

Flexibility of Interior Spaces for Low Cost Housing in Kenya- A Case Study of the Kibera Soweto East Housing Project in Nairobi, Kenya

Njeru G. W, Maina S, Munene M.

Abstract

Kibera is the largest slum areas in Nairobi and the largest urban slum in Africa (UN-HABITAT, 2008). It's characterized by poorly constructed mabati (iron sheet) structures, poor-drainage systems, and lack of clean water, electricity, medical care etc. Most of Kibera slum residents live in extreme poverty, earning less than Ksh. 100 per day. The government of Kenya set up the Kenya Slum Upgrading Program (KENSUP) in 2004 whose main aim was to provide low-cost housing to residents living in the slum areas including Kibera, Mathare, Kayole and Dandora. The Kibera Soweto East Project also dubbed 'The Canaan Estate' was one of the first projects under the program and comprised of 21 blocks of five floors each sitting in a five-acre piece of land. However in 2017, more than half of the apartments had been given out for renting or sold by the allocated owners and the residents went back to the slum. The major reason for these phenomenon was due economical enrichment. 40% of the residents preferred to rent their houses as means of earning extra income. However, 50% of the residents stated that the houses did not cater for their needs and lifestyles taking into consideration that they now own the houses. The slum houses allows them to manipulate as well as modify their interior spaces, a concept they are not able to implement in their new houses. This is indeed a great challenge due to their rapid growth in population and change in need and lifestyle over time. This study therefore sought to determine how flexible are the interior spaces of the low-cost housing units in Kibera and establish how they accommodate different arrangement of furniture pieces as well as allow performance of different tasks/functions within a particular space. The research design was the case study model where the research employs the collection and analysis of qualitative data obtained through examination of documents, interviews, observation and taking of photographs. The study was carried out at The Kibera Soweto East Housing Project, Kenya and its residents plus the professionals are involved in the project are the respondents. Findings revealed that the government did try to ensure that the low-cost houses are kept simple, regular/standard by installing standard window and door sizes, eliminating storage facilities apart from the kitchen, installing tiles for the floor, walls for the bathroom and counter top for the kitchen and also installing normal light fixtures, kitchen shelves and sanitary ware. This study findings contributes to informing the development of interior plans and layouts that are ideal for low-cost housing units. Affordability can indeed be achieved in low-cost housing but if the interior plans and layouts are not up to standard then it fails to fulfil its purpose of improving the living standards and quality of life of residents living in these housing units.

Key words; Low-cost housing units, Interior spaces, Flexibility, Multi-functionality, Interior partitioning, Furniture layouts.

INTRODUCTION

Background of the Research

Until September 2010, Kibera was considered as the second largest slum in Africa after South Africa. It has 170,070 residents according to the Kenya Population and Housing Census of 2009 (Daily Nation, 2010). The neighborhood is divided into 13 villages, including Kianda, Soweto East, Gatwekera, Kisumu Ndogo, Lindi, Laini Saba, Siranga, Makina and Mashimoni. A UN-HABITAT socio-economic record shows that Soweto East has 19,318 inhabitants spread out in four zones: A, B, C and D. Zone A is the largest in size with an area of 6.9 hectares and accounts for 37% of the houses in Soweto East. It has 876 structures and a population of 6,288. Out of this population, about 90% are tenants and only 10% are structure owners, who do not live at all in the area but collect a monthly rent from the tenants and use the money to develop housing in other areas of Nairobi (UN-HABITAT, 2008). This therefore means that on average, each unit is occupied by seven people which is a relatively high figure compared to the average size of a residential unit in Nairobi which has close to four occupants. This area is considered an ideal area to put up structures since its relatively close to the large industrial area, the health sector, for example, Kenyatta National Hospital, Angelic Mission Hospital and Mbagathi Hospital; the Central Business District (CBD), Upper Hill area and the affluent neighborhoods of Kilimani, Lavington, Lang'ata or the middle-class neighborhoods of Nairobi West or South C hence making it a sought-after residential area for workers, artisans and minor functionaries (Rosa & Bernard, 2012).

For purposes of this study low-cost housing denotes housing that is meant for the middle-low income group in the society. It is reasonably adequate in standard and location. It may be provided by local government authorities or private housing associations, helping to assist those who cannot access accommodation in the private rental market. In Kenya, it may be sold at or close to Ksh. 1 million (Van Noppen, 2012). Low income earners is used to refer to individuals who earn Ksh. 50,000 and below per month (Institute of Economic Affairs, 2015).

Statement of the Problem

The Kibera Soweto East Housing Project was launched in 2012 and the handing over ceremony of the completed houses took place on the 8th of July 2016. As of 2017, more than half of the apartments had been given out for renting or sold by the allocated owners and the residents went back to the slum. The major reason for these phenomenon was due economical enrichment. 40% of the residents preferred to rent their houses as means of earning extra income. However, 50% of the residents stated that the houses did not cater for their needs and lifestyles taking into consideration that they now own the houses. The slum houses allowed them to manipulate as well as modify their interior spaces, a concept they are not able to implement in their new houses. This is an important factor due to their rapid growth in population and change in need and lifestyle. This evidently shows that many low-cost housing especially those provided by the government only focus on reducing cost when coming up with the interior plans and layouts and not on the improvement of quality of life and living standards of residents.

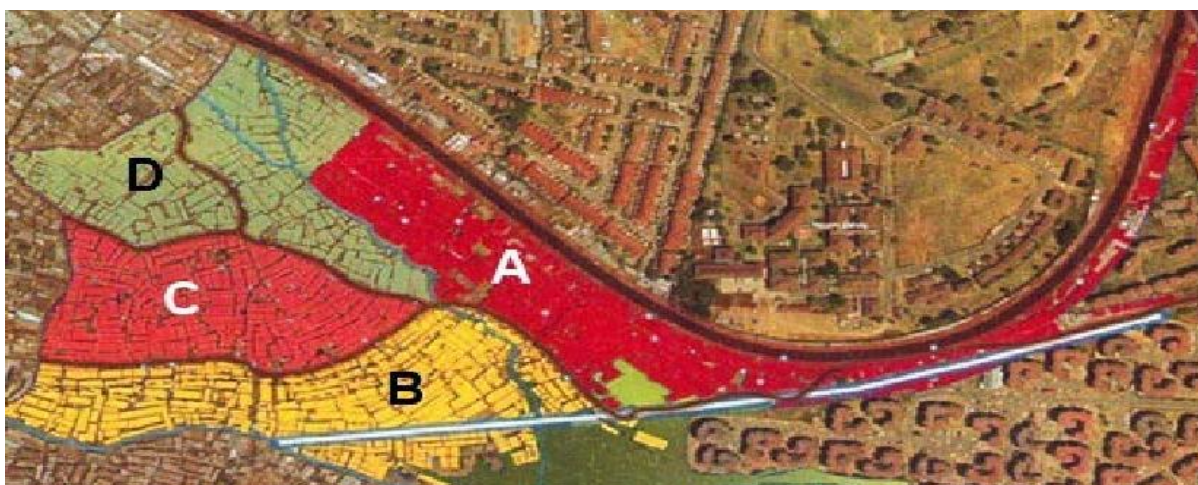
This study is of great importance since the recommended interior plans and layouts will be applied to the other housing units that the government seeks to construct in Zone B, C and D of Soweto East, Kibera. It may also act as a guideline to be used by the government and the private sector when coming up with future projects for low-cost housing in other parts of the country. In the long run, this will see an improvement of quality of life and living standards of not only the residents of Soweto East, Zone A but of other Kenyan citizens. The findings herein also enriches existing knowledge and hence is of great interest to both researchers and academicians who seek to explore and carry out further investigations.

Research Objectives

This study sought to examine how; flexible are the interior spaces of the low-cost housing units, interior plans and layouts for low-cost housing accommodates different arrangement of furniture pieces within a particular space, interior plans and layouts for low-cost housing allows for performance of different tasks/functions within a particular space and propose ideal interior plans and layout for low cost housing in Kenya.

Study Context and site

The study focused on the The Kibera Soweto East Housing Project which is a five-acre estate comprising of 21 blocks of five floors each. The apartments comprises of 144 three roomed



units, 570 two roomed units and 108 single roomed units. It is located in Langata area, southwest of Nairobi and approximately 6.6 kilometers from Nairobi City Centre.

Figure 1: Zone A, B, C & D of Kibera, Nairobi

Source: UN-HABITAT (2008b).

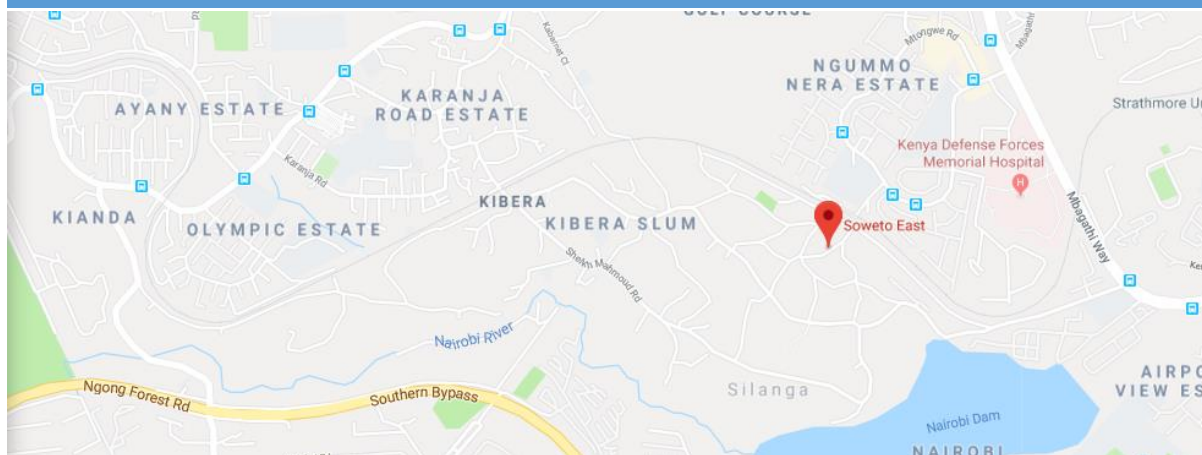


Figure 2: Location of the kibera Soweto east project

This study focuses on low-cost housing developed for the low-income earners who live in the informal settlements; mainly those which are developed by the local government and whose aim is towards slum upgrading. It confined itself to flexibility of interior spaces in low-cost housing units, its key aspects such as multi-functionality and different furniture layouts in interior spaces and the relevant key players such as the residents of the Kibera Soweto East Housing Project and the professionals involved in the success of the project such as architects, electrical engineers, quantity Surveyors, mechanical engineers, contractors and plumbers.

LITERATURE REVIEW

Housing is a set of durable assets, which accounts for a high proportion of a country's wealth and on which households spend a substantial part of their income (HoekSmit, 2011). In the case of low income earners, they spend more proportion of their income on housing than high income earner (UNCHS, 1996). In most developing countries like Kenya, the low income earners form the larger part of a country's population size hence most governments strive to house these particular set of people. This may be due to the fact that most developers have failed to come up with housing for this group of the society because they are not considered to be credit worth for financing to have decent, affordable housing.

Taking Kenya as an example, the government set up KENSUP in 2004, so to provide low-cost housing to its low income citizens especially those residing in slums. Unfortunately, low-cost housing has been equated with low-cost materials, reduced size of interior spaces and location of the development. No much emphasis has been placed on aesthetics, cultural performance, lighting, arrangement of furniture pieces, partitioning and circulation and movement within these housing units.

The term 'flexible housing'

Flexible housing is housing that can adjust to changing needs and patterns, both social and technological. It allows for change of space depending on the needs of the dwellers in order to adapt diversity and change of resident's life. It enables people to occupy their homes in a variety of ways, not tied to the specifics of room designations, and allows them to make adaptations to their home. It also allows housing providers to adapt the mix of units, to change internal layouts,

and also to upgrade their properties in an economic manner (Schneider & Till, 2007). It gives an individual some choice over how a space is arranged or used to support her or his activities and preferences. Control over the layout of a space can help an occupant manage privacy needs as well as opportunities for social interaction and changes in household characteristics such as growing or aging households. It creates efficient and comfortable homes. It also accommodates changing households and allows new owners a chance to personalize their homes while minimizing waste of materials and cost of make future changes. In general, flexibility is ability and potential of a building to change, adapt and reorganize itself in response to the changes (Estaji, 2017).

Flexible interior partitioning

Flexibility in Groák's definition, is achieved by altering the physical fabric of the building: by joining together rooms or units, by extending them, or through sliding or folding walls and furniture. Flexibility thus applies to both internal and external changes, and to both temporary changes (through the ability to slide a wall or door) and permanent changes (through moving an internal partition or external wall). Dash (2003) recommends wood and hardboard siding, since they are available in most parts of the country and their in-place cost is generally lower than that of masonry. They are relatively easy to work with and are often installed by a carpenter. Disadvantages lie primarily in the need for painting or staining every few years, higher fire insurance rates, and susceptibility to termites and weather. Boehland, & Wilson, (2005) believe that low-cost housing is more acceptable if there are no common walls between bedrooms. Closets can help provide this separation. Interior walls should also be insulated and wall studs for acoustic isolation should be provided.

An example of where this concept has been implemented is in the Barcode Room. It is composed of product furniture-walls that freely move from side to side, permitting the resident to create unique spaces to fit a variety of uses. Functional elements, such as storage and furniture, are built into these walls, and these elements are hidden and revealed at different times of day as walls are moved and the elements are unfolded, creating a new interior with each configuration. The tucking away of spaces not in use also allows for a greater floor area available to the inhabitant and their guests. Through the use of the mass-produced furniture-wall or bar, a typical studio space made for a single resident can transform its use, becoming multiple transformable spaces, expanding and contracting when needed, rather than remaining a single room that can be simply arranged. Just as each object in a store has its own unique barcode, each usage of the apartment has its own unique layout.

Dolphin House is also a home composed of individual product rooms with slid able hanging units on a double rail system in the ceiling replacing all walled surfaces. Cruciform columns as the structural elements are located at the corner of each room into which the walls can be locked. Fixed furniture within the rooms is restricted by the wall units' radius of curvature as the walls are moved along rails and rotate around room corners. The furniture for each type of room is organized in three different configurations: circle, square, and line. Since floor and wall material can be customized, when multiple rooms are placed adjacent to each other and furniture styles are varied, room size, function, and materiality can be mixed throughout the house, generating a unique arrangement of rooms that can fit into almost any site condition. The systematic use of components allows users to fully control their spaces by deciding how to combine these parts to create a whole. Rather than piecing spaces together from various individual items at random,

residents choose from cohesive units that, in conjunction with each other, create endless possibilities.

While the ideas of using a single space for multiple purposes, as well as folding various functions inside a wall, are not particularly groundbreaking, Barcode Room is unique because it is an easily replicated and customizable product. The rail and wall system that Dolphin House employs can also be mass produced and is created by modifying an existing product line by the Kimado Corporation called “dolphin windows.” This line of products is unique because they create large open spaces by effortlessly moving wall-sized hanging windows along rails to a storage space. Both systems, either through generation or modification, result in products that can be reproduced in great numbers.

Through mass production, the modification of Dolphin House allows various materials to replace glass while using the same current rail system. These new materials create differences in transparency and openness that exist between the individual rooms. In the original product, the single rail guiding the product windows from open to closed positions limits the movement of the windows. To overcome this challenge, the rail in Dolphin House has been doubled under each beam, allowing all movable walls to be unlocked and pulled out in either direction and permitting them to travel freely through the space. A wall can be opened temporarily as a door, can trade places with another wall to change a room’s materiality, or completely relocated to a storage area to link two or more rooms together for a longer period of time (Knezo, 2016).

Different furniture layouts in interior spaces

Fay (2005) states that the interior plans and layouts for low-cost housing should be in such a way that they allow flexibility within the spaces as these greatly contribute to increase in livability of residents living in these units. They should also be kept simple, regular/standard and to a bare minimum so as to make the most of the available space and allow maximum repetition of interior elements such as fittings, fixtures and materials. This provides residents with the choice in the way they use space and arrange furniture with the aim of allowing their living patterns to be accommodated as their needs change over time. It also meets social needs by allowing inhabitants a degree of personal expression and it also ensures that housing has a long life. Lack of it thereof, denies them the opportunities for self-expression results in isolation and stigmatization.

One of the earliest inventions to incorporate the concept of flexibility was after the Second World War when the interior of the low-cost housing was opened up in 1950 into what was described as an ‘open plan space.’ This meant that the conventional division between rooms disappeared, either through elimination or reduction of interior walls, and so the kitchen, living and dining room could occupy one free flow of space, running from the back to the front of the house. This meant that the open living space included a sitting area with sofa-beds and extendable dining tables to accommodate for guests, as well as a large pantry and island within a fully accessible kitchen. This meant that within the same space, one could entertain guests, watch television, work with a computer, use the telephone, relax, prepare meals and dine with friends and family (Ward, 2017). Another example would be the hallways, if their size is increased; it can be used for additional functional purpose such as study, library space, and bed or laundry niche. Storage cabinets and drawers built into the triangular space beneath stairways, library shelves along stairway walls; and display cases built into wall cavities (Brown, 1993).

Storage is critical as well. Low-cost house kitchens may need to include pantry cabinets, cabinetry with interior storage feature that increase efficiency, and overflow storage near/adjacent to the kitchen space. These are feature often omitted from low-cost houses house due to economy, yet may actually increase efficient use of space and are thus desirable. Where possible it is important to consider what the household has to store in the kitchen and how to accommodate any special needs for storage and access to storage space. Adequate counter space is needed in the kitchen and may be comparable to what is needed in a larger home. Counter space may be used as a work area for food preparation, to accommodate small appliances, and for storage or display space. Counter space in small kitchen is often cluttered if there is inadequate storage in the kitchen. Counter space may also be used for other household activities that require a horizontal work surface. Some counter space may need to be transition space between spaces/rooms (Grey, 2004).

However, in the early part of this century there was resistance to the idea and the responses to its introduction seemed more confused. So however much this is true and a completely open plan house did not seem to be universally liked, with time people have been able to identify the rooms to which they prefer for them to be combined and those they prefer to be private. One of the ways was having the boundary between public and private space shifted from the front door to the bedrooms. This meant that the whole of the ground floor of a house become an area for public entertainment and display whilst the bedrooms become private and for the family only (Roberts, 1990).

Multi-functionality in interior spaces

Multi-functional interior spaces are spaces which can be used in variety of ways, generally without making physical changes. This is primarily through the way the spaces are organized, the circulation patterns and the designation of rooms. Boehland, & Wilson, (2005) suggests combining functions of different rooms for space optimization. For example: combining a guest bedroom with a home office and provision for both television viewing and music functions in the living room. Hartany & Le (n.d) developed a project with the idea of a single space that is surrounded by the essential minimums of services - kitchens and bathrooms that are pushed to opposite sides of the single large space. A series of angles sections of wall provide the connecting point for concertina panels. These walls allow the creation of different connections between different areas and keep their multi-functionality intact.

This concept of multi-functionality in interior spaces has been widely implemented by MacDonald, 1996; who has designed a number of affordable house prototypes including a studio home for single people ('unmarried workers, retired widows/widowers, single parents, young people and those leading a lonely and unremunerated contemplative life'). This studio home is a single-story building with a ground floor area of 18.2 square meters and a loft of 5.8 square meters (below the pitched ceiling) that can be used for storage, a bed space, or work area, depending on local regulations. The dwelling in the ground floor area has basic furniture including a sofa bed, dining table for two people, and a number of storage units and has a bathroom, walk-in storage space, a large living-sleeping space with kitchen joinery along one wall and a niche at one end in which a prefabricated fireplace can be installed. One of the strategies that have been employed to make the small space appear larger than it is, is having high ceilings of 2.6 meters. This highlights the importance of design, especially if construction costs are to be reduced by keeping floor area to a minimum.

Vander Rohe achieves multi-functionality in interior spaces by only building the perimeter walls and two columns within, which support the ceiling. Everything else is as free as possible. He then proceeds to produce cheap plywood walls. He then designs the kitchen and bathroom as fixed rooms, and the remaining space as variable dwelling space so that he is able to subdivide these spaces according to the needs of the occupant. This would also have advantages insofar as it would provide the possibility to change the layout of a unit according to changes within a family, without large modification costs. Any joiner or any down-to-earth laymen would be in the position to shift walls (Till & Schneider, 2005).

Provide quality detailing and finishes. By limiting the overall square footage of a house, more budget can be allocated to the detailing, materials, and finish quality to make a house special. Minimizing house size may also be a way to include some of the “green” building materials and products that cost more (natural granite countertops, linoleum, certified wood flooring, top-efficiency appliances, etc.) (Boehland & Wilson, 2005). Among the strategies he believes that flexibility in low-cost housing can be achieved entails increased dwelling size, decreased housing specificity, allowance for change (walls to be removed, added or moved), provision of movable elements such as wardrobes, cupboards and walls and provision of developments containing a number of different types of units allowing residents to move as their needs change i.e. children no longer live at home. One of the countries that have successfully managed to incorporate well-designed interior plans and layouts in their low-cost housing project is Malaysia. Its commitment towards low-cost housing started during the First Malaysia Plan (1966-1970) while the private sector’s involvement was in the Second Malaysia Plan (1971-1975) when the government realized the need and importance of the role of the private sector in ensuring an adequate supply of low cost housing for the country. Its commitment continued through to the Seventh Malaysia Plan (1996-2000), Eight Malaysia Plan (2001-2005) & Ninth Malaysia Plan (2006-2010). More encouragement was placed on the private sector to build more low- and low-medium-cost houses in their mixed-development projects while the public sector concentrated on building low-cost houses as well as houses for public sector employees, the disadvantaged and the poor in urban and rural areas (Ghani & Lee, 1997). One of the ways the government of Malaysia set out to achieve this was to establish a set of standards for the design and interior planning of these low-cost houses. The floor space for the terrace house was 48-60m² while that of the flats was 45-56m². The Terrace Houses and flats was to have a minimum number of bedrooms being 3 with the first room having a minimum area of 11.7m², the second room having 9.9m² and the third room having 7.2m². The kitchen’s minimum area for both the terrace and flats was 4.5m². The living and dining rooms for the terraces and flats had either to be a combined space or separately with adequate area for both rooms. The bathroom and toilets for the terraces and flats were to be provided separately with a minimum area of 1.8m² each. The storage space and porch for the terraces and flats was to be designed in such a way that there was adequate provision for resident’s convenience and comfort (Idrus, Noraliah & Chin 2008)

METHODOLOGY

Research Design

Case studies are intensive analysis and descriptions of a single unit or system, for example, individuals, events or groups bounded by space and time (Hancock & Algozzine, 2016). In this study, the case study model was applied since the researcher seeks to gain in-depth

understanding of how the flexibility of interior spaces of the Kibera Soweto East Housing Projects affects the living standards and quality of life of its residents. Insights and results from this case study are then be used to propose ideal interior plans and layout for other low cost housing projects in Kenya.

Population and Sampling

The population for this study mainly comprised of the residents living in Soweto East, Zone A whose population is estimated to be around 10,000. The different professionals who were involved in the project such as the electrical engineers, architects, plumbers, contractors, mechanical engineers and quantity surveyors are also be included in the study. Purposive sampling was used to identify professionals involved in the project who are seven in number. They include Architect Koech, Quantity Surveyor Busei, Engineer Mutalanga, Engineer Wambugu, Contractor Muthinga, Engineer Koech and Plumber Karago. Stratified random sampling design was also used to come up with a properly representation of the residence of the Kibera Soweto East Housing Project who participated in the study which is 100. The population was grouped into strata, and then simple random systematic sampling is applied to each stratum. In this case, the strata is 2 i.e. residents who live in the one bedroom and two bedroom apartments.

Population	Target Size
Residents	100
Project Professionals	10
Total	110

Data Collection Methods

The following are the qualitative data collection methods, in order of priority, undertaken in this study;

a) Examination of documents

It is the analysis of existing resources, like government reports, personal documents, books, articles in newspapers or medical records (Prior, 2003). In this study, policies, guidelines and reports on The Kibera Soweto East Housing project at the ministry are critically analyzed. Information in journals, books and media publications on low-cost housings and especially on their flexibility both in Kenya and worldwide are also looked at in detail and provision.

b) Interviews

An interview is a product of interaction between the researcher and the interviewee and it may be structured, semi-structured or open/in-depth, dependent on the characteristics of structuring the interview by the researcher. Interviews are useful to explore experiences, views, opinions, or beliefs on specific matters. Accounts can be explored and compared to others, to develop an understanding of the underlying structures of beliefs (Green & Thorogood, 2010). In this study,

normal light fixtures, kitchen shelves and sanitary ware. The toilet and bathroom have been separated as well which allows one to use the different rooms at the same time. The kitchen shelves, in particular, have been left open so as to allow one to modify them in the best way that accommodates their lifestyle as illustrated in image 3.

Image 3: One Bedroom Floor Plan

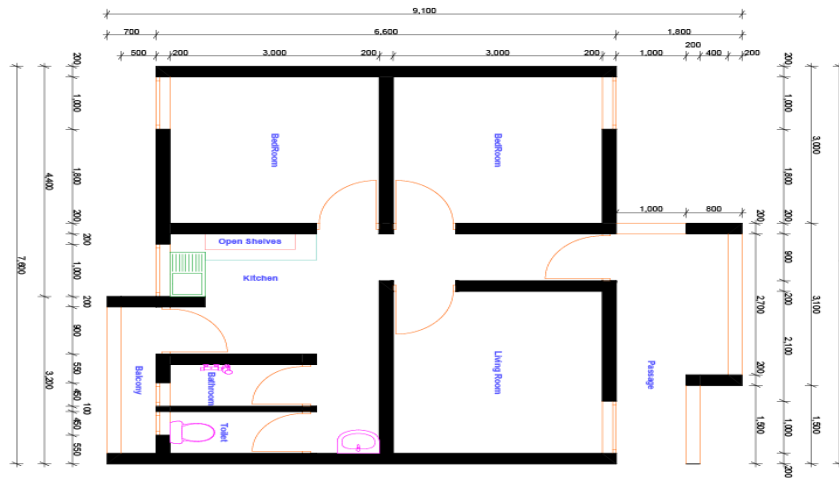


Image 4: Two Bedroom Floor Plan

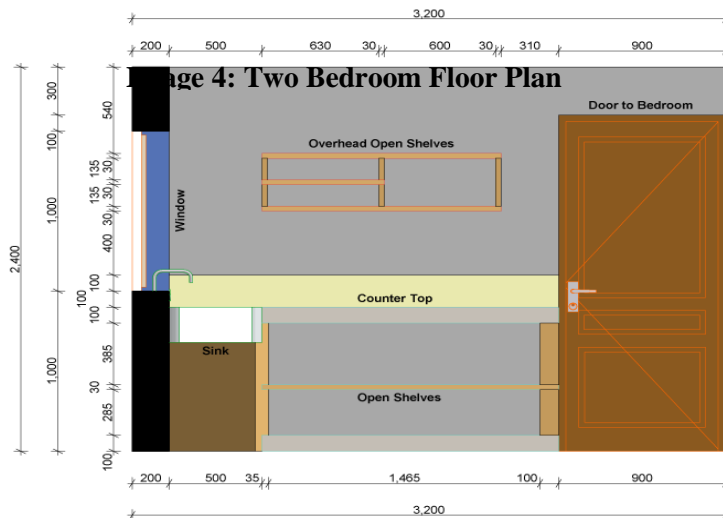


Image 5: Kitchen Shelving Particulars

However, there is an extent to which flexibility has not been attained in the individual spaces and in the entire house as well. The living room of the one bedroom house can only accommodate two furniture layouts while that of the two bedroom house can only accommodate three furniture layouts when maximizing on space. This limitation exists majorly due to the positioning of the window. One furniture layout for the one bedroom living room can only accommodate an L-sofa (five seater), table, TV. Cabinet and four stools while the other layout can only accommodate a three and one seater sofa, stool, table, TV. Cabinet and four stools. This is indicated in image 4 and 5 respectively. The residents believe that more space would be available for the living room if it would be combined with kitchen to make one single room. The partitioning walls would be eliminated thus allowing inclusion of more furniture pieces with its different layouts plus increased circulation.

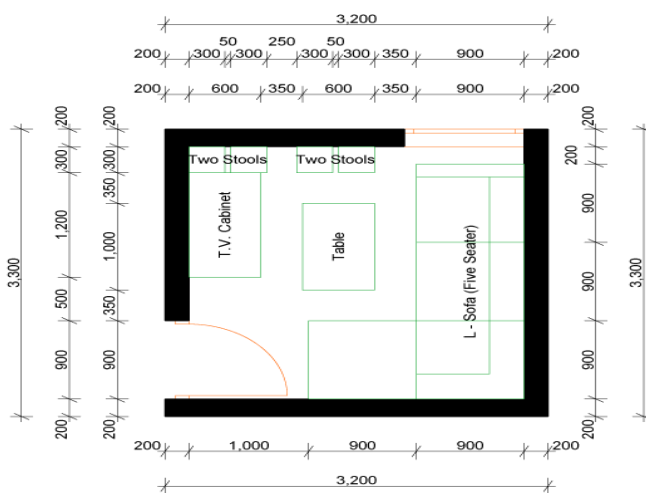


Image 6: One Bedroom, Living Room, Furniture Layout One

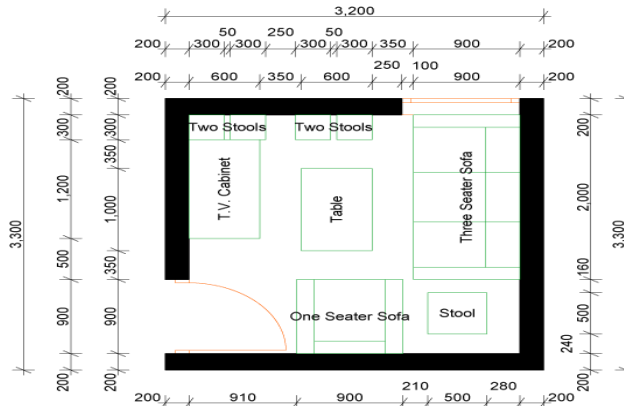


Image 7: One Bedroom, Living Room, Furniture Layout Two

As for the living room of two bedroom house, it can only accommodate three furniture layouts. The first layout accommodating an L-sofa (six seater), table, TV. Cabinet and four stools, the second layout accommodating an L-sofa (five seater), table, TV. Cabinet and four stools while the third accommodating a three and one seater sofa, stool, table, TV. Cabinet and four stools; all illustrated in image 6, 7 and 8 respectively.

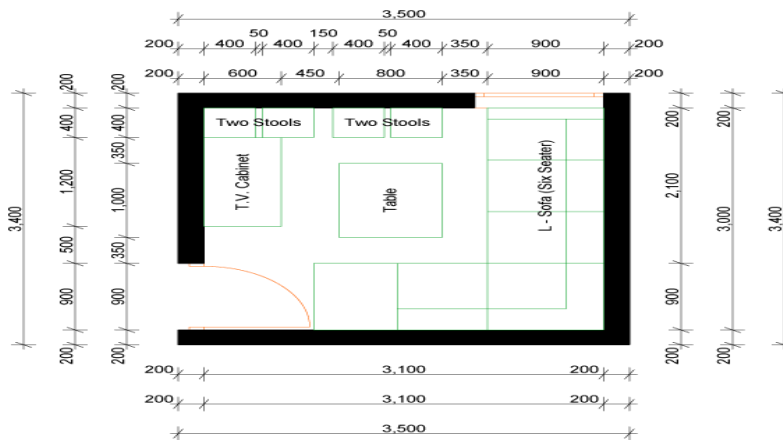


Image 8: Two Bedroom, Living Room, Furniture Layout One

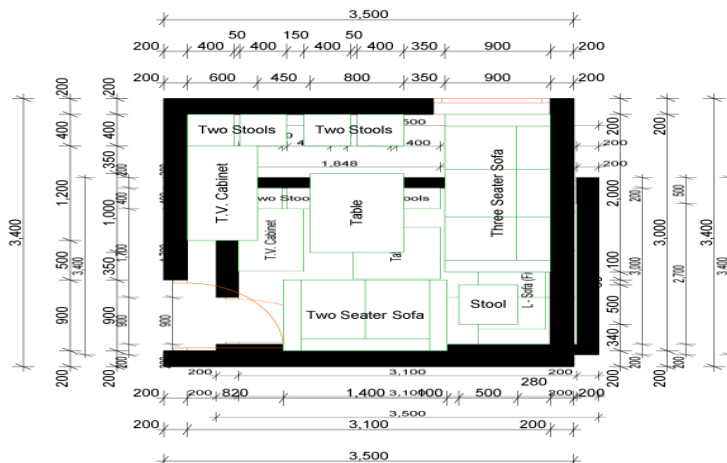


Image 9: Two Bedroom, Living Room, Furniture Layout Two

As for the bedrooms, the one bedroom house has only one furniture layout that accommodates a bed bunk (double bed), single bed, stool and wardrobes as illustrated in image 9 while that of the two bedroom house, has only two furniture layouts. The first one accommodating a double bed, bed bunk (single bed), stool and wardrobes while the second layout accommodates a bed bunk (double bed), double bed, stool and wardrobes as illustrated in image 10 and 11 respectively.

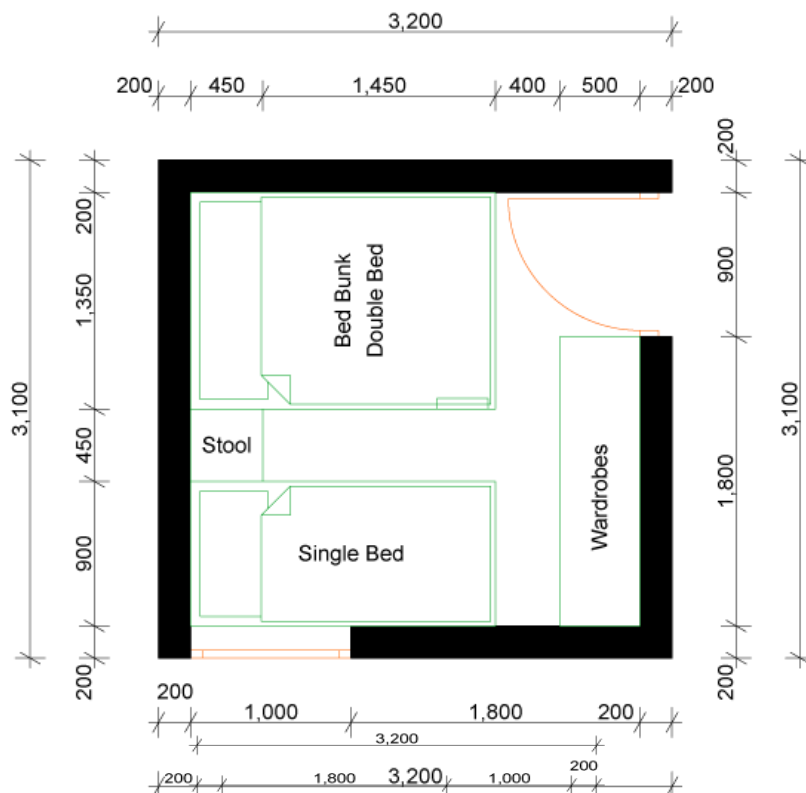


Image 10: One Bedroom Bedroom Furniture Layout

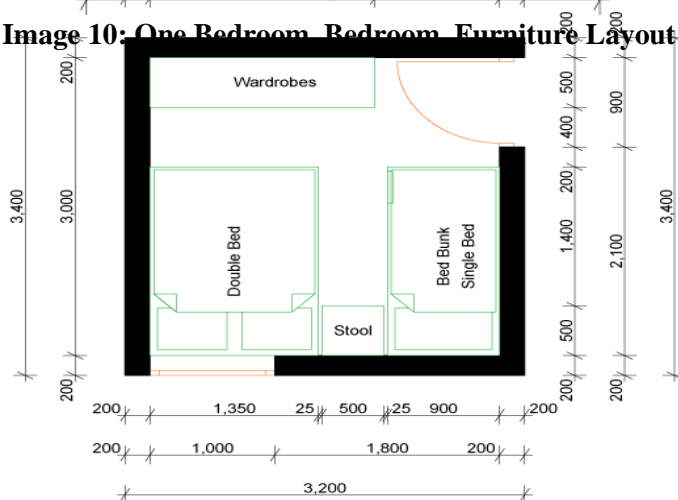


Image 11: Two Bedroom, Bedroom, Furniture Layout One

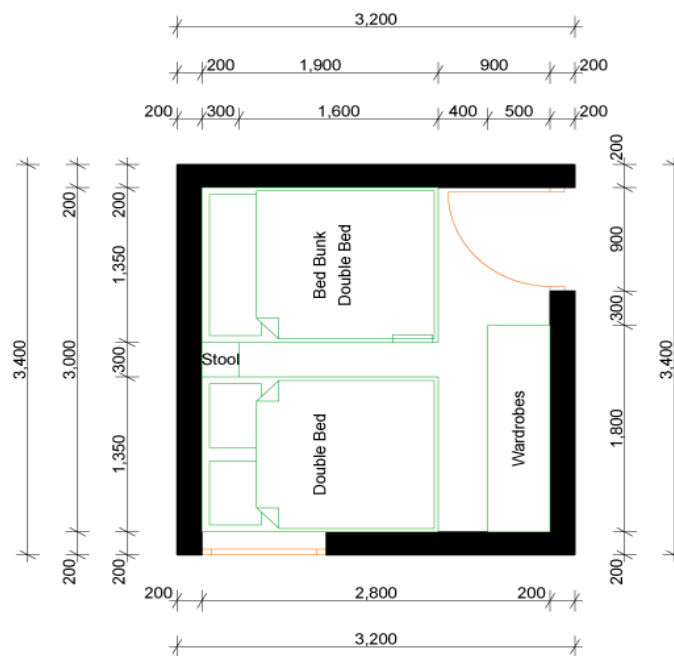


Image 12: Two Bedroom, Bedroom, Furniture Layout Two

The residents also felt it would be better if the rooms were of significant different sizes and make. This would mean that for each room the positioning of the windows, doors, sockets and switches would be different. This to them comes in handy when if they feel that one room does not accommodate what they specifically want, then they have the option for one or two extra rooms that serves them right for the purpose to which they desire to use the rooms. For example, if they were of the opinion that the living room needed more space, then they would convert the biggest room to be the living room. This would in turn allow residents to add more furniture pieces while at the same time arrange them in whatever layout that is pleasing to them.

In addition, more windows would be provided considering the ceiling is quite low and the rooms are quite small as well. The windows would have more provisions for opening to allow more

light and air to come into the spaces. This would enhance the aspect of bringing the outdoor environment into the interior spaces. More natural light as well would penetrate into the room hence bring the illusion of a bigger room. It would also increase the possibility of having a variety of furniture layouts since the arrangements would not be dependent on only one single window. It would also improve the aeration within the rooms hence reducing the aspect of the rooms being dump.

Having sockets on every wall, as suggested by Engineer Koech, would positively contribute to this phenomena as well. The residents also believe that more storage facilities especially those placed or hanged on the wall would have been provided, in particular, those which would work best for both living and bedroom setting. This then provides extra space at the floor area to accommodate more furniture pieces within the room. Also, since the rooms are small in size, the illusion of a bigger space would have been created by the construction of higher ceilings. This would also increase aeration within the rooms.

Multi-functionality in interior spaces

Multi-functionality has been achieved by ensuring that all rooms are of the same size and provision. This phenomenon allows residents to use whichever room they wish to as either the living room or bedroom/s since there is no specialty to any of them. However, the residents believe that more functionality and space would be achieved if the living room could be combined with the kitchen to make one big room. The kitchen counter top would then be used as a partial divider between the two spaces. Since the house is already small, this gives the illusion of a big room as well create more space for storage and aeration since the windows and door have been put to bare minimum. It would also allow for many activities to happen within the same place such as entertainment, interaction, cooking and many more.

Instead of a concrete wall in between the bedrooms, two or more columns and beams would be used to support the ceiling and the floors above it. The interior partitioning would then be made of closets that runs from the ceiling to the floor. Various functions could also be folded inside as well such as projecting tables and chairs. The most recommended is one that is made of wood e.g. plywood and is insulated as well. This would bring down the cost considering it's a low-cost house. The insulation would limit the noise from one room to another. This indeed provides more storage space not only for the bedroom but also for the entire house. It creates more floor space for bigger furniture pieces to fit in such as beds. The insulated wooden partition would be movable as well if possible on a rail. The other option would be for them to be supported by various steel bars that are screwed both to the ceiling and floor. The movement could be too and from as well as side by side. The partition would also have the element of it being retractable or expandable. With all these features in place, the partition should be in such a way that any joiner or down-to-earth laymen would be in a position to operate it. This phenomenon does allow residents to manipulate their spaces in whatever way that is suitable for them. Sliding doors that run inside the partition from one end to another could be provided to allow residents to have doors in whatever position that works best for their home setting.

The hallway to the different rooms would be eliminated. The space created would then be distributed to the living room and bedroom so as to create more space. The entrance door would be placed in the living room and this would facilitate maximization of space. The doors to the

two bedrooms would share the same wall as that of living room and kitchen. According to the residents, this arrangement would help in creating more space for the rooms.

More functionality in the kitchen and bathroom would be achieved by increase in the number of cabinets and shelves available, even if it meant for them to move up. Also, some of them would be closed (provision of doors) for privacy as well as aesthetics. This would be achieved by use of sliding doors. The residents also felt since the houses were constructed to bare minimum, the interior finishes and fittings already installed would be detailed and of better quality. Some of them complained that within the first two years, kitchen sink were breaking down, toilet seats and showers were broken, kitchen cabinets were weak, paint was chipping off and many other malfunctioning due to use of low quality material.

CONCLUSIONS AND RECOMMENDATIONS.

Elimination of the corridors to create more space for other rooms. This applies to the partitioning walls as well thus allowing inclusion of more furniture pieces with different layouts plus increased circulation. Employ the open plan concept by combining the living room and kitchen into one big space. The kitchen counter top would then be used as a partial divider between the two spaces. This allows for different furniture layouts as well as performs of different tasks and functions within a particular space. Addition of cabinets in the kitchen all the way to the ceiling. This provides more space for storage hence more room for circulation. Creating more storage space by installing floor to ceiling cabinetry. Addition of extra windows since these was one of the limitations of accommodating different furniture layouts within a space.

Introduction of movable closets that are supported by strong steel bars that are screwed both to the ceiling and floor. They are made of wood, preferably MDF boards or plywood. They may be insulated as well to prevent noise. At the end, the partition may be folded or unfolded to facilitate its movement to and from. They may have the element pull-out shelves and partitions that are projected when need be or retracted when not in use. This partition can move to and from to certain extent. Replacement of the hinged door with the sliding doors. This eliminates the space occupied by the door inside the room when open hence creating more space for other functions to take place.

REFERENCES

Ahn, M., Beamish, J., Parrott, K., & Emmel, J. (2015). Kitchen Space Planning in Small-Scale Houses. 83-94.

Akyalçın, B. (2015). Investigating and Categorizing the Concept of Flexibility in Mobile Interior Spaces: The Case Study of Yacht Interior Spaces. 8-60.

Boehland, J., & Wilson, A. (2005). Small is Beautiful. *Journal of Industrial Ecology*, 286-287.

Canepa, S. (2017). Living in a Flexible Space. *Materials Science and Engineering*, 1-10.

Cooper, R. D., & Schindler, S. P. (2009). *Business Research Methods* (10th Edition ed.). Tata McGraw Hill, New.

- Daily Nation. (2010a). *Myth shattered: Kibera numbers fail to add up*.
- Daily Nation. (2010b). *How numbers game turned Kibera into 'the biggest slum in Africa'*.
- Dash, K. (2003). Exterior and Interior Wall Materials. 146-147.
- Davis, S. (1997). The architecture of affordable housing.
- Estaji, H. (2017). A Review of Flexibility and Adaptability in Housing Design. *International Journal of Contemporary Architecture "The New ARCH" Vol. 4, No. 2, 37-49*.
- Fay, R. (2005). Design Strategies for Affordable And Sustainable Housing. *Environment Design Guide*, 1-9.
- Ghani, S., & Lee, L. M. (1997). *Low Cost Housing in Malaysia*. Kuala Lumpur: Utusan Publications & Distributor Sdn. Bhd. . . .
- Gjakun, M. (2015). Flexibility and Comfort in Limited Dwelling Interior. 15-62.
- Gjakun, M. (2015). Flexibility and comfort in limited dwelling interior. *Updated considerations regarding technical possibilities, functionality, trends and impacts on contemporary living since the period of 1970s*, 38-190.
- Grey, J. (2004). Trends in Kitchen design. Northwest Renovation: A Home Improvement Magazine.
- Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice*. Routledge.
- Hanser, A. (2003). Assembly + Diassembly of Interior Wall. 1-4.
- Hartany, J., & Le, A. (n.d.). On flexible spaces and modularity.
- Hoek-Smit, M. C. (2011). *Government Policies and their Implication for Housing Finance*.
- Idrus, N., & Ho, C. S. (2008). *Affordable and quality housing through the low cost housing provision in Malaysia*.
- Jones, T., Pettus, W., & Pyatok, M. (1997). *Affordable Family Housing*. Mulgrave: The Images Publishing Group Pty Ltd.
- Jones, T., Pettus, W., & Pyatok, M. (1997). *Good Neighbours: Affordable Family Housing*. Mulgrave: The Images Publishing Group Pty Ltd.
- Kiiskinen, A. T. (2016). A Design Concept Proposal About Compact Living Units : Use Case For Student Housing. 7-122.
- Knezo, A. (2016). Empowering Design through Flexible Personal Space. 32-37.
- Köhn, D., & Von Pischke, J.D., J. D. (n.d.). *Housing Finance in Emerging Markets*. Springer.
- MacDonald. (1996). *Practical Solutions to Today's Housing Crisis*. . New York: Whitney Library of Design.

- Raviz, S. R., Eteghad, A. N., Guardiola, E. U., & Aira, A. A. (2015). Flexible Housing: The Role Of Spatial Organization In Achieving Functional Efficiency. *International Journal of Architectural Research*, 65-75.
- Roberts, M. (1990). Gender and Housing: The Impact of Design. *Built Environment (1978-)*, Vol. 16, No. 4, *Women and the Designed Environment*, 257-268.
- Robson, C., & McCartan, K. (2016). *Real world research*. John Wiley & Sons.
- Rosa, A., Flores, F., & Bernard, C. (2012). *The Kibera Soweto East Project*. Nairobi, Kenya.
- Schneider, T., & Till, J. (2005). Flexible housing: the means to the end. *Theory*, 287-295.
- Schneider, T., & Till, J. (2007). Flexible Housing. 3-17.
- Standard Media. (2010b). *How numbers game turned Kibera into 'the biggest slum in Africa'*.
- Susanka, S., & Obolensky, K. (1998). *A Blueprint for the Way We Really Live*. Newtown: The Taunton Press Inc.
- Till, J., & Schneider, T. (2005). Flexible housing: opportunities and limits. *Theory*, 157-164.
- UN-HABITAT. (2008a). *Minutes of the Design and Redevelopment Committee Meeting*.
- UN-HABITAT. (2008b). *Soweto East Redevelopment Proposal*.
- UN-HABITAT. (2008c). *UN-HABITAT and the Kenya Slum Upgrading Programme Strategy Document*. Nairobi.
- Van Noppen, A. (2012). *The ABC's of Affordable Housing in Kenya*.
- Ward, K. (2017). *An Evidence-Based Approach to Designing Low-Income Housing Communities*.

