

## Field observation

# An observational examination of houses built under the ``Breaking New Ground`` housing policy of South Africa

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## Abstract

The aim of the study was to examine the physical condition of houses built under the ``Breaking New Ground`` scheme and the environment that surround the residential areas. The Breaking New Ground housing plan seeks to provide housing to low-income groups in South Africa. The housing structures were examined in accordance with the ``Breaking New Ground`` housing policy, the Constitution of South Africa and the Freedom Charter. The study was qualitative in nature and an observational method was used to collect data. The study examined the physical condition of 45 housing units and their surroundings. The observational examination indicated that most of the residential units had structural defects and the environment was not conducive to the promotion of health and wellbeing among housing beneficiaries and their families. The design and aesthetic appeal of the houses was distorted by poor workmanship as they presented with inherent flaws. It was observed that the location of some of the housing clusters was isolated and far from places of work and the transport network was not efficient. Recommendations include improved quality control, aesthetic appeal and durability of housing units constructed under the Breaking New Ground housing scheme in South Africa.

**Key words:** Low-cost housing, observation, breaking new ground, South Africa

## 1 Introduction

The housing shortage in South Africa is a problem that is difficult to resolve as the demand for houses exceeds supply. Research focusing on assessment of the quality of low-income residential schemes is needed in South Africa. Studies on location of housing schemes and amenities available to people who occupy new houses are essential in assisting housing policy makers and developers in South Africa. The constitution of South Africa states that everyone has the right to have access to adequate shelter (Constitution of South Africa, 1996). The demand for housing is high but the provision of housing by municipal authorities cannot cope with the demand. It is commonplace for workers in

urban areas to devise informal means of providing shelter for themselves. Informal settlements spring up when workers build tin structures on municipal land on the periphery of towns and cities without permission (Goebel, 2007). Municipal authorities and government jointly devise plans to provide sustainable low-cost housing. Statutory instruments are put in place to facilitate the development of housing projects to alleviate the accommodation shortage in towns and cities. One such statutory instrument is the Comprehensive Plan for Sustainable Human Settlement which is commonly referred to as the ``Breaking New Ground`` (BNG) housing plan (Department of Human Settlements, 2004). The housing plan seeks to provide quality and affordable housing to low-income earners (Department of Human Settlements, 2004). However, some of the houses might have housing quality problems relating to the aesthetic appeal, durability, space design and utilisation, and the location of residential areas might not be conducive to the needs of workers or community members.

### **1.1 Poor housing quality and associated health problems**

Housing developers and construction companies are expected to construct standard houses in physical environments that are not polluted or marginalised in order to promote health and wellbeing of occupants. The quality of a house is associated with the health and subjective wellbeing of its occupants (Nicola, Bravo, & Sarmiento, 2018). Poorly constructed houses present health challenges to occupants. The physical environment in which the houses are constructed may cause health and safety problems. It implies that individuals living in dilapidated buildings or unhealthy buildings are prone to developing health problems and their subjective wellbeing is more likely to be low (Baker, Lester, Bentley & Beer, 2016). Occupants of defective houses may present with health complaints such as nausea, dizziness, headaches, eye problems, nose or throat irritation, skin itching, dry cough, fatigue, hoarseness of voice, sensitivity to odours, difficulty in concentration or the development of allergies, (Joshi, 2008). Other building-related ailments include cough, chest pain, shortness of breath, nosebleed, cancers, pregnancy problems such as miscarriages, humidifier fever caused by inhaling droplets of water heavily contaminated with microorganisms that cause respiratory complications, asthma and extrinsic allergic alveolitis (Joshi, 2008). Biological contaminants of buildings include bacteria, fungus and moulds and these develop from poor design of buildings or lack of maintenance. Poor waterproofing installation and poor moisture content check affect ceilings, walls, floors and roofs (Othman, Jaafar, Harun, & Ibrahim, 2015). The contaminants breed in stagnant water that accumulates in drainpipes, ducts, ceiling and carpets (Joshi, 2008). Biological contamination caused by sludge in water tanks emits odour in the house and wastewater treatment emits an unpleasant smell in the house and surrounding areas (Liu, Yang, Li, & Zhang, 2017). Ventilation reduces health complaints associated with buildings such as sensation of dryness of mouth and throat, difficulties in thinking clearly and it improves air quality, freshness of air, task performance and occupants generally feel better (Wargoocki, Wyon, Sundell, Clausen, & Fanger, 2000). Chemical pollutants such as dust, concentrations of lead, polychlorinated biphenyls, organochlorine insecticides, and polycyclic aromatic hydrocarbons are correlated with the age of the house (Whitehead et al., 2015). Health ailments reported by occupants of new buildings could be caused by poor design of the buildings, prevailing environmental diseases in the area or structural failure threat.

Homeowners who are house-proud are happy to invite guests to their houses. Housing beneficiaries would be expected to like their houses and regard them as home. They would speak well of their houses and would be satisfied with the condition of their houses. Home owners make their properties look beautiful and plant flowers to adorn them. In as much as there is human-computer interaction, human-machine interaction, there is human-building interaction which is a subjective interactive experience between a house owner and the property. Human-building interaction (HBI) is enhanced through the construction of comfortable houses that adapt to the needs of occupants and the houses are decorated to improve quality of life (Langevin, Wen, & Gurian, 2015). The aesthetic appeal of a house builds a bond between the housing beneficiary and the property. The aesthetic appeal is enhanced through landscape design to accommodate gardens, lawns, shrubs, fruit trees, and keeping the environment surrounding the residential area clean. Having a house lawn is regarded as an essential element by homeowners without even quantifying the symbolic, ecological or aesthetic significance of the lawn (Ignatieva, Eriksson, Eriksson, Berg, & Hedblom, 2017). Housing quality is associated with improvement in quality of life, general happiness and improved housing tenure (Henwood, Matejkowski, Stefancic, & Lukens, 2014).

## **1.2 Housing durability**

Low-cost housing projects are constructed by contractors who are paid by government. In most cases, the materials used to build low-cost housing are cheap to keep the prices of houses low and affordable. Consequently, the houses built with cheap materials are not durable and sustainable (Olotuah and Taiwo, 2013). The houses are designed for low-income groups without financial resources to buy houses on the open market. The cost of building the house should be lower than the amount paid by government to the contractor for the project to be economically viable. Poor workmanship causes housing failure (Marshall, Worthing, & Heath, 2014). New housing schemes could show defects related to foundation failure, poor structural design, sagging roofs or sinking foundations due to the movement or warping of the subsoil under pressure (Marshall et al., 2014). In South Africa, it is not uncommon to find recently constructed structures collapsing in a storm or showing defects that make the house unsafe for human habitation (Lindeque, 2017). Some of the badly constructed houses leak during the rainy season while others have failing ceilings, loose floor tiles and breaking floors. Cracks that develop in new houses are a result of inadequate artisan skills that threaten the lifespan of a house (Buys & le Roux, 2013). Urban decay is caused by fast collapsing building structures resulting in abandoned buildings. The market value of a defective house depreciates, thus contributing towards urban decay and decline in economic value of residential investment (Ismail, Che-Ani, Tawil, & Yahaya, 2014). In South Africa, some of the low-cost houses are left incomplete and housing beneficiaries would have to look for builders they pay to complete some aspects of the houses left incomplete by the contractors (Damba-Hendrik, 2017). Beneficiaries of deformed houses could sell or move out of the houses. The houses might be rented out to tenants who might pay rent that is below market value or the monthly premium required by the bank or municipality as the cost of living in the house (Charlton & Meth, 2017).

Accountability among building contractors during the construction of low-cost housing could be deemed low, due to the lack of skilled inspectors to assess compliance and professionalism of the contractors (Estate Agency Affairs Board of South Africa, 2017).

Othman & Mydin (2014) posit that 90% of building failures occur due to problems that are encountered at the design and construction stages. Contractors might not adhere to building standards and they might use unqualified personnel to construct the houses. Typical problems that could cause building failure include, among others: poor communication between architects and builders, inadequate information provided to bricklayers, failure to check the requisite information on housing standards to be followed, inadequate checks and controls, lack of technical expertise, lack of skills and inadequate feedback resulting in recurring errors (Othman & Mydin, 2014). In South Africa, there is poor housing delivery partly due to the shortage of housing construction specialists and engineers, and there is also a shortage of inspectors in the construction industry to supervise housing development projects (Jones, 2018).

### **1.3 Housing space standards**

Housing space standards are followed when contractors build low-cost houses. The housing standards for a BNG house in South Africa are: the house should be 40m<sup>2</sup>, and it should have two bedrooms, a separate bathroom with a toilet, shower, and hand basin, a combined living area, a kitchen with a wash basin and a ready-board electrical installation where electricity is available in the residential area (Langeberg Municipality, 2015). The internal and external standards are adhered to when low-cost houses are constructed. Municipalities and financial institutions investing in the housing project check for housing space standards compliance to ensure sustainable housing development. Housing space standards vary according to income levels from one country to the other (Gallent, Madeddu, and Mace, 2010). Low-cost housing has reduced living and sleeping space. Limited internal space accommodates small family sizes. In South Africa, overcrowding is a common feature among low-income communities as a large number of people without shelter squeeze into the limited housing space available (Govender, Barnes, & Pieper, 2011). Housing external space is congested in South Africa when unapproved backyard shacks are built or outbuildings are erected on the premises (Govender et al., 2011).

### **1.4 Location of residential areas**

Many new housing schemes are located out of the central business district (CBD) on the periphery of towns and cities. Workers who are beneficiaries of the new houses are exposed to crime, unreliable transport system and environmental pollution (Meth & Buthelezi, 2017). New homeowners in South Africa complain of poor transport network, lack of amenities such as schools, clinics, roads and shopping malls (Lemanski, 2010). Some of the housing schemes are closer to informal settlements where crime rate is high and the environment is generally polluted (Meth, 2017). Garbage is not dumped in designated areas in some places. Sanitation is poor with reference to the provision of clean water, piped water and sewerage systems. Some of the residents fetch water from rivers, bath or wash clothes in rivers. Consequently, the rivers and dams near residential areas are heavily polluted (Cox, 2012). The chaotic movement of people from informal settlements to new residential areas exposes residents to crime, veld fires and health risks. Residents who move from informal settlements to take up ownership of the new houses might engage in violent behaviour or related undesirable behaviours that typically occur in crowded places and high-density residential areas (Meth, 2017). Some residential areas might not have access to reliable electricity supply; it might be dark at night, thus compromising the safety of residents at night. Some of the housing clusters are located on abandoned farms without reliable piped water supply or reliable communication

network such as having a landline, information and communication technology facilities (ICT), internet reception or reliable mobile phone reception (Sithole et al., 2013).

### **1.5 Background summary**

Poorly built houses present many challenges to occupants, which is why it is necessary to make these observations and identify common issues in the BNG project. It is apparent in this background survey of literature that low-quality houses may be hurriedly constructed and inhabitants are at risk of experiencing difficulties living in defective housing structures. Studies of this nature are needed in South Africa to shed more light on the plight of beneficiaries of new housing projects. Decision makers or policy makers in the housing sector need to reconsider issues of quality and safety in housing provision for low-income groups in South Africa.

The study observed the physical condition of low-cost houses built under the BNG housing scheme in South Africa. The observational examination focused on the appearance of the houses and potential health and safety risks posed by defective houses and the environmental condition. There are few observational studies on housing quality conducted in South Africa hence this study provides an insight into the quality of low-cost houses constructed in South Africa. The research question focused on the observable physical condition of the housing structures, the environment in which the houses were built and implications on health and safety of communities.

It is posited that if these aspects of housing standards are not achieved in the BNG housing scheme, there could be negative implications for those who take ownership of the houses such as exposure to unhygienic conditions, lack of access to social amenities and diminished well-being of the housing occupants.

## **2 Method**

### **2.1 Research design**

An observational approach was used to assess the physical and environmental conditions of the houses built under the BNG housing scheme. Observational methodologies including the use of observational diaries are essential in infrastructural assessment research (Mayo, 2010).

### **2.2 Sampling procedure**

Purposive sampling was used to identify housing clusters built under the BNG housing scheme. The housing sampling in each of the three clusters was demarcated according to streets. A total of 45 houses were observed, 15 in Springfontein, Free State Province, 15 in Joe Slovo, Eastern Cape Province, and 15 in Plettenberg Bay, Western Cape Province.

### **2.3 Instrument**

An observational examination checklist was developed for the purpose of this study. The BNG housing plan provides guidelines on the nature of houses to be constructed. The BNG housing standards that formed the observational examination checklist were: ``the BNG house is 40 m<sup>2</sup> in size with two bedrooms; a separate bathroom with a toilet, shower and hand basin; a combined living area and kitchen with wash basin; and a ready-board electrical installation where electricity supply is available in the township to qualifying

households earning less than R3 500 a month` (Langeberg Municipality, 2015). The checklist indicated the requirements that housing contractors were required to follow during the construction of the houses. In addition, in order to assess the physical condition of the houses, the observational examination checklist included the physical appearance and condition of the veranda, roof, ceiling, walls, plastering, painting, floors, plumbing and water system, windows, ventilation system, electrical connections, doors, lawns and pavements. The checklist included the location of social amenities, shopping malls, road networks and condition of the physical environment.

An observational diary developed for the purpose of this study was used to record notes about the observed physical condition of the houses and environmental condition of the residential areas. The observation included the aesthetic appeal of the houses. Aesthetic appeal is a subjective assessment of the beauty of a house. This included the subjective assessment of the physical attractiveness of the housing units in such a way that would make the housing beneficiaries like their properties, get attracted to their properties and develop an attachment to their houses and residential environment. The data collected on the physical condition of the houses and environmental condition were used to make subjective inferences about potential health and safety risks. An observational diary is a case-based approach that helps to stimulate analytical and creating thinking by maintaining an ongoing record of the activities and time spent observing real life situations (Mayo, 2010).

#### **2.4 Procedure**

Permission to observe the physical condition of the houses was given by house owners or occupants. The purpose of the study was explained to house owners or tenants. The observational examination checklist was used to assess the physical condition of the houses and the environment surrounding the residential cluster. The physical examination involved getting into the yard, entering the house and observing the inside space and outside area of the house. Aesthetic appeal was part of the observational criteria used to assess housing attractiveness and quality.

#### **2.5 Data analysis**

Thematic analysis was used to analyse observational data collected. The thematic areas that were derived from the observational checklist were analysed in relation to housing quality and safety. The method allowed the researcher to identify main physical and environmental conditions that affected the new housing units. The triangulation method was used to validate themes that were based on the observational checklist. Triangulation is used in data analysis to validate findings from various angles or perspectives.

#### **2.6 Ethical considerations**

Ethical clearance was obtained from Nelson Mandela University before data collection. The privacy of occupants was guaranteed and occupants were informed that the physical examination of the inside and outside areas of their houses could be intrusive and they had to prepare and make their houses ready for the observational examination.

### 3 Results

The results are presented in relation to the thematic areas that were contained in the checklist. The themes are: housing structure appearance, potential health and safety hazards, transport network, public amenities, recreational facilities and environmental conduciveness presented in Table 1. The housing clusters presented as case studies were drawn from Springfontein in the Free State, Plettenberg Bay in the Western Cape and Joe Slovo in the Eastern Cape.

The condition of the houses in Case Study 1 may have presented health and safety hazards as shown in Table 1. It was observed that the houses did not have enough space for occupants. A two-bedroom house is not enough to accommodate children and relatives. It was observed that the standard house according to the BNG housing plan is not sensitive to the gender of children and the need for separate rooms for boys and girls. It was observed that most of the houses had no ceiling and there was dust collecting through the roof. There was evidence of dust within house which may place occupants at risk of respiratory diseases. It was observed that dusty and noisy surroundings affected house occupants as they were forced to clean the rooms and windows often. The houses had no veranda and there was no shade outside to protect housing occupants from the sun. It was observed that some of the houses had no security fence and that may have made house occupants vulnerable to burglary. It was observed that the free movement of people and animals through the yard may have exposed housing occupants to theft of household belongings and communicable diseases.

It was observed that houses in this area had damp walls causing moisture-laden air to build up inside the house. Damp houses cause breathing difficulties. Dampness is associated with diseases such as dysentery, diarrhoea, pneumonia, or cholera. It was noted that moisture in the wall caused the paint to peel off. It was noted that poor quality paint peeled off easily. It was observed that the appearance of the houses in this area was marred by damp walls and rough walls with peeling off paint. The bad smell emanating from the damp painted walls presents a variety of risks to housing occupants, including sick building syndrome. It was noted that social amenities and commercial opportunities were needed in the area in compliance with the BNG housing policy and to improve the wellbeing of residents.

The housing structural defects observed may present a health and safety threat to the occupants. It was observed that housing defects affected the aesthetic appeal of the houses. Environmental pollution affected the aesthetic appeal of the landscape. It was observed that poorly constructed roofs could collapse or the houses could collapse under stress. Poorly fitted electrical connections may have posed a fire hazard. It was observed that the backyard shacks could cause hazards such as fire outbreaks that could engulf a number of backyard shacks and the unhygienic environment could lead to the outbreak of diseases such as typhoid, dysentery or cholera in the housing cluster. Unsurfaced roads may expose residents to dust-related diseases. It was observed that the poor road network made it difficult for workers to commute to work during peak hours. It was observed that the presence of slums or informal settlements near the new residential area exposed homeowners to crime, environmental pollution and communicable diseases.

**Table 1.** Case study 1: Condition of housing structures and the surrounding environment.

<b>Housing aspects</b>	<b>Observation</b>
1. Housing structure and appearance	<p>Each house consisted of two bedrooms; a lounge; kitchen; passage, and toilet.</p> <p>It was noted that the houses were built between 2010 and 2014.</p> <p>The houses were constructed using face-brick walls with internal plastering and roofed with zinc sheets.</p> <p>The windows, doors and floors still appeared in good condition.</p> <p>The houses had no internal ceiling or veranda.</p> <p>It was observed that most of the houses had outbuildings or backyard structures to accommodate the extended family or tenants.</p> <p>Most of the houses had no perimeter fencing.</p>
2. Transport network	<p>It was observed that the housing development is approximately 120 kilometres (km) outside of Bloemfontein, Free State, and 4km from the nearest town.</p> <p>It was observed that most of the residents used public transport such as minibuses or taxis owned by private associations.</p> <p>It was observed that there were no surfaced roads and pavements in the area.</p> <p>It was observed that the unsurfaced roads and pavements raised dust during the dry periods.</p> <p>It was noted that water puddles and mud formed in wet conditions.</p>
3. Public amenities	<p>It was observed that places of work, schools and clinics were within reach but there was no hospital.</p> <p>Residents are required to travel to other towns including Bloemfontein City to access hospitals.</p> <p>The emergency response provided by the municipal authority is 70 km away.</p>
4. Recreational facilities	<p>There were a few fenced sports grounds. It was observed that the sports grounds were dry and not watered often.</p> <p>There were very limited grassed areas or lawns, mostly scorched by the sun.</p> <p>There were no parks in the area for residents` recreation There were no cinemas as part of social amenities in the residential area or town.</p>
5. Environment and people	<p>Driving into the central business district (CBD) to access the housing project was problematic as the researcher struggled to distinguish if the township was separated from the CBD due to the haphazard movement of people, land use plan, location of buildings and congestion of living and business spaces.</p> <p>It was observed that the residential area was overcrowded.</p>

**Table 2.** Case study 2: Housing condition and the environment

<b>Housing aspects</b>	<b>Observation</b>
1. Housing structure appearance	<p>Houses in this project consist of two bedrooms, a lounge, separate kitchen, passage and toilet with a shower.</p> <p>They have roof tiles and a fully fitted ceiling.</p> <p>The windows are made of aluminium.</p> <p>It was observed in most houses that the walls were damp and paint was flaking off.</p> <p>It was observed that the housing structures did not conform to the National Home Builders Registration Council (NHBRC) standards regarding low-cost houses as dampness is one of the reasons for which housing structures are condemned and demolished before they are completed.</p> <p>It was observed that the houses were not adequately damp-proofed to prevent walls from absorbing water.</p> <p>It was observed that dampness affected the aesthetic appeal of the houses.</p> <p>It was observed that damp walls emitted an unpleasant smell that affected housing occupants.</p> <p>It was noted that most of the houses were completed in 2010 and early 2011.</p> <p>Most of the houses in this area were fenced.</p>
2. Transport network	<p>The residential area is located adjacent to the N2 highway.</p> <p>The housing cluster is not close to the central business district (CBD).</p> <p>Shops and major shopping malls are far away.</p> <p>It was observed that the location of the housing cluster was not in conformity with the BNG housing policy and the Freedom Charter which stipulate that new housing developments must be close to social amenities.</p> <p>It was observed that roads in this area were surfaced.</p>
3. Public amenities	<p>It was observed that there were no social amenities in the area, residents had to go to other towns for services.</p> <p>There were no places of work in the area, residents had to go to other towns for work which contradicts the BNG policy.</p>
4. Recreational facilities	<p>There were no recreational facilities in the area.</p>
5. Environment and people	<p>It was noted that most of the houses had floor tiles and they had modern kitchens.</p>

**Table 3.** Case study 3: Housing condition and the environment

<b>Housing aspects</b>	<b>Observation</b>
1. Housing structure appearance	<p>The houses have two bedrooms.</p> <p>The houses have roof tiles.</p> <p>It was observed that the walls of some of the houses were not plastered.</p> <p>The inside partitioning walls were poorly built.</p> <p>It was observed that the houses were in a bad condition and the finishing was poor.</p> <p>All the houses had a fitted ceiling and veranda</p> <p>It was observed that criss-crossing electrical wires were not properly connected to the main electric box to rooms, outbuildings and appliances, such as stoves, fridges and entertainment gadgets.</p> <p>In some houses, furniture was crammed in the lounge.</p> <p>It was observed in most houses that there was hardly any space to move due to the small size of the lounge.</p> <p>It was observed that the walls had cracks in some of the houses.</p> <p>It was observed that some of the houses had backyard shacks.</p>
2. Transport network	<p>The roads were not surfaced and cars drove slowly due to potholes on the rough gravel roads.</p>
3. Public amenities	<p>There were no schools in the area.</p> <p>The housing project was located close to a shopping mall with banks, shops, and fast food outlets.</p>
4. Recreational facilities	<p>There were no recreational facilities in the area</p>
5. Environment and people	<p>Black marks of burnt tyres were observed on the roads and half burnt tyres and posters with messages about housing demands were strewn on the streets.</p> <p>It was observed that protesters made the roads and streets dirty.</p> <p>It was noted on posters that residents took to the streets demanding houses for their dependents and adult children.</p> <p>Rocks were put on the roof of shacks to support shaky roofs against heavy winds and thunder storms.</p> <p>Tools, equipment and broken furniture were kept on the roof in congested houses and backyard shacks.</p> <p>It was observed that various unconventional or unapproved objects and materials were used to repair leaking roofs.</p> <p>It was observed that adult children lived in the backyard shacks.</p> <p>It was observed that informal settlements or slums in the surrounding environment were not demolished as opposed to the provisions of the BNG policy and Freedom Charter.</p> <p>It was noted that as government built the low-cost houses to end informal settlements, more shacks and other illegal structures were constructed on the premises to accommodate more occupants without shelter.</p> <p>Some of the houses were in a state of disrepair and not renovated.</p>

## 4 Discussion

The houses that were examined had structural defects that made them less attractive to owners and potential buyers. The aesthetic appeal was marred by the numerous defects and incomplete work noticeable on the housing units. The houses had cracks and some aspects of the houses were left incomplete by the contractors. Affect for the house and the house owner's health and safety could be affected by faults and substandard finishings (Baker et al., 2016). The defects may have exposed occupants to building-related health complaints such as respiratory diseases or injury incurred in the house (Joshi, 2008). The observational examination of the environment surrounding the residential areas indicated that residents were exposed to health and safety risks (Meth, 2017). Although the BNG housing scheme is a fairly new project since most of the houses under the scheme were constructed between 2010 and 2014, the houses observed were not durable and workmanship was poor. It was observed that some of the houses had major structural faults. The cracks weaken the strength of the houses and some of the houses could collapse and harm occupants in extreme weather conditions such as the occurrence of a violent storm or heavy rains. The results of this study confirm previous findings which indicate that low-cost houses built in South Africa are not strong and they show poor workmanship which compromises occupants' health and safety (Buys, & le Roux, 2013). Most of the houses observed had cracks and some were not plastered inside. If a housing structure has faults, its life span is bound to be shorter. Durability of a housing structure is considered in collateral assessment for mortgage lending and house pricing. If a house owner loses interest in a defective house, chances are that the owner would invest less in maintaining the house in anticipation that the house could be repossessed or it could be sold to pay off debt (Melzer, 2017). The abandoned house would contribute towards the degeneration and running down of residential areas. A deformed housing structure is a financial liability to the house owner. The BNG housing plan regards housing development as a form of investment for which a return on investment is expected by both the project sponsors and beneficiaries (Department of Human Settlements, 2004). The physical appearance of the houses showed that the houses lacked maintenance. Neglected houses have a low housing occupancy tenure and a high vacancy rate (Henwood et al., 2014).

It was observed in this study that some of the houses had damp walls and flaking paint on walls. The National Home Builders Registration Council (NHBRC) regards dampness as grounds for demolishing new housing structures under construction by building inspectors (Estate Agency Board of South Africa, 2017). House dampness is a health and safety risk associated with the sick building syndrome (Joshi, 2008). Odour, respiratory infections, asthma attacks, allergies or fever are health complaints associated with the sick building syndrome (Joshi, 2008). In this study, houses with damp walls had a bad smell. Ventilation is needed to improve air quality but the housing beneficiaries were a low-income group who could hardly afford to install air-conditioning facilities (Wargoeki et al., 2000). It was observed that the rooms were congested as there was no enough space to accommodate belongings. The results were in tandem with previous studies which showed that there was overcrowding in new residential areas for low-income groups (Govender et al., 2011). It was noticed that dust came from inside walls that were not plastered, rough floors, cracks and incomplete ceilings in some of the houses. This indicates that occupants may be vulnerable to diseases associated with dust such as

pneumoconiosis caused by breathing insoluble dust, tuberculosis or dry cough (Brewer, 2013). Criss-crossing electrical wires were observed in some of the houses. Improper or illegal connections to access electricity endanger housing occupants by exposing them to fire hazards or electrocution. The observed improper or illegal connections to access electricity may cause explosions that could destroy the housing structure (Lewis, 2017). It is common in South Africa that housing beneficiaries without enough financial resources to pay for electricity could device illegal and unsafe means to access electricity (Mzini & Lukamba-Muhiya, 2014). Qualified and certified electricians are required to tube or wire the houses and housing units should be inspected for compliance but due to the shortage of qualified electricians, electrical technologists and electrical engineers in South Africa, house owners might not adhere to the housing standards governing the distribution and consumption of electricity. Similarly, improper or illegal connections to access piped water are reported in residential areas in South Africa.

Even though the Freedom Charter of South Africa and the BNG housing policy state that new residential developments should be close to communication networks such as road, rail and telecommunication systems, it was observed that most of the new housing developments have poor communication networks. Infrastructural development in new residential areas lacked sustainable information and communication technology facilities (ICT), residents had to travel to shopping malls and the central business district (CBD) in town for services (Sithole et al., 2013). It was observed that most of the roads were not surfaced and they had potholes. Potholes damage residents` cars, increase insurance claims and hinder development when investors and service providers shun new residential areas (Zikhali, 2017). Potholes affect road safety as they cause accidents. Potholes are a common feature in residential areas that are poorly serviced in South Africa (Lemanski, 2010; Mboniyane & Ladzani, 2011).

It was observed that public amenities such as hospitals were not available in new residential areas. Ambulance service was poor and centrally located away from the new residential areas. An unreliable ambulance service makes it difficult for communities to access health services. The clinics in the area would not be able to handle complicated injuries or diseases that require referral to hospital. In some places, it was observed that there were no schools or clinics. The findings confirm that the new housing development does not comply with the Freedom Charter and BNG housing policy in some housing clusters. It was observed in this study that public amenities such as hospitals, schools, crèches, playing fields and social centres which should be made available to new residential communities were not consistently provided (Freedom Charter, 2017). The construction of social and economic infrastructure in new residential areas is mandatory according to the BNG housing policy (Department of Human Settlements, 2004).

The provision of recreational facilities is contained in the BNG housing policy. The development of primary municipal facilities such as parks, playgrounds and sport fields is mandatory (Department of Human Settlements, 2004). Recreational facilities help communities to relax and improve mental health and wellbeing (Colman, 2015). In this study, it was observed that sporting fields, grounds, parks, gardens and lawns were neglected. There was inadequate sentimental attachment to house lawns, parks and gardens among residents and local authorities (Ignatieva et al., 2017).

An observational examination of the surroundings of new residential developments showed that the areas were overcrowded. Some of the houses did not have a fence. New homeowners erected illegal structures in their backyard to accommodate tenants and members of the extended family. The congestion could cause a fire hazard if occupants in the backyard shacks used paraffin stoves and candles due to lack of access to electricity in the main house. It was observed that overcrowding compromised the provision of water and sanitation services in new residential areas (Govender, et al., 2011). Overcrowding is a strain on municipal services as residents get more than what was budgeted for the area. It was also observed that instead of demolishing informal settlements in accordance with the Freedom Charter and BNG housing policy, the informal settlements mushroomed alongside the new residential developments thus compromising government's ability to provide low-cost housing for the poor.

## **5 Implications for occupants and policy makers**

The implications for house occupants is that due to shortages of low-cost houses in South Africa, housing beneficiaries tend to accept the allocated houses as shelter which is a basic need for humanity with limited alternatives. Allocating poorly built and poorly located low-income houses to the poor has social, health, economic and general constitutional implications for which beneficiaries of the BNG housing plan may seek redress. Housing policy makers and housing administrators should routinely inspect new houses to maintain the health and safety standards as stipulated in the BNG housing policy.

## **6 Limitations of the study**

The limitations of the study are that the observational study did not include the interviewing of house owners. The research design only required the researcher to focus on observational data relating to the physical appearance of the housing units and the surrounding environment. The findings could be subjective as inferences were made in relation to potential housing health and safety risks that could affect occupants. There is no causal link or cause-and-effect relationship between what was observed and events that affected housing occupants. This observational study did not establish a causal relationship between housing quality and health and safety of occupants.

## **7 Conclusion and recommendations**

The provision of low-cost housing is a noble cause for which government, municipal authorities and financial institutions collaborate to achieve the national goal. However, the companies that are contracted to construct the houses tend to maximise profit and neglect housing quality, health and safety. It was evident following the observations in this study, that the main issues across the visited housing clusters observed were poor housing quality and environmental degradation. Contractors might work under pressure to deliver the houses with minimal supervision resulting in beneficiaries incurring costs associated with incomplete work. The poor workmanship increases the cost of maintaining the house and affects the beneficiary's ability to pay monthly instalments to the financiers of the housing project. It is posited in this study that the aesthetic appeal, human-building interaction, and health and safety of occupants would be compromised

when housing structures develop faults. Future studies could focus on on-site strategies of monitoring health and safety standards in the construction houses and development of landscapes for low-income groups as quality control and quality assurance measures.

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