

The Significance of Green Space in the Living Environment: A Case Study of the Bekkersdal Community, Westonaria, South Africa

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Abstract

There is increasing evidence for a positive relation between the amount of green space in the living environment, people's health and their well-being. The Bekkersdal Township was founded in 1945 as a mining community. As the mines in the area closed down, unemployment grew and a new informal township was established with the concomitant health, other socio-economic issues and a lack of green space in the immediate environment. This article addresses the following question: 'Do green spaces matter in this specific socio-economic environment?' The participants consisted of 520 residents of the informal settlement section of Bekkersdal who completed a questionnaire with the assistance of trained fieldworkers. The results revealed that although the residents generally have positive feelings concerning their natural environment, in particular with regard to the vegetable gardens and open areas, environmental risks, i.e. dust, noise, litter and polluted water sources affect them considerably. Vegetable gardens are popular as they also serve as a food source in this underprivileged environment. The participants also showed a great affinity for natural features i.e. trees and open areas. Research from similar surroundings suggested various positive effects thereof on the residents. This study suggests that Bekkersdal, although impoverished and plagued with many adversities, has the potential to add value to the living conditions of residents by exploring and cultivating the existing green spaces.

This includes incentive-driven organised environmental activities and initiatives such as clean-up operations, recycling, communal food- and medicinal gardens, and training to establish and maintain such initiatives.

Keywords: Bekkersdal, green space, wellbeing, informal settlement, mining community, urban development

Introduction

There is increasing attention and evidence for a positive relation between the amount of green space in the living environment, people's health and wellbeing (Maas *et al.* 2009; Alcock *et al.* 2014). Several international studies show that more green space in the living environment is positively related to people's self-perceived wellbeing (De Vries *et al.* 2003; Maas *et al.* 2006; Mitchell & Popham 2007; Capaldi, Dopko & Zelenski 2014). People living in urban areas with more green space tend to report greater wellbeing than city dwellers that do not have parks, gardens, or other green space nearby (Kaplan & Kaplan 1989; Maller *et al.* 2006).

Since the 1970s, many European countries have developed programmes for nature conservation in urban areas. Although a certain amount of 'nature' (green space) has always been found in cities, the concept of 'nature in the city' is relatively new in South Africa. It is only over the last 15 years that certain South African cities have adopted an urban nature conservation or green space strategy (Cilliers, Muller & Drewes 2004; Shackleton *et al.* 2013). According to Boswell (1993), these strategies developed in response to changing perceptions towards the environment within the nature conservation movement, together with an increase in environmental awareness. Despite these relative early insights into the need for urban green spaces, the immense increase in urbanisation and human competition for space remains a problem.

According to the most recent survey released by the South African Institute of Race Relations (SAIRR) two-thirds of South Africa's population live in urban areas (SAIRR 2014: Online). Urbanisation is, therefore, regarded as one of the most severe impacts on the environment (Cilliers, Muller & Drewes 2004). Natural vegetation in and around South African cities is destroyed at an alarming rate and immense areas of ecologically significant

open spaces are cleared for persistent lateral growth (Cilliers 1998). Urban nature conservation issues in South Africa are overshadowed by the goal to improve human well-being, which focuses on aspects such as poverty, equity, redistribution of wealth and wealth creation (Hindson 1994). McConnachie and Shackleton (2010) also found that poorer communities had lower areas of public green space relative to more affluent areas in several small towns in South Africa. Additionally, South African cities have witnessed an increase in the number of informal settlements. These settlements, together with trends of suburbanisation, have resulted in habitat fragmentation and sprawling of cities (Cilliers, Muller & Drewes 2004). The study site Bekkersdal, a mining community situated 7 km northeast of Westonaria and 14 km south of Randfontein in the Gauteng Province of South Africa, is an example of such an informal settlement.

Study Area

Bekkersdal was established in 1945 and served mainly as a settlement for migrant Africans who worked in the surrounding cities, towns and gold mines (Van Eeden 2014). It is currently part of the greater Westonaria and its population forms part of the inhabitants of the Westonaria Local Municipality (WLM). The semi-urban township has an approximate population of 150 000 people and consists of a formal section and an unplanned informal settlement near the core of the formal township (Housing Development Agency (HDA) 2012: Online). The informal settlement started in the early 1980s and has since grown to a population of approximately 70 000 residents (Van Eeden 2014). The dire need for housing in the Bekkersdal area resulted in an expansion of informal settlements in a disorderly fashion. Housing development was also affected by the fact that the area is undermined for gold and the underlying bedrock is dolomite. Moreover, the population growth in the area has placed a heavy burden on the provision of water (Van Eeden 2011). Research also indicates that mining activities lead to environmental degradation and various types of pollution and subsequent health problems (e.g. respiratory difficulties) experienced by inhabitants who reside near such areas (Edmeston 2010; Radio Netherlands Worldwide 2012: Online).

Recent literature also speculates on the possible effects of acid mine drainage (AMD), water decanting upstream of Bekkersdal and adjacent areas, including the Donaldson Dam (Stuijt 2010: Online). The Donaldson Dam (a

surface water collection and storage facility in the Wonderfontein Spruit, which is a tributary to the Mooi River sub-catchment of the Vaal River system and bordering the north-western side of Bekkersdal informal settlement – Figure 1), is known for its high radioactive levels in the sediment. According to Kardas-Nelson (2010: Online), uranium is a reported by-product of mining activities and acid mine drainage. AMD is evidently the result of the flooding of mine basins, or the run-off from mine dumps, which can lead to uranium contamination (Kardas-Nelson 2010: Online). In 2009, it was reported that AMD, originating in the Western Basin of the Witwatersrand, led to the disposal of more than three tons of uranium in the Donaldson Dam from 1997 to 2008 (Winde 2009: Online). The Bekkersdal community uses this dam extensively for, amongst others, baptising purposes, recreation and fishing, fish that feed on the uranium-rich sediment. Informal vendors also sell food products close by, and the residents allow their domestic animals, such as cattle, to drink from the dam¹ (Figure 2 and 3).

Furthermore, Bekkersdal is characterised by people living close together, human traffic, informal and unsafe buildings, pollution, dust, and often, noise, in a dolomite-underlain area which is undermined by gold mines. In these informal squatter settlements, poverty, homelessness and a lack of essential services such as storm-water management, sanitation, refuse removal and the sustainable supply of safe potable water on each household stand, contribute to a poor quality of life². Therefore, the significance of green spaces in these settlements should be explored, not only as formal conservational possibilities, but also specifically for their value in contributing to human well-being. The significance of green space in the living environment of the residents of Bekkersdal should be specifically investigated to determine whether they value such areas. Moreover, one of the priorities in this human settlement is the maintenance and development of green space.

Green Spaces

Urban green spaces are considered as outdoor places with significant amounts

¹ Compare NNR Report – TR-RRD-07-0006 – ‘Radiological Impacts of the Mining Activities to the Public in the Wonderfonteinspruit Catchment Area’. 12 July 2007 as obtained in Federation for a Sustainable Environment, Hearings, 21-22 June 2011: Environmental reliability, pp. 7-8.

² Refer to http://www.botany.uwc.ac.za/envfacts/facts/urban_conserve.htm

of vegetation, existing as either managed areas or remnants of natural landscapes and vegetation (Beatley 2012). Breuste *et al.* (2013) define urban green space as a range of parks, street trees, urban agriculture, residential lawns, and roof gardens. The provision of urban green space has many ecological, psychological, social, and economic benefits (Uy & Nakagoshi 2008; Shackleton & Blair 2013). At the individual level urban green spaces offer opportunities for physical and psychological rejuvenation and well-being and a sense of place (Stigsdotter & Grahn 2003). At the family level they provide a place for interaction, learning and relaxation (Lo & Jim 2010) and at the community level they offer opportunities for social contact, a sense of place, contributing to community identity, solidarity and security (Peters, Elands & Buijs 2010; Erasmus & De Crom 2014). In developing countries green spaces may provide tangible products for urban populations, such as fuelwood, medicinal plants, shade and food (Shackleton 2012). This differs from the largely recreational uses of green spaces in developed countries (Hunter 2001). According to Schäffler and Swilling (2013) green spaces and infrastructure include trees, private and public gardens, parks, riparian zones along urban drainage lines, undeveloped ridges and a variety of urban agricultural spaces such as food- and community-based gardens.

For the purpose of this article, green space is regarded as any open piece of land that is undeveloped (has no buildings or other built structures) and is accessible to the inhabitants of Bekkersdal. Such existing green spaces in this area of study indicated in Figure 1, included the areas of natural vegetation (for example, an open field with grass, a patch of green trees, open piece of bare soil), parks (formally developed areas with trees), community gardens (mostly vegetable gardens), the cemetery, schoolyards, children playgrounds, sport fields and vacant lots. The Donaldson Dam adjacent to Bekkersdal (Figure 1) and any pond or small dam (usually the result of rain showers) was also regarded as green spaces. Backyard (private) gardens (flower beds, vegetable patches and small areas with crops) are found at certain homes in the area and were also regarded as green spaces.

Problem Statement

From the abovementioned information, it is clear that the Bekkersdal community faces many physical, natural, and social challenges. Some of these

challenges include the surrounding physical environment (e.g. acid mine drainage, undermined area, pollution, dolomite rock formations and a lack of green- or recreational space), unemployment, poverty, and the on-going protests for improved basic services (Simelane & Nicolson 2014: Online).

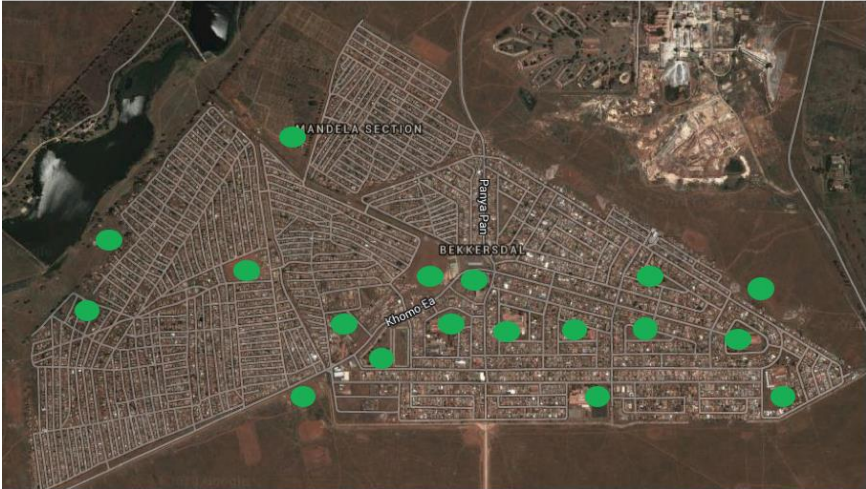


Figure 1: Layout of Bekkersdal with the Donaldson Dam in the north-western side of the settlement and some of the existing ‘green spaces’ (Researchers’ own work).

The literature indicates that limited green space in a living environment coincides with feelings of loneliness and a perceived lack of social support (Maas *et al.* 2009). According to Van Averbek (2007) it is also in informal settlements (like Bekkersdal) that problems of food insecurity and under-nutrition are most likely to occur. Provided that space and resources are available, production of vegetables for home consumption is one of the most obvious ways in which such poor households can address these problems (Burgess *et al.* 1998). The Health Council of the Netherlands (2004) suggested that green space might ‘have beneficial effects ... as [it] promotes social contact, for example through green meeting places in neighbourhoods, group-based nature activities (e.g. walking) and gardening (shared vegetable gardens and urban farming)’. It is apparent from the latter suggestions that research is

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needed to determine whether green spaces matter to the people in this specific socio-economic and ecological high-risk environment of Bekkersdal.



Figure 2: Residents of the Bekkersdal area use the polluted Donaldson Dam for various activities such as grazing and drinking area for animals and a source of water for washing clothes (Source: IOL: Online).

To determine the significance of green space for the residents, the following aspects were investigated: the residents' feelings towards and the perceived importance of certain aspects of the natural environment (trees, water and open

spaces); their awareness of the possible effect of environmental problems (risks), e.g. dust, noise, litter or polluted water on households, and finally, which and to what extent environmental problems are encountered. The rationale for determining whether the residents regard any significant meaning of the natural environment and their awareness of the effects of the risks they encounter, is to help the role-players and local authorities in public decision-making to either invest in the development of formalised and maintained green spaces, or in the awareness and environmental education programmes in the area.



Figure 3: Children use the polluted Donaldson Dam as recreation area (Photograph: Elise Tempelhoff)

Research Questions and Objectives

Based on the problem statement, the investigation addressed the following main question: ‘Do green spaces matter to the people in this specific socio-economic and ecological high-risk environment?’ The main objective was to determine the significance of green space in the living environment of the Bekkersdal residents. In order to address this objective, the following questions were explored:

- How do the residents feel about the existing green spaces in their immediate environment?

- What role do green spaces play in recreation and other community activities?
- What is the effect of environmental problems/risks on the households?

Method

This study was both exploratory and descriptive in nature (Bless, Higson-Smith & Kagee 2007). It was exploratory in the sense that the study aimed to gain insight into the significance of green space in the study area for the individual. The study was descriptive in the sense that the information gathered described the meaning of the environment in terms of the role and effect it has on the community.

A mixed-methods research design was adopted as the basis for this study. This type of research combines quantitative and qualitative strategies in one study (Teddle & Tashakkori 2009). In this case, both the numeric and text (word) data was collected concurrently by means of rating questions and open-ended questions. Fieldworkers from the Bekkersdal community, who share language and cultural similarities with the community, were trained to distribute and assist in administering the questionnaires.

Participants

A total of 520 participants residing in the Bekkersdal informal settlement took part in the study. The average age of the participants was 23 years. The ages ranged from 17 to 83. The characteristics of the participant group are set out in Table 1.

Data Collection

Data was gathered through a structured baseline questionnaire that was administered by trained fieldworkers. The first section of the questionnaire was aimed at gathering biographical data in relation to the participants' age, gender, language spoken, level of education and residential status. The remainder of the questionnaire dealt with satisfaction with the environment of residents of Bekkersdal. The questionnaire consisted of closed questions which required

the participants to select their choices from a list. In certain instances open-ended questions were included where the participants had to elaborate or clarify their responses. Only aspects directly applicable to the physical/natural environment were taken into consideration during the analysis and interpretation of the data.

Table 1 Characteristics of the participants (n = 520)

Item		Frequency	Percentage (%)
Gender	Female	286	55
	Male	234	45
Culture	Xhosa	245	47.1
	Sotho	138	26.5
	Tsonga	48	9.3
	Zulu	37	7.2
	Tswana	36	6.9
	Other	16	3.0
Educational level	None	104	20.0
	Primary	170	32.6
	school	231	44.5
	Secondary	15	2.9
	school		
Residential status	Other	401	77.0
		119	23.0
	SA citizen		
	Non-SA citizen		

Data Analysis

Data from the structured questionnaires were captured in the Statistical Program for the Social Sciences, version 21 (SPSS 21). Basic descriptive

statistics (mean and average) were computed for all scales and items contained in the questionnaire. Direct quotations from open-ended questions were used to qualify certain attitudes and views of individuals.

Ethical Considerations

Institutional ethical permission was received for the research under the umbrella Integrated Multidisciplinary community project. Ethical issues were considered in order to ensure that the rights of the participants were observed, namely: anonymity, respect for the dignity of persons, non-maleficence and confidentiality (Terre Blanche, Durrheim, & Painter 2006). Participation was voluntary and the participants were required to give informed and voluntary consent to participate in the research.

Results

Following the question ‘How do you feel about the existing green spaces in your immediate environment?’ the participants indicated their choices as presented in Table 2. The participants could choose 1 - Like it a lot, 2 - Like it a little, 3 - Do not care, and 4 - No response.

The results in Table 2 clearly reveal that the majority of the participants (Mean = 39%) feel positive about the existing green spaces in their immediate environment, indicating that they ‘like it a lot’. Vegetable gardens revealed the highest score (66.7%). In descending order the following features scored above 40% of the participants' choice of ‘like it a lot’, soccer field, park, patch of green trees and an open field with grass. The following quotes from participants are representative of these findings:

‘We like sitting under the trees to relax and to talk with each other’.

‘When the grass is green, we like it very much. Sometimes we go there for church ...’.

‘... the open place is good for us to gather to pray or just sit and talk ...’.

Table 2 Participants’ feelings regarding existing green spaces in their immediate environment

Item	1 Like it a lot	2 Like it a little	3 Do not care	4 No response	Mean	SD
Patch of green trees	46.2%	12.1%	6.0%	35.7%	2.31	1.36
Open field with grass	44.4%	11.9%	6.5%	37.2%	2.37	1.36
Large open piece of bare soil	32.9%	23.2%	10.6%	33.3%	2.44	1.25
Soccer field	48.9%	25.8%	6.0%	19.3%	1.96	1.15
Park	46.2%	15.6%	6.8%	31.4%	2.23	1.31
River or stream	22.8%	17.0%	16.2%	44.0%	2.82	1.22
Vegetable gardens	66.7%	7.2%	2.8%	23.3%	1.83	1.26
Flower beds	33.7%	16.5%	6.8%	43.0%	2.59	1.33
Dam filled with water throughout the year	26.4%	23.7%	17.5%	32.4%	2.56	1.19
Pond with water after rain	20.8%	20.8%	15.3%	43.1%	2.81	1.19
Mean	39%	18%	9%	34%	22.39	

With regards to vegetable gardens, the following quotes are representative of what the participants said:

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‘I like making a garden where I can plant pumpkins and sometimes mealies [corn]...it grows good when we have rain...’

‘We plant vegetables in our garden...it is for food. Sometimes I can sell the vegetables...’

‘I have a small yard where I plant mealies and other things...My children can get food from the garden. Sometimes we make a bigger place to grow vegetables, but that is not in my yard. We go to another place where there are open areas where we dig up the soil and plant...’

An average of only 9% of the participants indicated that they do not care about the natural features in their environment. The relatively large number of ‘no response’ (Mean = 34%) was the result of the aforementioned features not being visible in the participant’s immediate environment or they were unaware or ignorant of these items. Therefore, they selected the ‘no response’ option. Typical responses to these questions were:

‘I don’t know of such a place’; ‘This place is very far from my house...’; ‘I don’t go there...I don’t play [soccer]...’; and ‘I cannot see that [item mentioned]...’

On the question of participation in outdoor or community activities, an average of only 17.6% responded positively (Table 3). However, those who do participate in outdoor activities mentioned gardening (33.6%) (see quotes above) and playing soccer (29.5%) as the most popular (Table 3). Quotes with regards to playing soccer include:

‘We like the soccer field very much because we all play soccer. Even small children play with a ball...’

‘We cannot play in the yard or the street...sometimes dangerous...but we like the place where there are no houses, where we can kick ball and play soccer...’

Fishing apparently plays a minor role as an outdoor activity in the community and less than 5% of the participants indicated that they fish in the area. However, responses to open questions of what the participants preferred to do at

certain green spaces, a number responded that they ‘like to catch fish in the dam’.

Table 3 Outdoor recreational and community activities

Activity	Yes	No	Mean	SD
Playing soccer	29.5%	70.5%	1.70	0.457
Fishing	4.6%	95.4%	1.95	0.210
Cycling	8.9%	91.1%	1.91	0.286
Gardening	33.6%	66.4%	1.66	0.473
Traditional dancing	11.4%	88.6%	1.89	0.318
Mean	17.6%	82.4%		

Finally, the participants were asked how they perceived households affected by identified environmental risks. The participants could select between being affected, 1 - very bad, 2 - not so bad, and 3 - no problem. The responses are indicated in Table 4.

Table 4 Extent to which households are affected by environmental risks as perceived by participants

Risk	Very bad	Not so bad	No problem	Mean	SD
Dusty	90.8%	7.4%	1.8%	1.11	0.367
Dangerous fumes	49.8%	27.6%	22.6%	1.73	0.807
Underground mining	41.5%	34.3%	24.2%	1.83	0.792
Dolomite underlain area	38.0%	31.9%	30.1%	1.92	0.822
Sinkholes	41.2%	32.7%	26.1%	1.85	0.807
Acid underground water	21.5%	28.3%	50.2%	2.29	0.797
Donaldson dam	43.8%	20.8%	35.4%	1.92	0.887

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Litter polluting area	87.1%	9.4%	3.4%	1.16	0.453
Area is noisy	88.6%	10.6%	0.8%	1.12	0.351
Polluted soil	62.8%	27.4%	9.8%	1.47	0.668
Access to clean drinking water	25.5%	29.7%	44.9%	2.19	0.817
Open canal	35.9%	30.1%	33.9%	1.98	0.836
Lack of recreational facilities	63.7%	22.8%	13.6%	1.50	0.723
Visible sewerage overflow in streets	74.1%	13.8%	12.1%	1.38	0.692
Mean	59.0%	33.3%	18.3%		

It is evident from the above Table 4 that the majority of the participants are aware of the fact that the area is highly subjected to a variety of environmental risks. Dust (90.8%), noise (88.6%) and litter (87.1%) stood out as being the worst in affecting households, whilst visible sewerage overflow in the streets (74.1%), polluted soil (62.8%) and a lack of recreational facilities (63.7%) also play a major role in the running of households. The majority of the participants also identified dangerous fumes, underground mining, the dolomite-underlain area and sinkholes as having a negative effect on the households. Representative quotes qualifying these findings include the following:

‘It is very bad...and too much noise. The place is not clean and sometimes we get sick because of the sewerage in the street. Water is running, especially when it rains and toilets are full of waste’.

‘I know about the sinkholes...I am scared...one day one might wake up and see your house is in a hole...’

‘...we have pollution and we get sick...The problem is there is no dumping site and no services [to clean up] from municipality. Children play there [littered areas] and get sick. They fall into the [dirty] water’.

‘Many people die...sometimes people get sick because of the water pollution and air pollution...They need to use water and the problem is caused by all the rubbish...’

‘No electricity, no good infrastructure...no good services to clean up...visible sewerage and dust in the street...it affects us because we get sick’.

Almost 44% of the respondents considered the highly polluted Donaldson Dam as ‘very bad’. An aspect that should be looked into is that a mere 20% of the participants consider that acid underground water (from mining activities) affects the households. Another interesting result revealed in Table 4 is that more than 75% of participants feel that access to clean drinking water is either not a problem at all, or it does not affect them in a bad way. However, 25% of the inhabitants are affected by the lack of easy access to clean drinking water. The extremely littered open concrete canal running through the area was not perceived as a serious problem. However, evidence as illustrated in Figure 4, reveals the opposite.



Figure 4: The highly polluted open canal running through the study area. Photograph: Mike Hutchings/Reuters (Source: Guardian 2014: Online).

Discussion

The majority of literature on case studies of urban green spaces is from developed societies (Shackleton 2012; Wendell, Zarger & Mihelcic 2012). South Africa, however, is a developing society faced with backlogs in urban infrastructure and housing development and with more than 60% of its population living in urban areas, Southern Africa is the most urbanised sub-region in Africa (UNHabitat 2010). In addition, environmental concerns are largely absent from academic, policy and even civil-society activist discourse, being dwarfed by the seemingly more pressing matters of service delivery deficits, economic exclusion and poverty (Schäffler & Swilling 2013). Scientific papers underline the importance of maintaining and developing green spaces because of their multiple environmental and social benefits for residents in the area. However, a general understanding of the significance of contemporary human-environment interaction in poverty stricken urban areas is still incomplete.

The aim of this article was to investigate the possible significance of green space in the living environment of the Bekkersdal community members. A random sample of 520 residents in the area of study was targeted as the participant group.

The results revealed that the majority of the participants expressed a positive feeling towards the natural features in their immediate environment. An average of almost 60% indicated that they 'like' features such as a patch of green trees, open grass fields, parks, water sources and even large open areas of bare soil in their vicinity (Table 2).

What stood out in the results were the relatively high scores for vegetable gardens (66.6%) and places where people can play or participate in outdoor activities such as a soccer field (48.9%) and parks (46.2%). In addition, naturally green features also scored a relatively high 46.1% and 44.4% for a patch of green trees and an open grass field respectively. A possible reason why vegetable gardens are the most popular of the choices is that it is more than just 'a natural feature', but also serves as a food source in this underprivileged environment. From the qualitative data, it was clear that 'gardening' as a preferred outdoor activity involves planting vegetables or crops in either private backyards or in open communal areas, to provide food for the households, a practice referred to as 'urban agriculture' (Martin, Oudwater & Meadows 2000; Thornton 2008). According to Rogerson (1996)

and Thornton (2008), the majority of ‘urban farmers’ in South Africa produce food as part of their survival strategy. This was confirmed by Martin, Oudwater and Meadows (2000) who reported that urban agriculture in Pretoria and Cape Town tended to be associated with lack of formal sector employment and aimed primarily at the production of food for home consumption. However, they also pointed out that besides food, urban farming performed other important functions, including social, cultural, developmental, aesthetic and environmental (Van Averbeke, 2007).

Ogilvie (2012) has undertaken similar studies in a rural community in the northern part of the KwaZulu-Natal Province, South Africa. Her findings provide much insight of the value of green space for the livelihoods in deprived communities. For example, community vegetable gardens and ‘food’ gardens at schools provide meals to children and the elderly and refuse areas become recycle stations where community members collect items for re-use or manufacture usable items in the community. This initiative not only teaches children to respect their natural resources but the vegetables from these school gardens are the only nutritional benefit in their daily meal.

A study by Nell *et al.* (2015) in the same area, found that the natural environment enabled the community to make a living in a self-sustaining way (due to the presence of patches of rich soil where community members plant crops, women gather firewood and building materials to construct houses and groups of young boys watch over livestock in grazing areas). A second environment-related theme that emerged from this study was that the good climate of the area was also viewed as a factor that positively impacted residents’ well-being. It would appear that mild winters, abundant rain and warm temperatures increase the habitability of the region, and community members spend much of their time in the open or in the shade of trees surrounding the houses. By spending time together in these green spaces in activities either to make a living (such as wood gathering and planting crops) or conversing in the shade of a tree, enhance the social ties and well-being of the community (Nell *et al.* 2015).

Three closely related studies performed in an underprivileged area of Chicago provide an indication of a positive relation between the presence of green public facilities and social ties (Coley, Kuo & Sullivan 1997; Kuo, Sullivan & Wiley 1998; Kweon, Sullivan & Wiley 1998).

The natural environment, however, seems to be of less importance for the study participants who live in the Bekkersdal area (Table 2). These results

are comprehensible when one looks at the physical surroundings as well as the socio-economic situation and current municipal service delivery in the area. The people in this area struggle to survive and take on almost any job or activity to gain an income for food. Therefore, the extremely poor and destitute participants indicated that the physical green environment is very low on the hierarchy of basic needs. Quotes from participants illustrating this situation include the following:

‘We do not get jobs in the area...the mines are to blame...now the young ones start to gamble to get money. Sometimes they buy food...sometimes they do drugs...’

‘I walk to town every day to work...maybe I watch cars. I do anything’.

‘I have to feed my family. I need work. There is no job here. Sometimes we gamble’.

‘The people are poor and there is no work. Crime is very bad here because there is no work. There are prostitutes...’

However, in spite of the aforementioned conditions, many studies have suggested that green space may have beneficial effects as it promotes social contact. Examples hereof include green meeting places in neighbourhoods (i.e. to discuss service delivery challenges), group-based outdoor activities (e.g. playing soccer) and gardening (shared gardens for the elderly or unemployed individuals) (Kaplan & Kaplan 1989; Coley, Kuo & Sullivan 1997; Hartig *et al.* 2003). Coley, Kuo and Sullivan (1997) also found that trees and grass in common spaces, as opposed to barren common spaces, may attract residents outdoors, thereby leading to frequent contact among neighbours. This is confirmed by Ogilvie (2012) and Nell *et al.* (2015). Natural settings in common space are attractive because they can, for example, provide shade, privacy and sound buffering from surrounding environments and could have restorative effects (Hartig *et al.* 2003, Shackleton & Blair, 2013; Shackleton 2014; Honold *et al.* 2015).

Besides offering opportunities to meet, green spaces can also promote a general sense of community. According to Kim and Kaplan (2004) and

Erasmus and De Crom (2015), the sense of community of the residents is strengthened when they feel at home (community attachment), have a bond with others, feel a sense of connection with the place (community identity) and have access to local exploration (pedestrianism). Natural features and open spaces were the most important physical features that contribute to these four domains of sense of community (Maas *et al.* 2009; Erasmus & De Crom 2015). Natural features can promote a sense of community by increasing the feelings of emotional attachment to a neighbourhood and the people's identity with a place, which in turn could decrease the feelings of loneliness and increase social support (Prezza *et al.* 2001; De Crom 2005). The Bekkersdal community could use these domains of a sense of community in their fight against the current poor living conditions. Green spaces could also enhance their sense of pride in their living environment; for example, take care of small private gardens (Figure 5).



Figure 5: An example of a small flowerbed that may create a sense of pride in the living space of residents in informal settlements such as Bekkersdal (Source: CBB 2014: Online)

Furthermore, the findings also revealed that only a small percentage of the participants participate in any outdoor activity (Table 3). Lifestyles in an area such as the Bekkersdal community are increasingly characterised by sedentary behaviour, stress, mental ill health and disconnection from nature. However,

contact with nature has been shown to improve psychological health reducing stress, enhancing mood and replenishing mental fatigue. Both physical activity and exposure to nature are known individually to have a positive effect on physical and mental health (Barton & Pretty 2010; Thompson Coon *et al.* 2011). The respondents in this study who participate in a physical outdoor activity identified gardening (33.6%) and playing soccer (29.5%) as their preferred activities, with the majority of the community 'doing nothing'. For many gardening is propagating and growing one's own food supply and/or providing food for others. In the 1990s Lewis (1996) and Furnass (1996) provided evidence to suggest that gardening reduces stress, encourage nurturing characteristics, build social networks and enhance social capital. This is confirmed by Ogilvie (2012) with the communal gardens in Northern KwaZulu-Natal.

From the above it can be concluded that although the participants have a positive feeling towards natural features in their environment, many reasons exist why they abuse, do not use, or have access to these features. These reasons may be found, amongst others, in the perceived environmental risks the residents are faced with. As indicated in Table 4, almost 60% of the participants regard environmental risks as a serious influence on their livelihood. Various types of pollution were highlighted as the worst. In addition, the participants recognised the potential dangers and effects of risks such as dangerous fumes, underground mining, the dolomitic area on which their houses are built and the possibilities of cracks, ground surface subsidence and ultimately, sinkholes. According to the World Health Organization (2010), potential urban hazards with associated health risks include the typical conditions of a Bekkersdal situation - substandard housing, crowded living conditions, contaminated food, unclean water, inadequate sanitation, poor solid waste disposal services and air pollution. Furthermore, within these slum conditions there are often significant health inequities such as lower life expectancy than for those living in wealthy neighbourhoods (Kjellstrom *et al.* 2007). These health inequities can be traced back to differences in social- and living conditions of urban dwellers, and variable environmental qualities in cities.

Although the adjacent Donaldson Dam is recognised as a danger to the households, the residents still utilise it in many ways. Children often swim in the dam and fish is still caught as a food source.

Linked with environmental risks is service delivery. Aspects such as

sewerage overflow in the streets, litter, lack of recreational facilities, not so easy access to clean drinking water, and the polluted open concrete canals, amongst others, are all part of a lack of proper municipal service delivery. Maintenance of green spaces within urban areas is widely recognised as one of the primary strategies available to urban planners to contribute to urban ecology and regular human contact with nature for their physical and psychological wellbeing (Louv 2006).

Although the residents of Bekkersdal are impoverished and plagued with many adversities, they do have the potential to add value to their living conditions by exploring and cultivating the existing green spaces.

Conclusion and Recommendations

It can be concluded from this study that natural features can promote a better living environment for the Bekkersdal community by increasing feelings of emotional attachment to their neighbourhood, their identity with the place, which in turn could decrease feelings of loneliness and despair, and increase social support and hope in an otherwise demoralising socio-economic environment. This, however, will only be possible through engagement, political will, involvement and tenacity of both the residents and external role-players (e.g. municipalities and mines), to explore the options identified in this study to create employment (albeit informal) and ascertain a holistic healthier community.

The research venture suggests that Bekkersdal, although impoverished and plagued with many adversities, has the potential to add value to the living conditions of residents by exploring and cultivating the existing green spaces. This includes incentive-driven organised environmental activities and initiatives such as clean-up operations, recycling, communal food- and medicinal gardens, and training to establish and maintain such initiatives.

The findings of this study have several significant implications. Firstly, it suggests that green spaces can add value to the living conditions of the Bekkersdal community: the community has a positive attitude towards green spaces and the desire exists to utilise such areas if they are available.

However, basic municipal service delivery has left the community in the lurch as well as in identifying, developing, establishing and maintaining green spaces. Non-Governmental Organisations (NGOs), funders and volunteers should become actively involved in establishing, educating, encouraging, and

supporting green space initiatives.

To support and ensure local empowerment, the community needs to be empowered with, amongst others, infrastructural work opportunities in community-based organisations as a prerequisite for the community's well-being (Van Eeden, 2014). Green space development, -activities and maintenance may offer such opportunities.

Successes from comparable other studies in similar environments should be investigated and implemented in the Bekkersdal community. For example, the possibility of vegetable gardens at schools and backyards as well as community gardens and gardens for traditional medicine, should be investigated.

Research suggests that green spaces have beneficial effects on health in so far as they promote social contact through green meeting places in neighbourhoods leading to frequent contact amongst neighbours (Kim & Kaplan, 2004; Maas *et al.*, 2009). Renewed initiatives to establish such areas should be investigated i.e. community tree planting days at such national events, education on re-use and recycling of waste material (Ogilvie 2012) and stimulating a general sense of pride in their living environment (Erasmus & De Crom 2015), providing that the community members are encouraged to participate through tangible incentives such as job creation.

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