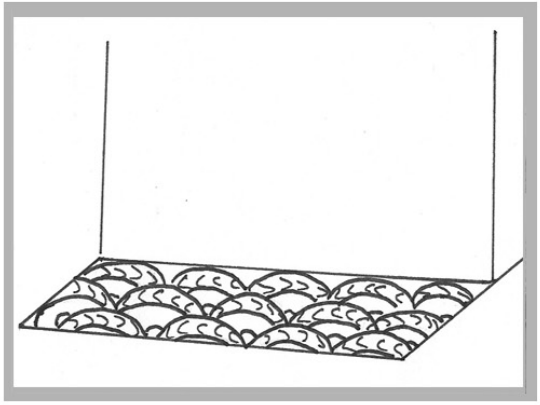
- Then they could fill the trench with rocks and tyres that were cut in half.

- This would stop the rain from making more holes.



The people from Ehirorujano and Dantago dug a trench next to the house. It was deep enough so half of a tyre could stand up in it.





Both groups helped put the tyres in the trench. The tyres were spaced out nicely.

The groups filled the trench with stones and soil. You could only see the tops of the tyres. They put small rocks around the tyres to make it look nice.

Now there were no more holes next to the houses. The yards were safe and looked nice. Everyone was happy.

A woman named Edlagh had another idea:

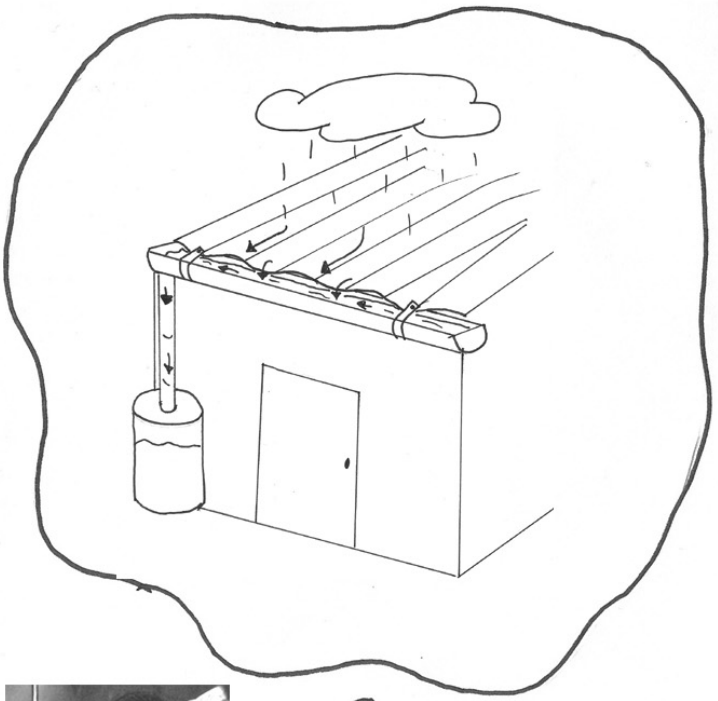
- They could attach a gutter to the roof to catch the rain.

- The gutter could be made by cutting a PVC pipe in half.

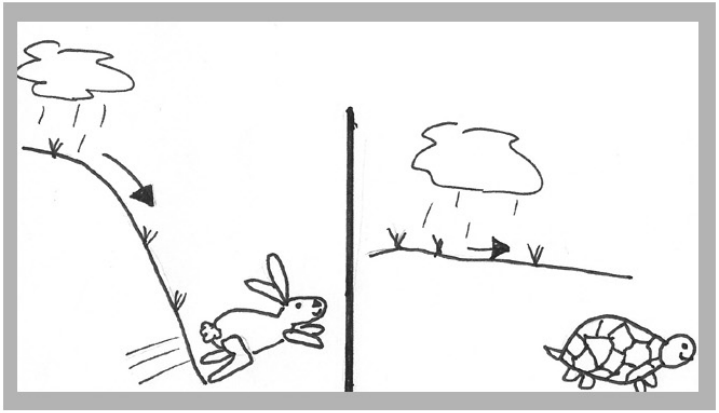
- The rainwater would be collected in the pipe.

- An old barrel could collect water from the gutter.

- The collected water could be used for washing and planting.



The community had so many good ideas because people discussed the issues as a group. They also talked about trying to change the surface of the land to stop the water from washing away the good soil.



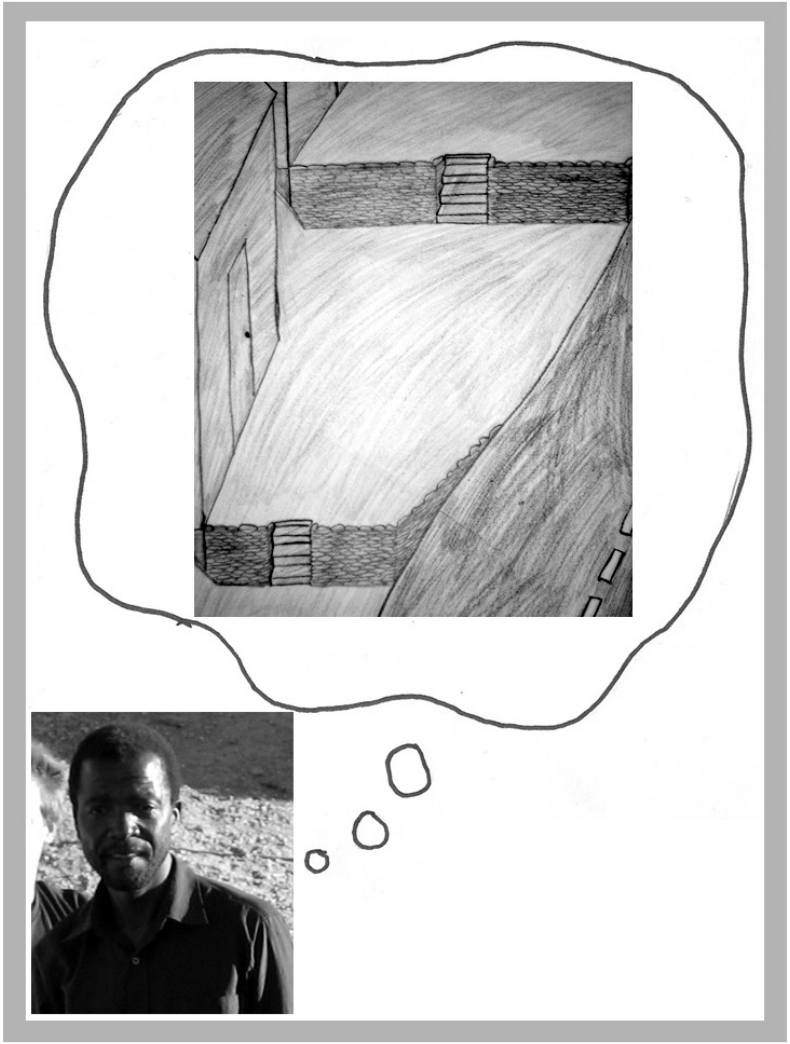
The people saw how the water flowed fast when it went down a hill. The water moved slow when the ground was flat. The water made big holes when it flowed fast and no holes when it flowed slow.

A man had an idea to stop the water from going fast:

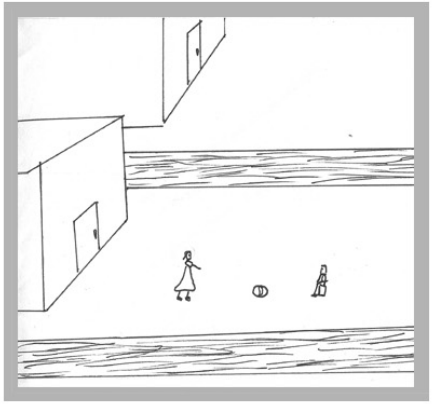
- The people of Otjomuise could make steps to slow down the water.

- The rainwater would go into the soil instead of running down the hills.

- No more holes would be made.



The groups had to save to buy a lot of soil. They needed to fill the sloped areas to make them flat. They made the steps sturdy with tyre walls.



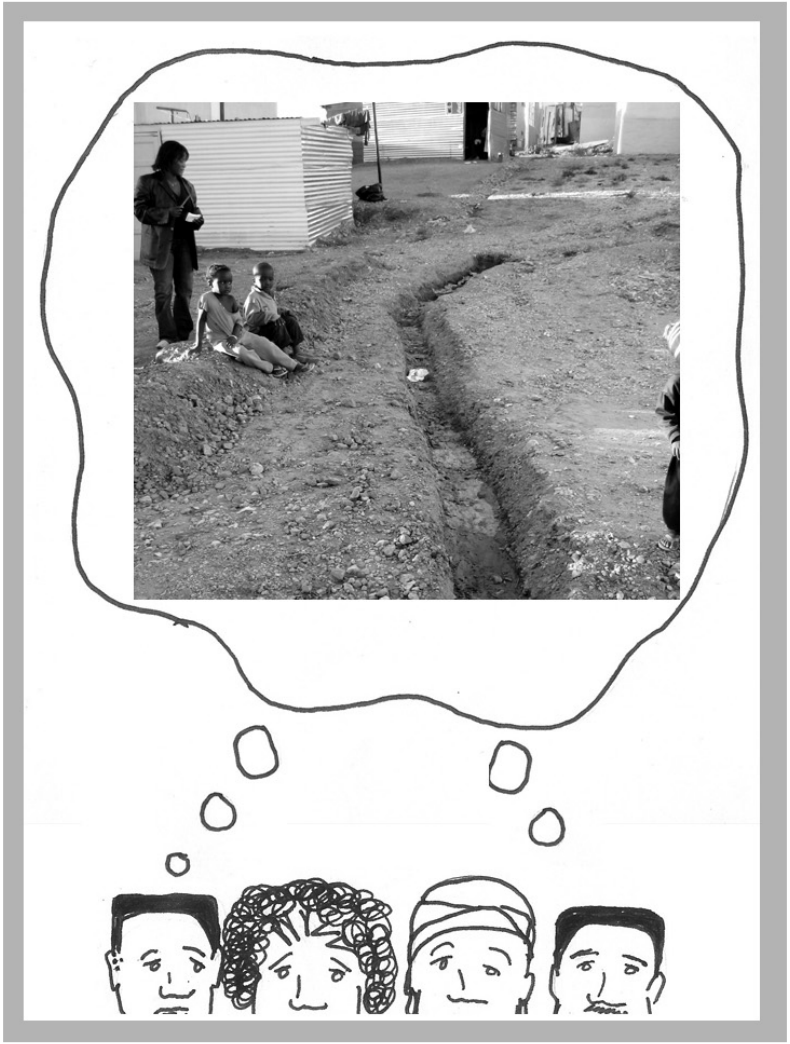
They worked together to grow plants on the flat parts. Then there was a nice area for the children to play. Now they have a community area to share.

The people of Otjomuise had another idea to change the land:

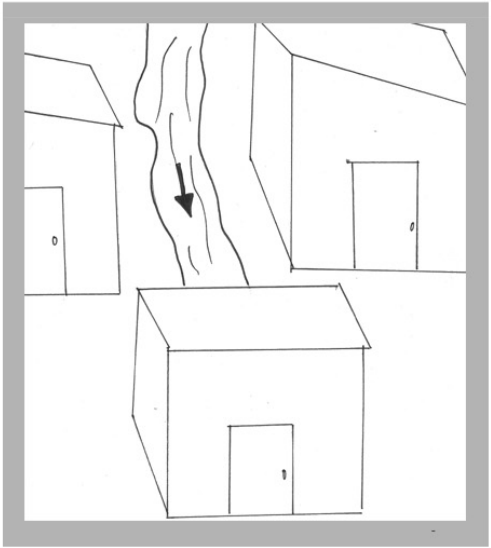
- They could make ditches.

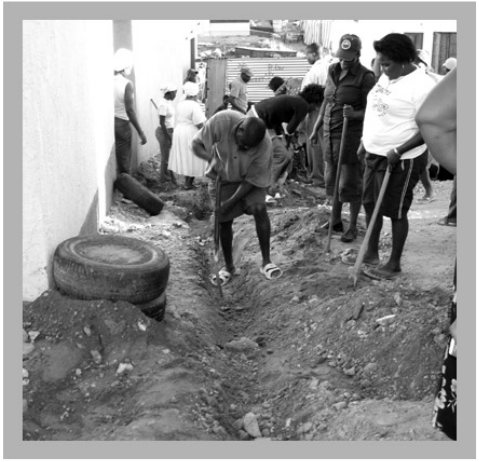
- Ditches would hold all the water in one area.

- Then the people could control where the water went.



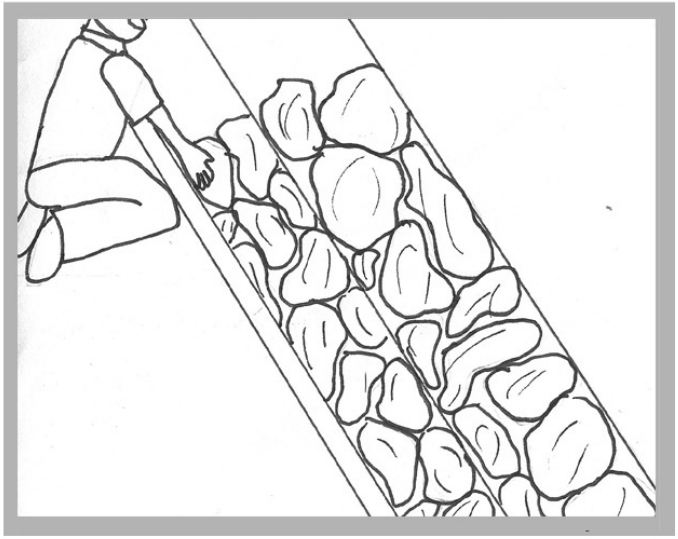
Water was running between some houses and into one man's house. The people wanted the water to go around the house instead.

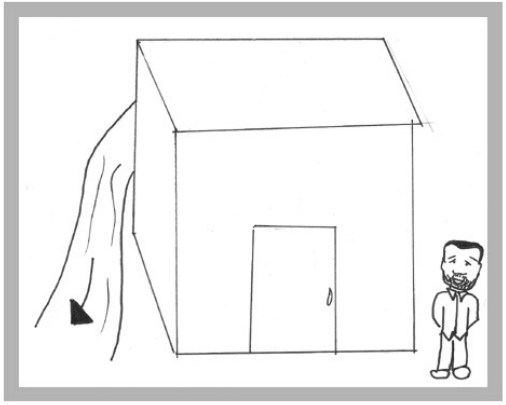




The entire community dug a ditch between the houses. The ditch went around the man's house. The ditch was wide and deep enough to hold all the water.

The people wanted the ditch to be strong. The people put flat rocks along the sides of the walls. The water could not dig through the rocks.





When the rains came, the water went around the man's house. Now his house was dry. His family was very happy.

In Otjomuise, the rain does not bring many problems now. The people of Otjomuise are proud of their hard work. The ground is less dangerous and looks nice.

Now the people of Otjomuise teach each other how to solve the rain problems. They help other communities too. The people of Otjomuise were happy to help their community.

Hoe Die Mense Van Otjomuise Erosie Saamgekeer Het

by Nicole Labbe, Nicholas McBride, and Ethan Ray

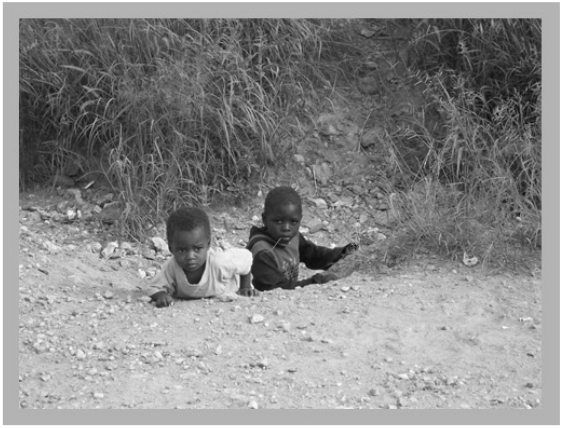
The Better Life Programme

NHAG
Namibia Housing Action Group

SDFN
Shack Dwellers Federation of Namibia

Hoe Die Mense Van Otjomuise Erosie Saamgekeer Het

In Namibië, het dit baie gereën hierdie jaar. Die reën het die grond weggespoel. Waar daar nie grasse of bosse was nie, het die water slote en gate gemaak.



Die mense het gedink die riviere en gate was gevaarlik. Dit was moeilik om by die huise uit te kom.

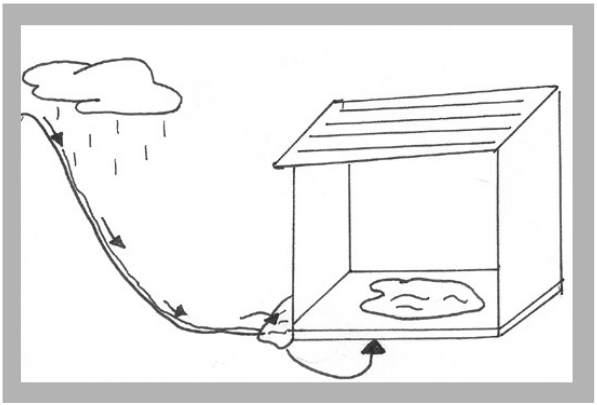
Die mense van Otjomuise was nie gelukkig nie. Hulle wou nie meer skade hê nie en wou die probleme oplos.

Ehirorujano en Dantago spaargroepe van Otjomuise het ‘n vergadering gehou en lede van die Beter Lewe program was ook daar.

Die mense het tesame die skade bespreek wat die reën veroorsaak het en hoe hulle dit kan oplos. Hulle het baie idees gehad.

Die mense het die probleem areas op ‘n kaart aangeteken, en nou weet elkeen waar die erosie in die gebied is.

By die vergadering het die groepe besluit om saam te werk en te leer. Meer mense maak ligter werk.



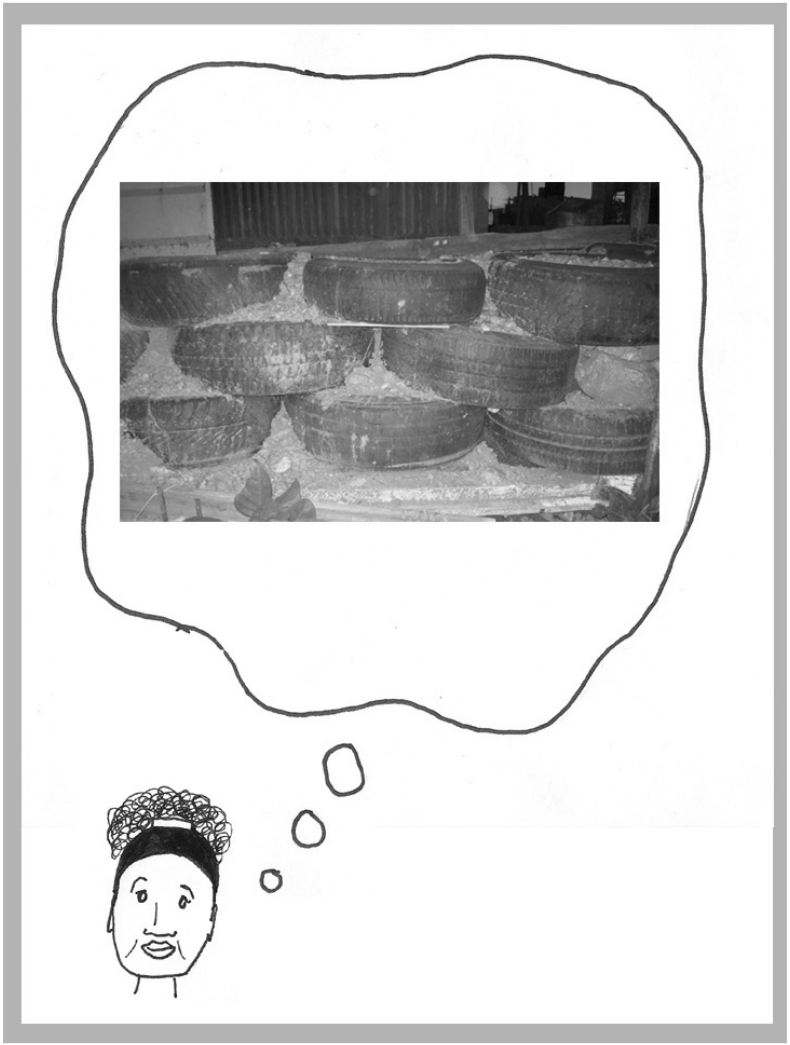
By Meme Kandanga se huis, het die water van ‘n bult afgeloop tot in haar huis. Sy het hulp nodig gehad. Die mense van Otjomuise het besluit om by Meme Kandanga se huis te begin werk.

Een persoon het ‘n gedagte gehad:

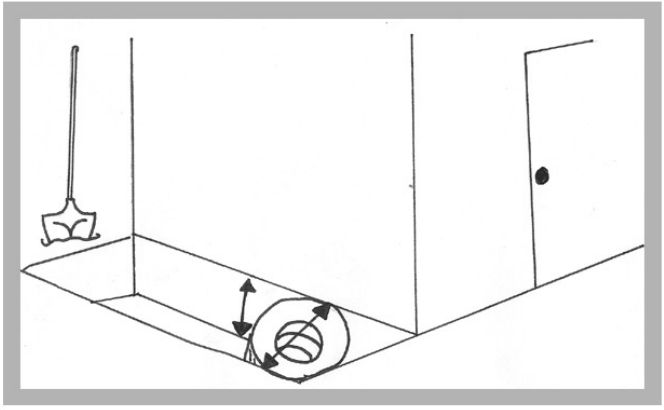
-Hulle kon ‘n muur van moter buitebande teen die huis bou.

-Die buitebande kon die water blok, sodat die water nie in die huis ingaan nie.

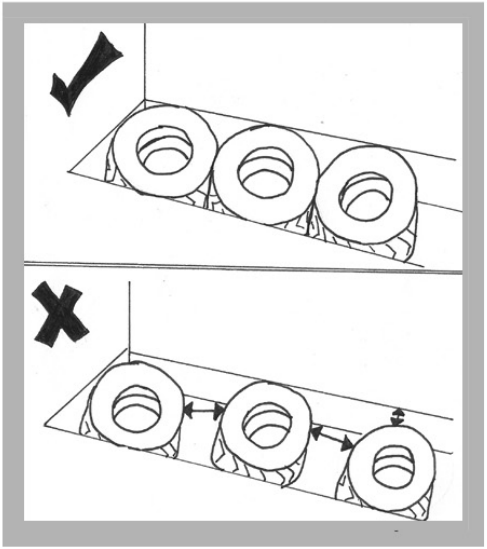
-Die water kon rondom die muur loop.



Die mense het baie buitebande bymekaar gemaak. Hulle het ou buitebande by bandewinkels gekry. Die Federasie het vir hulle ‘n lorrie gereël. Hulle het ook klippe bymekaar gemaak.



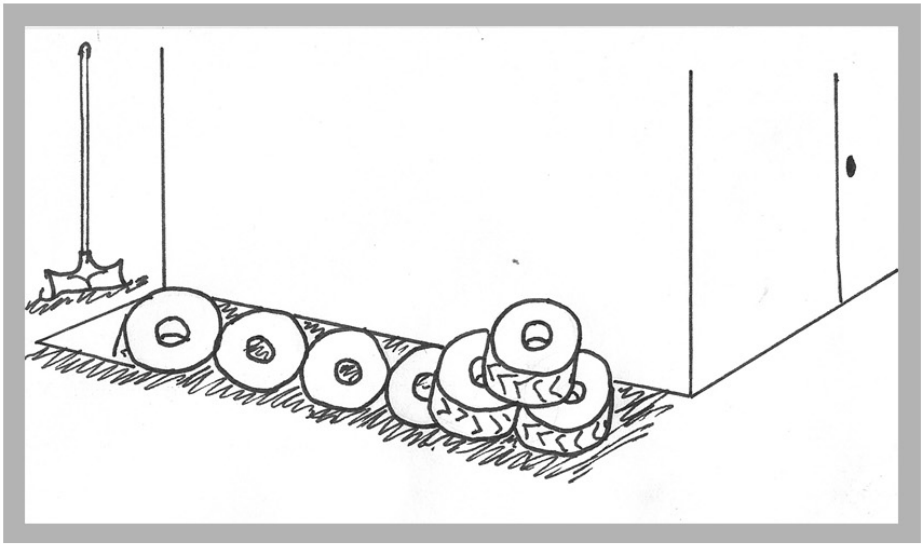
Die gemeenskap het ‘n sloot langs die huis gegrawe. Die sloot het tot fondasies diepte gegaan, en was diep genoeg om ‘n buiteband in te sit.



Die gemeemskap het toe die buitebande in die sloot ingesit. Hulle het seker gemaak dat daar nie spasies tussen in is nie. Die bande was teenaan die huis gestoot.

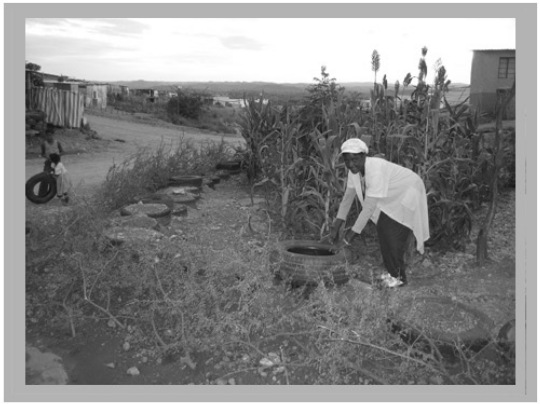
Dan het die mense stene en sand in die bande gesit tot teen die binnekante van die bande. Daar was nie leë plekke in die bande nie en hulle konnie nie beweeg nie.

Die mense het die sloot met sand toegemaak. Jy kon net die bokante van die bande sien. Bo-op het hulle not ‘n ry bande gebou.



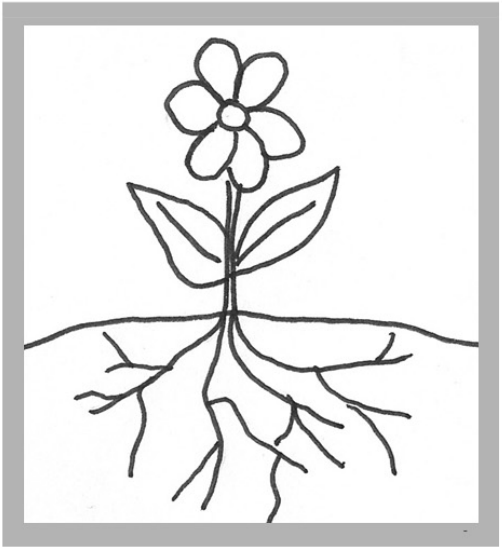
Hulle het die nuwe ry ook met sand en stene gevul, en plastieksakke onder ingesit sodat die sand nie uitval nie. Gou was ‘n muur gebou.

Die twee groepe het hardgewerk en die werk was gou klaar. Almal het geleer hoe om met bande keermure te bou, en hulle was tevrede want Meme Kandanga se huis was nou droog.



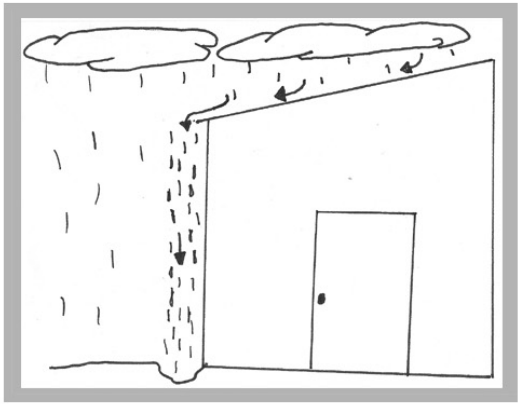
Meme Helena het ook geleer by Membe Kandange hoe om met bande ‘n muur te bou. Sy wou ook ‘n muur gehad het om haar tuin te beskerm. Die gemeenskap het vir haar ook gehelp.

Meme Helena se tuin was goed. Die plantwortels in haar tuin het die grond vasgehou en sy het ook groente gehad om te eet.



Baie mense het gesien hoe die plante die grond help om nie weg te spoel nie. Hulle het ook rondom hulle huise begin plant.

Die gemeenskap het van die bandemuur en plante gehou. Hulle wou ook ander water probleme oplos.



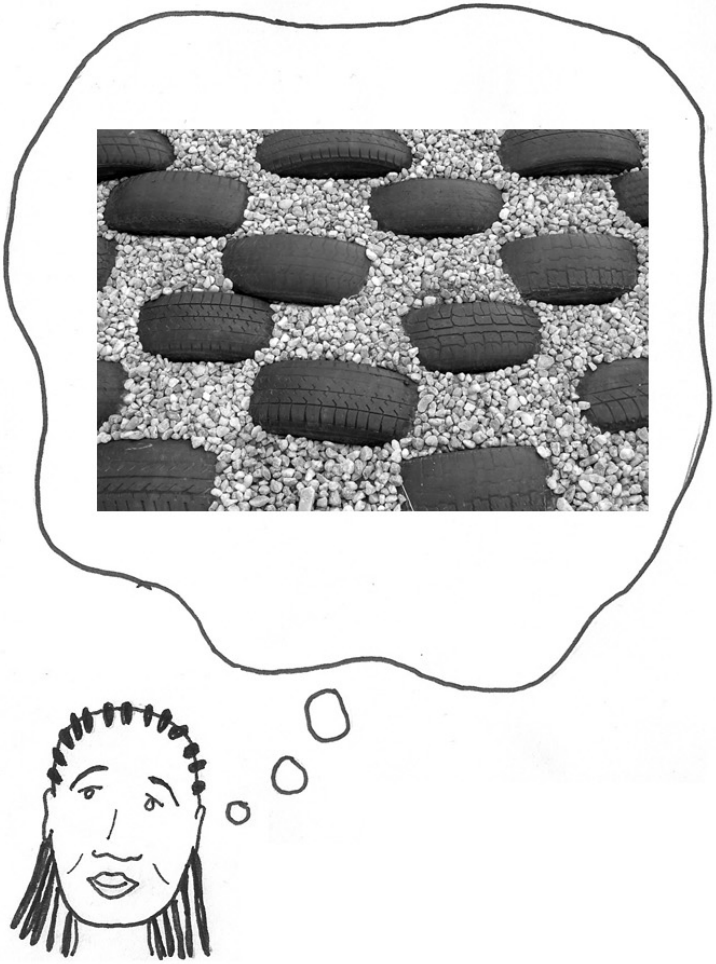
By sommige huise het die water deur die dak gegaan en gate in die grond gemaak. En hulle het nie daarvan gehou nie.

Een vrou mens het ‘n gedagte gehad:

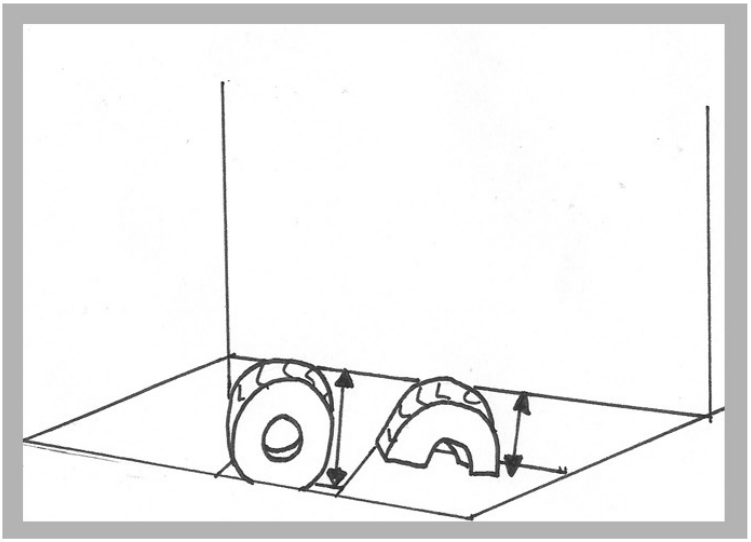
-Hulle kon ‘n diep sloot grawe.

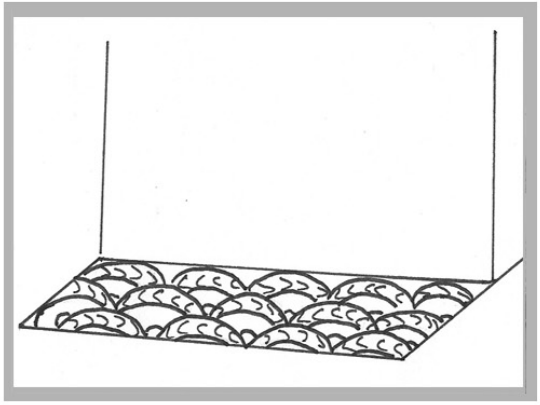
-Dan kon hulle die sloot met stene en bande vul.

-Dit kon dan die reën stop om meer gate te maak.



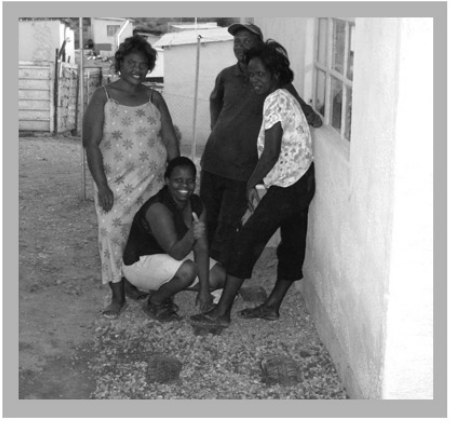
Die mense van Ehirorujano en Dantago het ‘n sloot langs die huis gegrawe, dit was diep genoeg vir ’n halwe band om regop te staan.





Altwee groepe het gehelp om die bande in die sloot te sit.

Die groepe het die sloot met stene en sand gevul. Jy kon net die bokante van die bande sien. Om dit mooi te maak het hulle klippertjies rondom gepak.



Daar was nie meer gate langs die huis nie.
Die erf was veilig en het ook mooige lyk.
Almal was tevrede.

Edlagh ‘n ander lid het nog ‘n gedagte gehad:

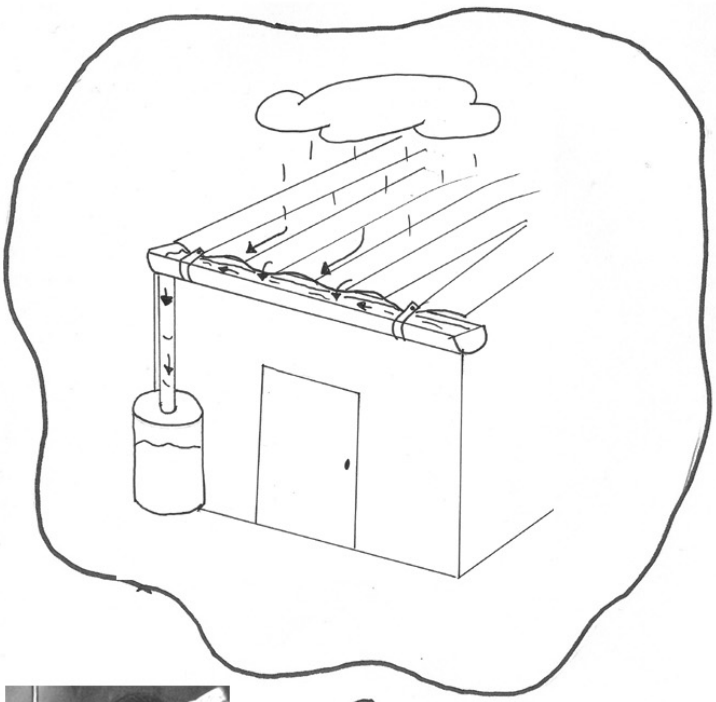
-Hulle kon ‘n geut op die dak vasmaak, om die water op te vang.

-Die geut kon gemaak word met ‘n half gesnyde PVC (riool) pyp.

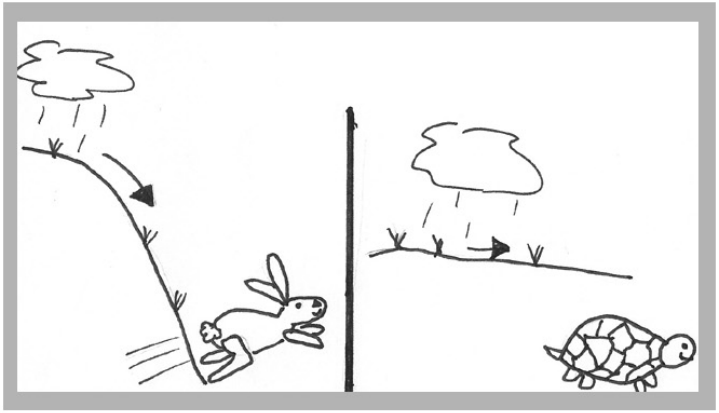
-Die reënwater kon dan in die pyp loop.

-‘n ou drom kan die water van die geut af opvang.

-En die water kon vir wasgoed gebruik word en om plante nat te maak.



Die gemeenskap het ’n klomp gedagtes gehad want hulle het dit saam bespreek as ‘n groep mense. Hulle het ook gepraat om die grond te verander sodat die goeie grond nie weggespoel word nie.



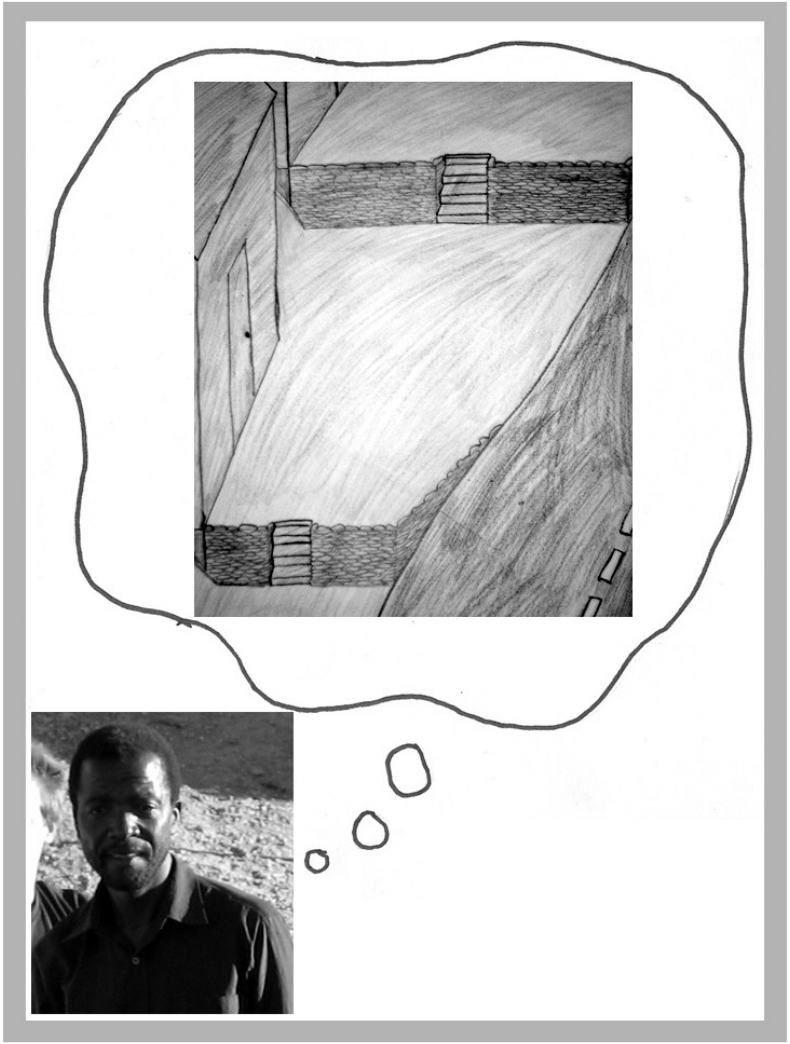
Die mense het gesien hoe die water vinnig van die bult afloop, maar stadig loop waar die die grond gelyk is. Die water het slote gemaak toe dit vinnig geloop het.

‘n Ander gedagte was:

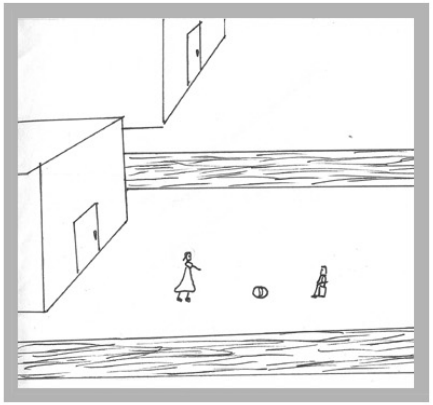
-Hulle het terasse (groot trappe) maak sodat die water stadiger kan loop.

-Die reënwater kon in die grond gaan, eerder as om teen die bult af te stroom.

-Die grond is dan nie uit gegrawe met gate nie.



Die groep moet eers spaar om grond saam te koop, dan kan hulle moet die slote toemaak en die grond gelyk maak. Die trappe/terasse word met bande gebou.



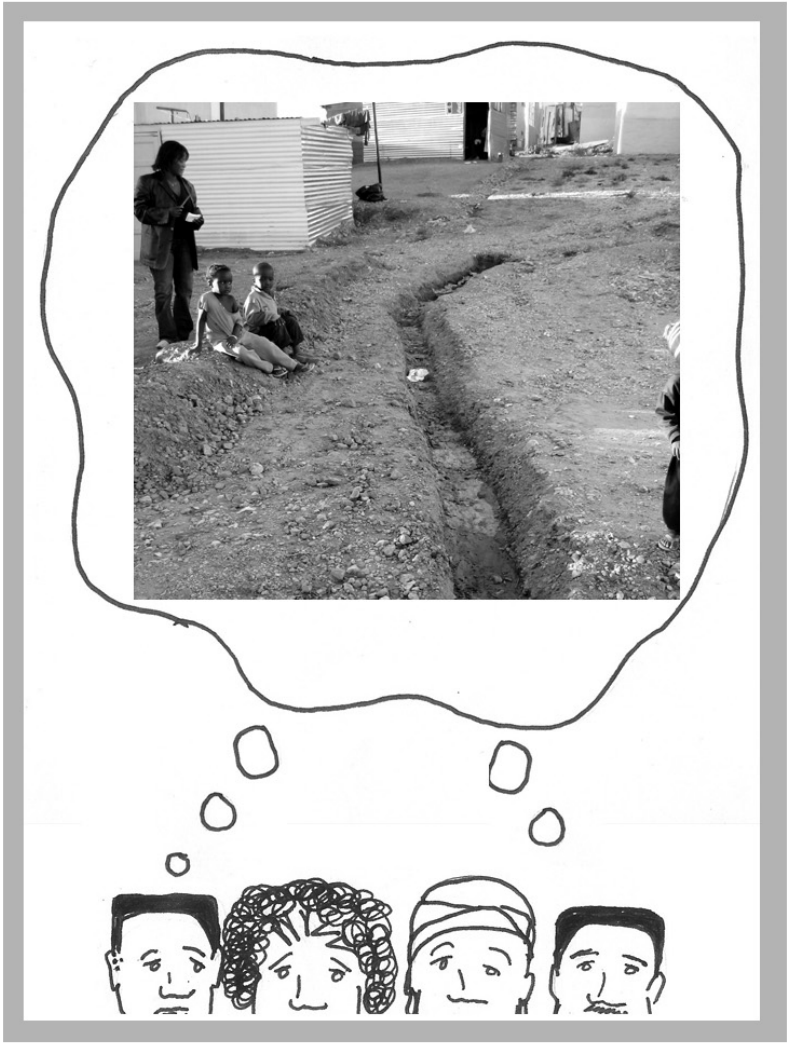
Hulle het saamgewerk om op op die gelyk plekke te plant en daar was ook ‘n mooi plek vir kinders om te speel. Nou het hulle ’n gemeenskaps area om te deel.

Die mense van Otjomuise het ook nog gedagtes gehad gehad om die grond te verander:

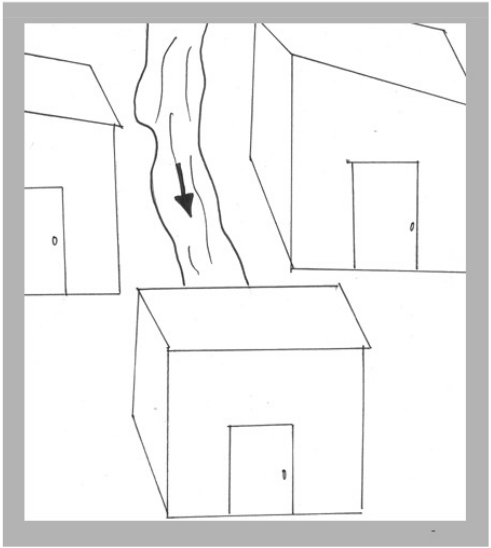
-Hulle kon ‘n sloot grawe.

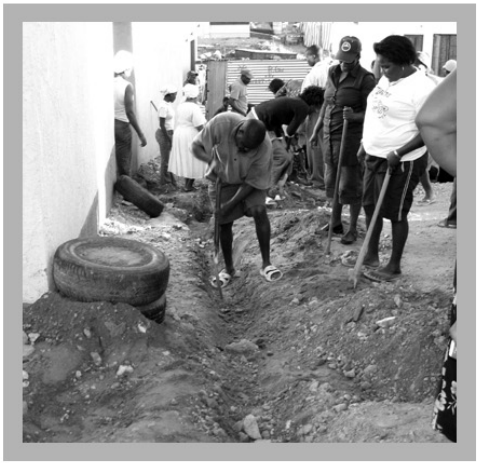
-Die sloot kon water in een plek hou.

-Dan kan hulle die water beheer.



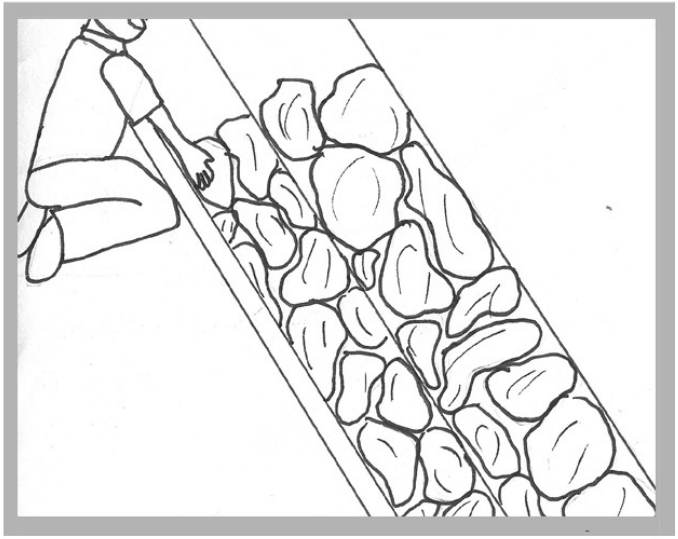
Die water het tussen die huise geloop tot in een man se huis. Hulle wou hê dat die water om die huis moet loop.

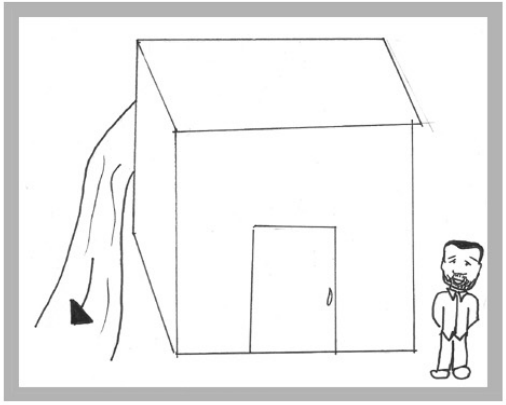




Die gemeenskap het ‘n sloot om die huis gegrawe. Die sloot was groot genoeg en diep genoeg om die water te hou.

Hulle wou ook gehad het die sloot moet sterk wees,en hulle het stene langs die kante van die sloot ingesit. Die water kon nie deur die stene grond uitspoel nie.





Toe die reën kom het die water rondom die man se huis geloop, die huis was droog en die man se familie was baie bly.

Die reën bring nie meer skade in Otjomuise nie, en hulle is so bly want hulle het hard gewerk. Die grond is nie meer gevaarlik nie en dit lyk baie mooi.

Nou leer hulle mekaar hoe om reën skade op te los en die water beter te gebruik. Hulle help ook ander gemeenskappe. Die mense van Otjomuise was bly om hulle se gemeenskap te help.