

The Influence of the Tenure System to the Physical Environments in Nairobi's Human Settlements

Peter A. Makachia

Abstract

Tenure has often been cited as the underlying reason for the wanting physical state that defines slums in Nairobi. The contrary view is that secure tenure would bestow physical environments befitting urban spaces. These positions are hardly well-supported empirically, and in fact physical depravity persists broadly across a spectrum of tenure options. This paper aims to identify the variety of land tenure systems in the slum environments of Nairobi and ascertain if this influences the physical qualities of these neighbourhoods. The underlying question is whether the spatial qualities, inside and outside the dwelling units (DUs), that prevail in slums relate to the tenure system of the settlement. The proposition is that the tenure contributes only peripherally to the physical environments in human settlements. Thus, regardless of tenure system, 'slum' conditions are unavoidable at various stages of a householder's economic progression. The findings in the paper largely support this view.

Introduction

With regard to this study, literature analysis of the human settlements in Nairobi was critical in isolating the 'slum' conditions across the city. Empirical data was captured from the 2009 National Census, which was further confirmed in the case of *vijiji* (villages) in low-income human settlements. The choice of case strategy was aimed at unearthing a guiding rationale relating the physical qualities of the spaces and the underlying tenure systems from slum environments in Nairobi¹. The theoretical part of this paper is structured to present the intricate tenure systems under which slums thrive and the physical conditions under which large proportions of households across the city live relying on definitions on classifications from the census.

Out of the 12 villages that this study investigated, five were selected as units of analyses, representing various tenure regimes based on the theoretical discourse. The tenure characteristics ranged from the quasi-legal with Temporary Occupation Licenses (TOLs) that were instigated by the government and the privately instigated Land Buying Companies (LBCs) and land buying cooperatives. The legal aspect was either private with individual freehold titles or public on government land. The illegal aspect was squatting on public land. The presentation of empirical work was précis descriptions accompanied by several visual images of maps, photographs and figures. Themes discussed included the physical quality of materials used, services provided as well as predominant functions. The villages' tenure systems varied within the frames defined in the section of legal (private/public), quasi-legal (TOL/LBC) and illegal squatting (Table 1).

¹ Slums are unregulated housing developments on legal, quasi-legal or illegal land, and that demonstrate visual physical depravity to formal urban design.

Some scholars identify tenure security as necessary for sustainable upgrading and other interventions (Majale, 1995 & De Soto, 2000) but hardly offer any supporting empirical proof. Participatory planning (Majale and Payne, 2004 & Majale, 2008), for sustainable upgrading, is also considered a prerequisite, a position which can be supported and probably a stronger proof of 'ownership' than the alternative official deeds. One can relate the concept of 'slums' to their existence in the 'city landscape is of spontaneous origin' (Stokes, 1962) in the modern city. This is as espoused in the early industrial city based on the narrative in 'The City of the Dreadful Night' (Hall, 1990, pp. 13 – 47). This spontaneous origin led to appalling physical environments that typify a modern slum in Nairobi.

Table 1: Village Characteristics

Village	Tenure	Tenure System Description
Gitara-Marigo	Quasi-legal	Resettlement area for Mukuru dwellers, close to Dandora Site & Service Scheme
Kangemi-Sodom	Legal	Private land that was formerly rural Kikuyu (of Kiambu District) homesteads that was incorporated into the city boundaries through expansion. Developments have been made to accommodate tenants from Western Kenya, mainly the Luhya.
Mihang'o	Legal	Private land, acquired through land buying co-operative society and ownership is through share holdings.
Githogoro	Legal/illegal	Mostly privately owned land but some squatting on public land (road reserve). It is located on urban fringe and its development is due to urban sprawl.
Majengo-Pumwani	Quasi-legal	Early 'African location', where dwellers were allocated 'stands' using Temporary Occupation Licenses (TOL). Swahili house typology used in all dwellings.
Mji-wa-Huruma	Illegal	Squatting on public land
Kibera-Makina	Quasi-legal	Land allocated to Sudanese soldiers who served in the colonial British army. Initially occupied by Nubian of mainly Muslim religious persuasion. Tenants are predominantly from other Kenyan communities.
Mukuru	Illegal	Squatting on public land in areas adjacent to industries. Largely multi-ethnic dwellership.
Kibera-Soweto East	Illegal	Squatting on public land, largely land invasions and encroachment on railway reserve and other public land. Mainly Luo tenants with Kikuyu slum lords.
Mathare - 4A &B	Quasi-legal	Authorised squatting on public land through populist presidential order. Settlement never legalised but dwellers believe they have the rights to inhabit the area even without documentation. Dwellership mostly Kikuyu. A subject of upgrading to create order, quasi-legal inhabitation as in 4B.
NTID	Quasi-legal	Emerged as a labour camp for road construction workers in 1974 (NTID = Native Industrial Training Department)
Kaloleni	Legal	City Council of Nairobi (CCN) rental estate that has been transformed through dwellers' initiatives of extensions of 'temporary' dwelling units.

Source: Peter Makachia

However, not all such city sectors of spontaneous origin qualify as slums even among city authorities. Indeed, dweller-initiated transformations in formal estates of Nairobi in middle-income neighbourhoods are justified by their social, physical and economic rationality rather than being condemned (Makachia, 2010). Others refer to them as ‘affluent informality’ as opposed to ‘survivalist informality’ (Anyamba, 2006) of the lower-income city sectors of the emerging Nairobi’s ‘informal urbanism’ (Anyamba, 2011).

1. Land Tenure Systems in Slums

In the formal system, there are three distinct categories of land: Government, Trust and private land (Yahya, 2002) that are variously qualified in slums. These were categories defined in the former Kenya Constitution when all urban slums emerged. Private land is for individuals and so-registered with freehold title-deeds or leaseholds (Cap 300). Government land is owned by the government on behalf of the public (Cap 280) whereas Trust Land is communal under the trusteeship of the county councils (Cap 288). The former is for public purpose and government-use and administered by the Commissioner of Lands. Trust land is utilised by local residents for agriculture, pastoral-use and by individuals; often guided by customary laws and rights (Table 2).

Table 2: Basic categories of land ownership in Kenya

Land category	Ownership	Type	User	Government Legislation
Government Land	Government on behalf of the public	Utilized Unutilized Un-alienated Reserved	Government use; General public use	Government Land Act Cap 280; Administered by Commissioner of Lands
Trust Land (Communal)	Trusteeship under county council (customary laws and rights)	Utilized Unutilized	Local residents' various uses e.g. agriculture, pastoral, self etc.	Trust Lands Act Cap 288
Private land	Private individuals	Freehold and leasehold tenure	Registered individuals and organisations, various uses	Registered Land Act Cap 300

Source: Yahya, S. S. (2002). *Community Land Trusts and other Tenure Innovations in Kenya*.

In slum environments, dwellership is often re-defined. In addition to the legal, there are illegal and quasi-legal systems. For the illegal occupation, the terms often used are squatting and ‘land invasion’ (mostly used in Latin American cities). In this context, the quasi-legal refers to

authorised occupation though not legalised through issuance of leaseholds or title deeds. In this respect two categories exist: Temporary Occupation Licenses (TOL) and share certificates in Land Buying Companies (LBCs). In these cases there are various authorities that include politicians (e.g. Presidential orders), party (e.g. the Kenya African National Union, KANU) and local administration (e.g. Chiefs).

The TOL is an interesting tool of land access as it bestows the Commissioner of Lands authority to allocate un-alienated land for individual use. The CCN acts under delegated authority to administer TOLs that include way-leaves, reservations and other public utility land that is unutilised before the allocation. For the poor, the most common avenue of accessing the TOL involves the local administration, the Chiefs; a scenario bereft with extortion and corruption at the grassroots in the name of issuance of annual permits for temporary structures. That these TOLs are issued for largely informal activities involving trade, light industry, schools and worship places located in residential areas to complement the residential function (Yahya, 2002), contributes greatly to the 'slumification' of the city as their temporary nature can only imply use of non-durable materials and technologies.

LBCs and land cooperative societies emerge at the city periphery and are meant to enable the individual membership access land cheaply, often because of the location and lack of services. Further, it is often subdivided illegally to avoid prohibitive CCN planning standards. Often such sub-divisions are not supported by the issuance of a title-deed, and where such deeds are still held by the company the shareholders are treated "as 'tenants at will' and may be ordered to quit as directed by the company if they have not completed paying the purchase price" (Yahya, 2002, p. 254). LBCs and land cooperative societies are avenues for other managerial problems and hardly offer the security most dwellers desire. Further, since these settlements are outside the city's planning zones, the developments are unrestrained by formal standards which constitute a recipe for slum formation.

Outside the quasi-legal tenure, instances of slums are witnessed in legal tenure systems that are both private and public concerns. The freehold tenures in areas formerly deemed rural but now deemed urban due to city boundary expansion are examples of privately formed slums. Here, instances of demand for urban accommodation have led to the emergence of these slum environments. Similarly, estates formed through legal processes like CCN Rental Housing are also subjects of recent slumification through Dweller-Initiate Transformations (DITs). Table 3, gives a theoretical classification model for tenure systems within which slums emerge. Thus, whereas one understands why slums emerge from non-tenured systems in the non-legal/illegal dwellerships (squatting) landscapes, the same however is also observed in the legal and the quasi-legal alternatives.

Table 3: Tenure systems within slums

	PRIVATE	PUBLIC
QUASI-LEGAL	QUASI-LEGAL	QUASI-LEGAL
	LBCs City periphery location	TOL Interstitial locations
LEGAL	LEGAL	LEGAL
	Private Formerly rural land	Public City rental/other low-cost schemes

Source: Peter Makachia

2. Quality of Housing and the Physical Indicators of Slums in Nairobi

The slum in Nairobi is commonly defined physically when ‘temporary’² materials are used in an urban setting for housing. Unlike the rural setting where traditional settlements employ earth-based and organic raw materials in shelter, the urban setting often uses industrial materials (e.g. *mabati* i.e. CGI – Corrugated Galvanised Iron sheets) including recycled metal, cardboard, timber and timber off-cuts for walling. It should be noted that most of these materials, used as roofing finishes do not infer notions of ‘temporary’ or ‘slum’. Other than in the rural setting, few urban dwellings employ grass for roofing. Instead, the common organic roofing is palm leaves (*makuti*) for urban buildings, which are rarely however, for residential use.

Closely related to the ‘temporary’ concept of slums are the more positive views of ‘permanent’³ and ‘semi-permanent’⁴ houses. The former infers the use of durable materials often cement-based like masonry for walling and the floor. The roofing would thus be anything from CGI and other sheets to tiles (clay, concrete etc), timber shingles and slates. The ‘semi-permanent’ is commonly implied when walling is not from masonry and the roofing finish is anything but vegetative/organic raw material. A further clarification of the physical state of the slum can be insinuated in the quality, propensity for wear and tear of the DU flooring. Again, this negative connotation is not commonly related to the rural dwelling that is often located on expansive land and lower population densities.

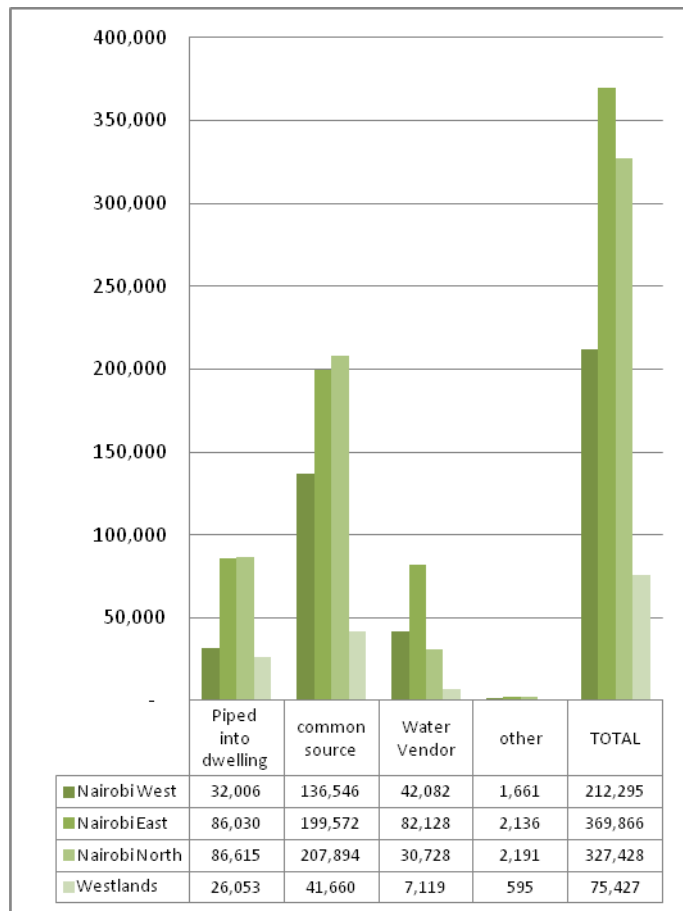
² ‘Temporary’ commonly refers to building technology of non-durable materials, often mud and wattle walling and vegetative roofing like grass, reeds and *makuti* i.e. palm leaves used for roofing materials.

³ ‘Permanent’ refers to building technology of durable materials, often cement-based, stone, and fired brick walling. These are materials that fulfil requirements of the Kenyan Building Code.

⁴ ‘Semi-permanent’ refers to building technology of a mixture of non-durable materials, often mud/timber based, paper and CGI for walls.

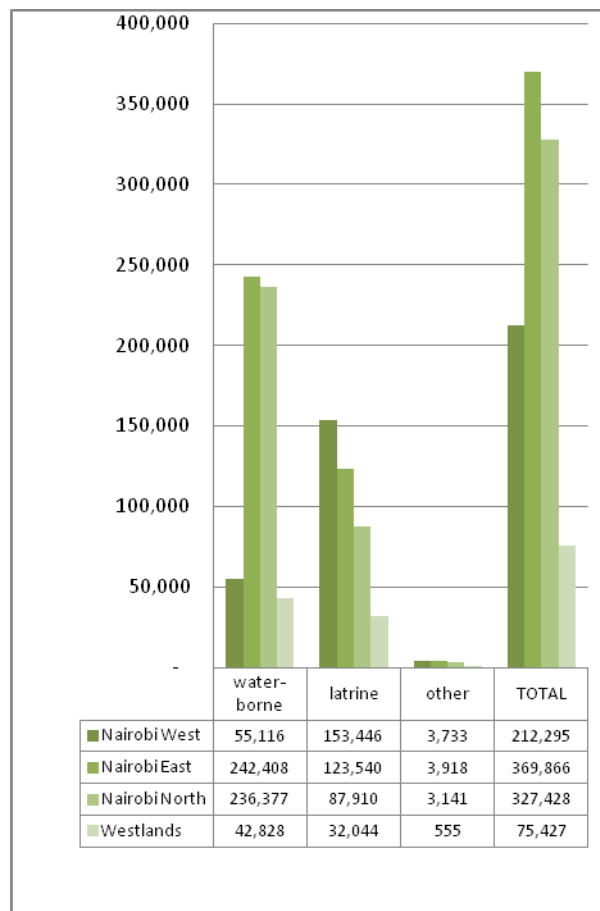
Other slum indicators relate to the mode of human waste disposal. Settlements that do not access water-borne sanitation are easily within this ‘slum’ definition for Nairobi city. However, this line is best qualified when high population densities are encountered as even some of the affluent districts like Karen and Lavington often lack these sewerage systems and rely on septic tanks and even cesspools. Another ‘slum’ indicator is the access to piped water. Slums mostly access water from communal points; either as a single collection point or from ponds, lakes, dams, streams, as well as roof rain harvesting.

Figure 1: Sanitation Type used in Nairobi Households in each district



Source: Government of Kenya, 2010

Figure 2: Water sources for Nairobi households by district



Source: Government of Kenya, 2010

These factors seen from the city of Nairobi perspective indicate ‘slums’ are not a preserve of specific residential districts but are widespread in all the city’s administrative districts. The report and Figures 1 and 2 on these indicators in Nairobi are based on the latest national census (Government of Kenya, 2010).

Thus, in Nairobi roofing is predominantly (99%) of ‘permanent’ construction from CGI, tiles, concrete and asbestos. For walling, 89% of households live in a DU with durable materials that excludes timber and earth/dung-based flooring. It is only in walling that the proportion of ‘temporary’ materials is significant with 39% of households not from masonry but from other materials that include mud-based, timber, CGI/tins and reeds/grass.

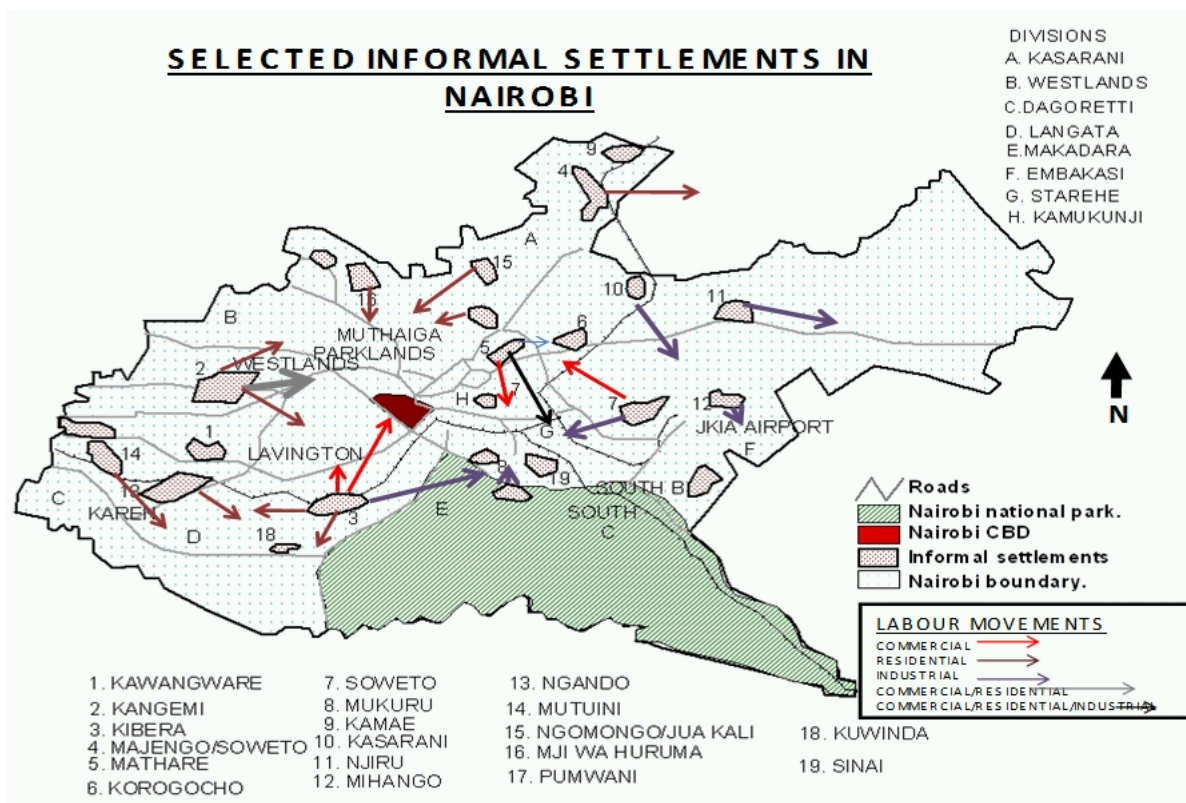
The other significant qualification is the access to modern waste disposal (Figure 1) like sewerage, septic tank and cesspools, where 59% of households are able to use the more hygienic options. The alternatives include pit latrines (ventilated or otherwise), buckets and the ‘bush’, which account for 41% of human waste disposal systems. Similarly, the slum propensity is at its highest when access to clean water (Figure 2) is considered with 60% of Nairobians accessing

water from common places like dams/lakes, ponds, roof harvesting and streams. A further 16% get water from vendors and only 23% have piped water within the DUs.

3. The Case Study Villages

The total number of informal settlements keeps changing as some new settlements emerge near construction sites, factories, acquired land parcels from formerly private/agricultural land (northern periphery) or ranches (eastern zones) close to the city by LBCs and cooperatives. Villages within the settlements have never been documented and remain numerous and are fluid in number. Rapidly urbanizing peripheries also include the western zones which were predominantly private freeholds but are now developing housing to capitalize on the city expansion. The southern city periphery is spared by the protected National Park. Figure 3 shows the location of the city's informal human settlements.

Figure 3: Location of selected informal settlements in Nairobi



Source: Syagga, 2001

a) *Mihang'o Settlement: Slum on Quasi-legal Cooperative land*

Located on the eastern periphery of the city, bordering Kayole Site & Service (S&S) Scheme, Mihang'o is an image of a transforming settlement from unoccupied open land to settlement formation. This is typified by temporary dwellings mixed with semi-permanent and permanent modern structures. They are however informally contrived. It accommodates both owner-occupiers in nuclear family DUs and tenants in row room-housing. The tenure is of private ownership by individuals, acquired through a land-owning cooperative society, the Dandora Cooperative Society (Mihang'o-Ruiru plot-owners). The increasing prominence of permanent DUs reflects the increasing investment values and hence the formation of an urban human settlement.

The DU-technology was a mixture of temporary, semi-permanent and permanent structures (Figure 4). However, permanent structures were becoming more prominent due to relocation, into the settlement, by plot-owners. At the time of the survey in 2004, it was home to about 2,000 people. Among the services, water was available on site and some dwellers had illegal connections from which they sold water to others. No paved carriageways existed and storm-water drainage was not available on site (Figure 5). For domestic energy needs, no electricity was available on site and the dwellers used other means of energy including charcoal burners (*jiko*) for cooking and kerosene lanterns for lighting.

Figure 4: Ill-defined DUs in Mihang'o



Source: Author, 2005

Figure 5: Main road through Mihang'o



Source: Author, 2005

Though private at the time of the survey, no title deeds had been issued to owners and this accounted for the less-than active resettlement by plot-owners. It was felt their issuance would give the dwellers a sense of belonging hence the license to take better care of their environment. The second desirable intervention was the provision of trunk services which would further enhance values of individual plots and an improvement of dwelling types. Seemingly, this was a settlement in its formative stages and would soon upgrade with the provision of services.

The openness of the settlement did betray typical slum models, even if the physical DU image was poor.

b) *Mukuru: Illegal Squatting Slum*

Mukuru means 'valley' in the Kikuyu language. This valley along Ngong' River has difficult terrain, is prone to flooding and is largely used as a dumping site. The whole scheme consists of a group of 11 villages. The settlement dates back to colonial times and its dwellers are heterogeneous and from diverse ethnic backgrounds. Mukuru slum is located within the inner city and borders the Industrial Area to the North and East and South B housing estate to the South and West. The two maps in Figure 6 show the location of the settlement. Land is owned by the government or private corporations/individuals.

Figure 6: Location map of Mukuru

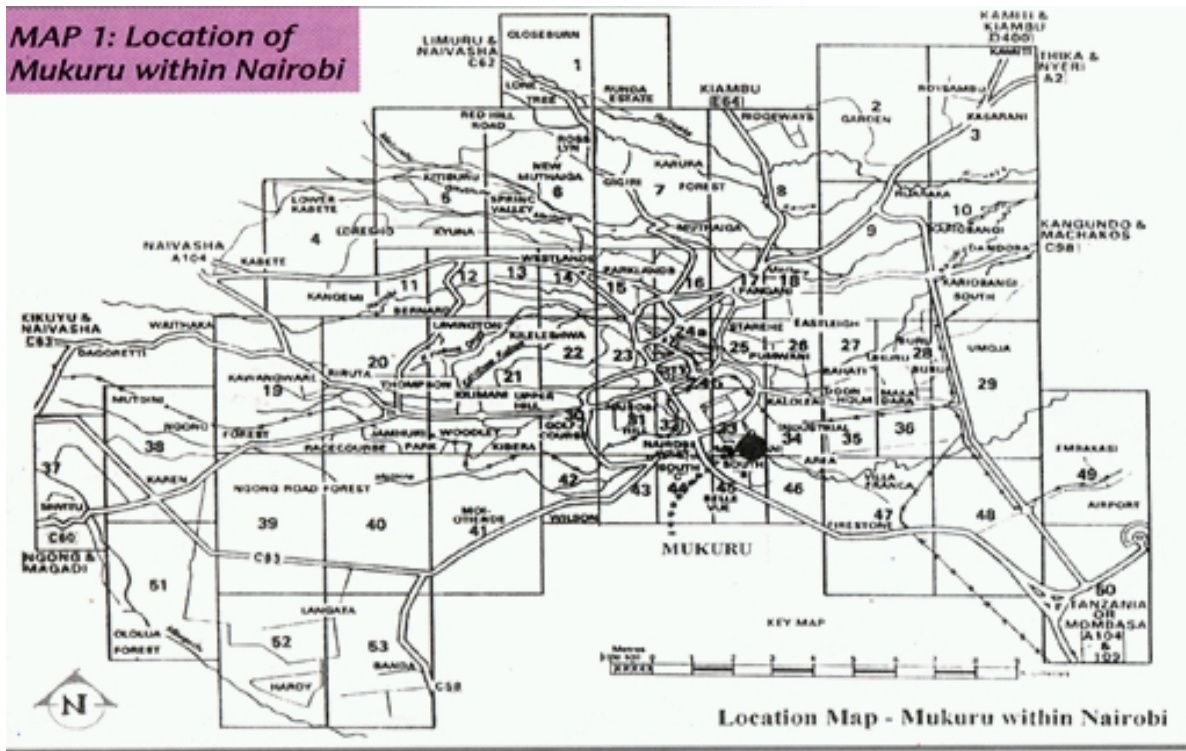
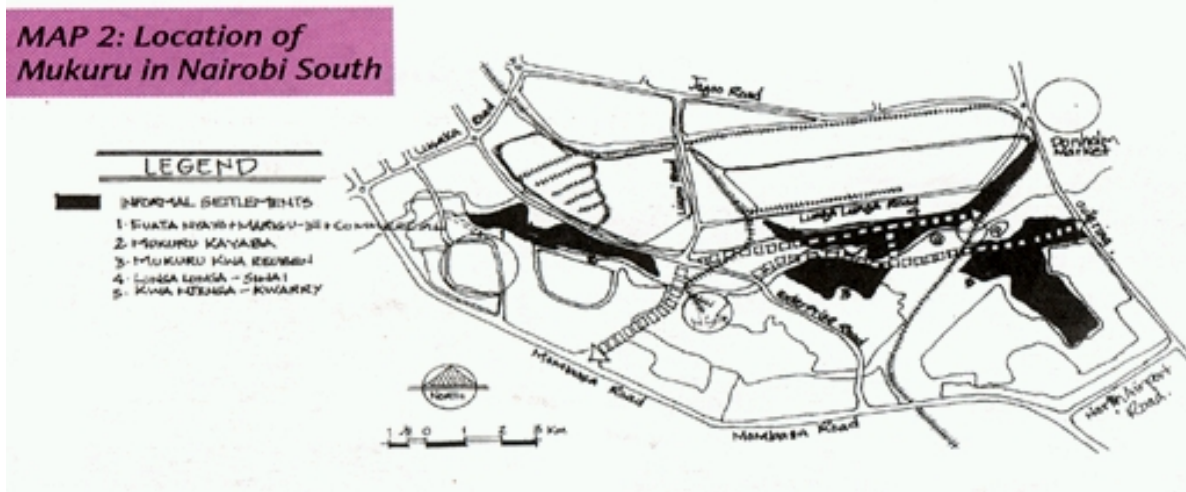


Figure 1: Base Map for Southern Nairobi



Source: Author, 2004.

Large sections of the populace of Mukuru are tenants to slumlords who have developed the predominantly ‘temporary’ DUs. These DU-types are mainly of timber walling and CGI roofing. Semi-permanent (mud walls and CGI roofs) and permanent (stone walls) structures are rare. Most DUs have cement-screeded floors. Room-dimensions averaged 2.5 to 3 metres, defined using timber framework while the floor was mostly rammed earth. The DUs were aligned in rows of rooms and were separated by a passageway of up to 2 metres. The passage

also served the purpose of disposal of foul water, laundry work and as play space for children. There was no evidence of edge-definition of 'owned' territory (Figure 7).

Shared water points, owned by the slumlords, were observed in open but narrow courts in-between the structure. Residents bought the water at 1 Kenya Shilling (KSh) per 4-litre container (USD 0.05)⁵. There were no sewer-lines and garbage dumping was into the Ngong' River, traversing the settlement (Figure 8). Human waste disposal has been the main concern of any external body concerned with addressing the Mukuru situation.

Figure 7: Mukuru - Use of timber for DU walls



Source: Author, 2005

Figure 8: Mukuru - Sewer lines not present and solid waste dumping in Ngong River

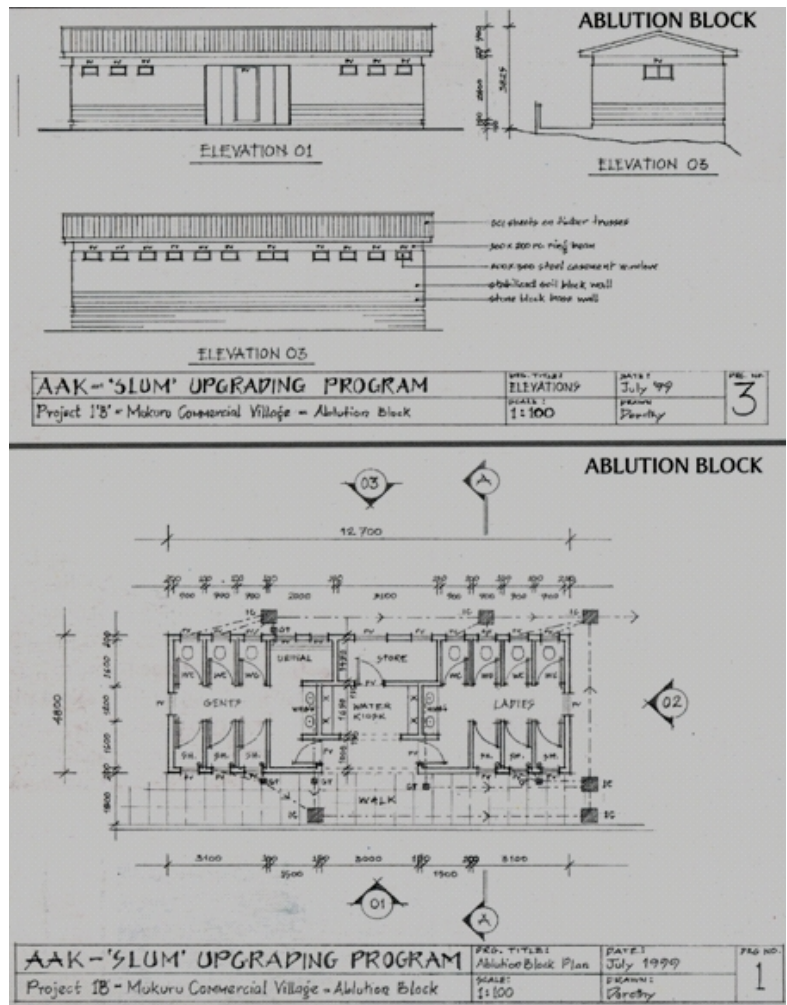


Source: Author, 2005

Figure 9 illustrates drawings of a proposed commercial toilet block by Architectural Association of Kenya (AAK) in 1999 in place of the common makeshift alternatives (Figure 10). The high density, coupled with the lack of proper sanitation was the most perverse image one got from Mukuru. This could have been promoted by the illegality of squatting on public land and demand for shelter in proximity to the employment source of Industrial Area.

⁵ 1 USD = 93 Kenyan Shillings (September, 2011).

Figure 9: AAK proposal for Mukuru ablution block



Source: AAK, 1999.

Figure 10: Informal community toilets



Source: Peter Makachia (2005)

c) *Sodom Village: Slum on Freehold Tenure*

Sodom is part of Kangemi slum which was incorporated in the city boundaries after independence. This slum sprouted to quench demand for low-income rental housing in the city and as the interplay of the city with its high-income neighbourhoods of Loresho, Mountain View and Lavington. The informal housing was provided by the land owners from their rural homesteads hence remain freehold tenures acquired through inheritance. Sodom is located approximately 12 km from the Central Business District (CBD) off Waiyaki Way (Figure 11), in a swampy lot below Kangemi shopping centre. It neighbours other villages such as *Kitoka, 23, Dallas, Shienyu ni Shienyu, Shangilia, Express, 84* and *Bottom-Line*. A significant proportion of the original dwellers lived within the compounds with tenants and they practiced subsistence farming (Figure 12) especially in uninhabitable parcel sections.

The mixture of traditionally owned dwellings and those for tenants has generated rows of single/double roomed rental DUs with land owner dwellings at one end, creating courtyard typologies (Figure 12). Other layouts show detached owner-DUs separated by an open court used for shared activities such as laundry and meetings. Storied masonry units have been put up by more affluent landowners. Such apartments are better serviced and therefore cost more to rent (Figure 11). A few commercial typologies were observed where shops were located at the ground level, with the residential DU on the upper level.

The village had high DU density (Figures 11 & 12) with over 200 units per hectare. Each room unit housed a family-use module, and at most two such units could be used by a family. Such families include parents with 2 – 4 children, single parents with children, and even single people who shared row room housing. DUs were mainly ‘temporary’ and erected variously from CGI (walling/roof) or timber board walling.

Figure 11: Sodom from Waiyaki Way



Source: Peter Makachia (2005)

Figure 12: Green space and urban agriculture in Sodom



Source: Peter Makachia (2005)

Monthly rents depended on the unit typology and the services provided. For instance, an un-serviced bungalow DU attracted KShs 1,000 (USD 11) monthly while KShs. 3,000 (USD 32) was the monthly rate for the serviced flats. The CCN was unheard of with regard to services and as such the residents maintained their own areas. Garbage collection was neglected and water

was available only on given days of the week at the land-owners direction and discretion. Outside this arrangement were vendors selling water at KShs 3 (USD 0.03) per 20-litre Jerri-can. Some social amenities, available in Sodom, were provided for through private initiatives. Vigilante groups provided security in addition to a Kenya Police presence.

Open drains that also function as “irrigation channels” for swamp agriculture were observed. Footpaths linking the highway with the greater Kangemi were littered with garbage. Without sewerage provision, sanitation was mainly by pit latrines. Within Sodom, all roads were un-graded and earth-based but linkages elsewhere were through public transport minibuses (*matatus*) that plied tarmac roads to the rest of Kangemi and the CBD. Electricity was available along main market streets and also where commerce was concentrated. Lack of serious positive investment in the physical environment on the privately owned land defeated conventional logic, although evidence of gradual upgrading was in the offing (conspicuous with the permanent blocks of flats sprouting from the rest of Kangemi, beyond Sodom).

d) *Majengo Pumwani: The TOLs of the ‘Swahili village’*

The location of Pumwani was where indigenous Africans were first ever permitted to erect DUs based on an African typology; the Swahili type (Stren, 1978). A few postcolonial projects have been undertaken aiming to delete the negative history of African urbanisation but none manage to eliminate the physical and social presence of Pumwani, or more precisely – the Majengo slum. The name *Majengo* originates from Swahili word meaning “constructions”. Majengo was initially at the peri-urban location of the city, and with time it became closer to the CBD. Land in Majengo is owned by the government and was allocated in 1941 as ‘stands’, where dwellers were provided water points, defined plots, a circulation network and drainage. Indeed, it was a ‘site and service’ scheme in the colonial era. The plot or ‘Stand’-occupation was by a Temporary Occupation License (TOL).

The Swahili DU-type based on the coastal/Islamic lifestyle (Hake, 1977) was initially constructed using mud/wattle walling and CGI or other metal sheet roofing. It is multi-faceted in use (commercial/residential), occupation (single/extended-family or tenants) and in construction technology (temporary/semi-permanent/permanent). Moreover, it is transformable to accommodate more rooms but sharing a common ‘wet service core’ (Makachia, 1995; Shihembetsa, 1995). A typical room in a Swahili house⁶ was used for living, dining, storage, entertainment, visitors, bathroom and commercial activities. It is a 4 by 3 metre room with 1 by 2 metre bed-space.

Most are crowded with different family members of all ages and gender. The DU corridor is a versatile space that acts as a transition between the street and the room and it is used as a multi-family kitchen and laundry space. Other uses include: a sleeping space, storage and social meeting area during funerals. The streets (Figure 13) act as meeting points for commercial activities, play and relaxation. However, the houses abut each with narrow in-

⁶ A multi-family house typology commonly used along the East African coast and was the only African dwelling typology permitted in urban settlements in East Africa (Stren, 1978).

between corridors (Figure 14). Water points are communal and act as socializing points managed by vendors who charge for the commodity. The foul water drains made of concrete or stone blocks are located between the DUs and the major streets. CCN public toilets, built from permanent materials are evenly spread in the settlement.

Figure 13: Majengo streets houses



Source: Peter Makachia (2005)

Figure 14: Majengo - Narrow spaces between multiple pitched CGI roofing



Source: Peter Makachia (2005)

Sadly, communal bathrooms lack water and are mostly used as urinals. The WC cisterns are long-damaged and the toilets are but ‘pour-flash’ systems. The settlements demonstrate some long-held space-use values despite its crowding, physical and social depravity. Efforts of translocation of the dwellers into modern flats came a cropper more than once during the postcolonial era. This came with erection of the California Flats in 1969 and the National Housing Corporation (NHC) apartment projects in 1980s to date. These alien typologies offer solutions outside of the income brackets of the original dwellers. Further they create alien spaces in the high-rise ‘street’ that counters the socially more amenable horizontal streets in the original Swahili Majengo.

e) *Kaloleni: Informalisation of the Formal*

Kaloleni is located on the Eastern part of Nairobi, about two kilometres from the CBD. It is now an inner city residential neighbourhood because of the rapid expansion of the City. Constructed between 1945 and 1948 (Ogilvie, 1946; Hake, 1977; Nevanlinna, 1996 and Anderson, 2002) through colonial grants, it is now a CCN rental housing scheme. The CCN owns 27 residential estates in Nairobi (Olende, 2001).

Kaloleni has been described as a ‘model neighbourhood unit’ (Hake, 1977, p. 56) and was developed to house the native Kenyans following the recommendations of Mortimer who chaired the African Housing Committee (Mortimer, 1946; Ogilvie, 1946) that was tasked to address African urban housing needs. The estate was located on an expansive open layout aimed

at creating environmentally suitable spaces. However, the DUs were small, between one and three rooms and an adjoining ablution/kitchen unit. These features were catalytic to extension in two ways: first the open un-alienated space was appropriated by the dwellers for expansion of the domestic space. Secondly, this expansion was instanced by the paucity of the space within the provided DUs that proved inadequate for the households. It is common to assert that the resulting physical quality was due to the continued ownership of the estate by the CCN. Nevertheless, the villages (in the present study) illustrate that this is hardly the case, and the physical depravity is best viewed as a transitory state.

The main feature of estate-wide DITs was accommodation of commercial and social functions. However, close to the DUs are residential extensions that also mirror the slum image of 'temporary' technology. The most obvious transformations observed in the estate were informal-use activities and erected from 'temporary' technology (Figures 15, 16 & 17). Other features included transient activities like hawking commonly housed within temporary stands and locations, scattered estate-wide. This type of kiosks dotted circulation nodes and the estate's edges (Figure 17).

Kaloleni's transformations were informal and used temporary materials creating a slum aura. This sadly typifies most public rental housing within the city. Motivated by the economic gain and encapsulated in physical form, transformations by dwellers were a choice that realised the slum conditions that now define the estate. The extensions create higher density neighbourhoods from the 'temporary' technology and further congest the infrastructure including water and sewerage system.

Figure 15: Inside extension courts



Source: Peter Makachia (2005)

Figure 16: 3D model



Source: Peter Makachia (2005)

Figure 17: Kiosk extension



Source: Peter Makachia (2005)

A social feature of the Kaloleni DITs was to create a new socio-physical entity in a mini-court to redefine the expansive courtyards in the clusters. Thus, the findings show a breakdown of cluster level community action and the emergence of this newer physical socio-economic entity around the unit as illustrated in Figures 15 and 16. This however was often of deprived physical quality and further ‘slumified’ the neighbourhood (Figures 15, 16 and 17).

The unique aspect of the Kaloleni depravity was the economic dimension of the social rental dwelling strategy in public housing. This was rooted in the fact that the rents were highly subsidised which made the units attractive for the low-income bracket and were in close proximity to the Industrial Area and the CBD. This lent the DUs suitable for sub-letting and created a new layer of ‘land lord’ tenants, possible from the extended houses.

The sub-tenant arrangements in rental housing have earlier been reported from Kenyan urban rental housing market (Andreasen, 1987). In the Kaloleni case sub-letting was mainly realised in added spaces. This was largely because the provided spaces were not adequate for the household size. The tenancy arrangement meant the added units were of low technological value since the property was still owned by CCN. By commission or omission, the utilitarian and pragmatic solutions by dwellers in Kaloleni have succeeded in qualifying the scheme as a slum out of the social rental scheme it was meant to be. The solution may be inherent in bestowing more rights to the dwellers. The evidence may not be obvious given the lessons from other low-income schemes.

Conclusion

The case villages are but a synopsis of the physico-environmental conditions prevailing in the informal settlements of the city of Nairobi. Common to all is the informality in the technology employed in the dwelling forms, settlement development, circulation arteries, and services provision. Significantly, despite the variety of tenure options, the results cascade towards the same slum physical formations of depravity in the use of transient technologies. This demonstrated the limits and extents of physical functionality for the economically stretched populations.

At the dwelling unit level, the multi-functional nature of the dwelling space within the rooms implied the need to permit flexible spaces in the design of dwelling rooms for the low-income. Indeed, the functional separation whose objects are often privacy and exclusivity within separated room-spaces was reduced to non-importance. This functional depravity was further reiterated in the technological depravity of the DUs, often manifested as 'temporary' technology of CGI that was environmentally vulnerable and amenable to arson attack or fire accidents.

At planning level, the layouts were mainly dense with narrow passageways which demonstrate the extremities of common space use. This was further compounded by the dangers in the event of natural and man-made hazards in the slum conditions of Nairobi. Key to the layout is access to services of water, sewerage, foul- and storm-water drainage. The evidence in the slums hardly points to a solution from within the settlements.

However, it is imperative that we look at some pointers to the root causes of the problematic tenurial status of the settlements. Indeed, most of the cases were rooted in informality of squatting on public or private land. Those that were of legal and private tenure hardly demonstrated more regulated conditions.

At layout level, in Sodom, the separation of the owner-occupied dwelling and the tenants showed some modicum of respectability. Indeed, the shared spaces were for the services like water supply and the pit latrines and these were often intervened by a decent open space and/or passageway. Whereas the rental typology was composed of linearly aligned row-rooms, the owners had DUs for a nuclear family set-up. This however created hierarchical values of owner and tenant which do not augur well for harmonious settlement formation.

The lesson that emerges therefore is, increased security of tenure accords territoriality within the control of the plot-owner, a condition not possible within the illegal dwellings of the government land inhabited through squatting e.g. in Mukuru. In the quasi-legal dwellings such as in Majengo, one noticed the use of the Swahili compound form to accord some semblance of spatial order with hierarchical orders, separating owners from dwellers and the shared amenities.

The cultural roots of the rationale can be exploited fully with other housing rights. Unlike the rental typologies, the culture of sharing demonstrated in the Swahili typology should be emulated across the board in determining the DU typology for low-income settlements. Indeed, the linear row DUs, unconfined within a shared territory led to the dysfunctional relationships

amongst dwellers common in the slums. This emanates from the lack of tenure and the squatter mentality, best exhibited in Mukuru.

The security of tenure that implies freehold titles is not an obvious solution to the removal of slums. Instead a modicum of respect for dwellership in the form of enhanced tenancy rights, for instance, may offer more respect for positive physical qualities in slums and other low-income settlements. For both tenants and structure owners, the quality of the environment is only assured with this enhanced security. For the owners, access to market finance instruments will be easier; while for the tenants, better quality of the environment is assured with increased rights.

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