TRANSFORMATION OF HOUSING IN NAIROBI

Dweller Initiated Transformations in Formal Housing in Nairobi Estates with Case Studies of Kaloleni and Buru-Buru Estates

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy of the University Of Nairobi

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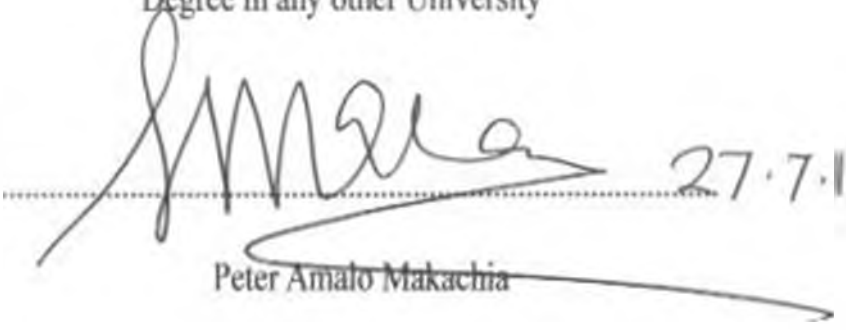
DECLARATION

This Thesis is My Original Work and has not been presented for a

Degree in any other University



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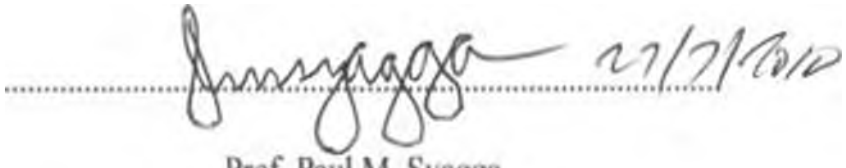

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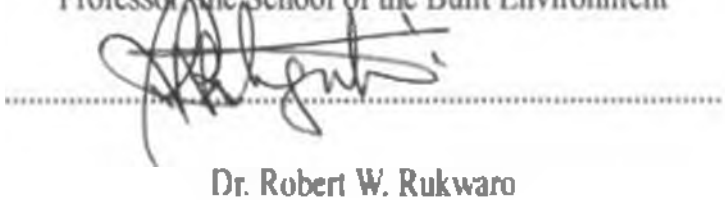

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ACRONYMS AND ABBREVIATIONS

AARH:	Agency for the Administration of Rental Housing, Ethiopia
AHO:	Oslo School of Architecture (acronym in Norwegian)
BIBYS:	Norwegian academic library system (Nordic acronym)
CAE:	College of Architecture and Engineering
CARDO:	Centre for Architectural Research and Development Overseas
CBD:	Central Business District
CBS:	Central Bureau of Statistics, Kenya
CDC:	Commonwealth Development Corporation
CGI:	Corrugated Galvanised Iron
CHB:	Central Housing Board
CIAM:	International Congress of Modern Architecture (French)
DABS:	Department of Architecture and Building Science
DDA:	Delhi Development Authority, India
DIT(s):	Dweller-Initiated Transformation(s)
DSQ(s):	Domestic Servants Quarter(s)
DU:	Dwelling Unit
DURP:	Department of Urban and Regional Planning
DUT:	Delft University of Technology
E-B:	Environment and Behaviour
GFCF:	Gross Fixed Capital Formation
GIS:	Geographical Information System
GNP:	Gross National Product
GURU:	Global Urban Research Unit, University Of Newcastle, UK
HABITAT:	United Nations Centre for Human Settlements
HABRI:	Housing and Building Research Institute, University Of Nairobi
HBE:	Home Base Enterprise
HDM:	Housing Development and Management, Lund University
HELB:	Higher Education Loans Board
HRDU:	Housing Research and Development Unit
JICA:	Japanese International Cooperation Agency
KES:	Kenya Shillings (78 KES = 1 US$ by end of the survey, 2010)
KPLC:	Kenya Power and Lighting Company
KUL:	Catholic University of Leuven (Flemish)
MMI:	Mutiso Menezes International (consulting Architects)
NCC:	Nairobi City Council
nd:	not dated
NGO:	Non-Governmental Organisation
NHC:	National Housing Corporation
NTNU:	Norwegian University of Science and Technology
NUC:	Neighbourhood Unit Concept
NUFU:	Norwegian Council for Higher Education (Norwegian)
NUSG:	Nairobi Urban Study Group

PC:	Plot Ratio
PR:	Plot Ratio
RA:	Residents' Association
RC:	Reinforced Concrete
RCMRD:	Regional Centre for Mapping of Resources for Development
RoK:	Republic Of Kenya
SAR:	Stichting Architecten Research (Dutch)
SBE:	School of the Built Environment
SEARCH:	Southern and Eastern African Research Cooperation for Habitat
SoK:	Survey of Kenya
StAD:	School of the Arts and Design
SUC:	Starter Unit Concept
TP:	Tenant Purchase
TW:	Thornton-White
UDE:	Urban Design Element
UoN:	University of Nairobi, Kenya
WC:	Water Closet

***Kiswahili* words used in the work**

Baraza	public meeting
Baraza	meeting
Debe:	tin cans
Fundi:	artisan/technician
Gorofani:	storeyed building
Jua Kali	informal industry/trade (euphemism)
Mabati:	Corrugated Galvanized Iron (CGI) sheets
Mkokoteni	handcarts
Sukuma wiki:	kale (collard greens), a vegetable (euphemism)

Notes

- **Names:** No names of respondents used in the cases are real to protect their privacy.
- **Photographs:** all photographs marked 'survey, 2010', used in the work were taken by the author. Sources of others are acknowledged.
- Drawings:
- All graphics marked 'survey, 2010', used in the work were sourced from the field during the study.
- All graphics marked 'author, 2010' , used in the work were constructed by the author during the study
- All other graphics are acknowledged and the date of the source shown
- Tables and Charts:
- All tables marked 'survey, 2010' were constructed by the author from the field data
- All other sources of tables and charts are acknowledged

DEDICATION

DEDICATED TO MY PARENTS

ANDREA AND LUCIA

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ABSTRACT

Dwellers in public housing undertake transformations that lead to compromised environments in housing neighbourhoods. Architectural strategies do not envisage this trends and this had led to questionable environmental qualities. The study investigated these strategies and their contribution to the prevailing scenario. A literature study explored theoretical writings and empirical work from within Kenya and elsewhere. Key to these studies was the three tenets of social, economic, and physical attainment as central to the dweller's efforts for functional fulfilment. However, the physical spatial aspects of the strategy used, found wanting were least explored in these readings, and this formed the basis for the study's conceptual framework. Case study estates of Buru-Buru and Kaloleni in Nairobi city formed the location of the empirical investigation. Qualitative and quantitative data that used various techniques including questionnaire and semi-structured interviews, digital photography and mapping, measurements and analyses of project and archival drawings, which were analysed using both qualitative and quantitative techniques. The findings confirmed the prevalence to the phenomenon within public housing schemes and the different perceptions dwellers attached to physical, social, and economic values in dwelling neighbourhoods. The study confirmed that despite the need for social and economic attainment in the neighbourhoods, the physical strategy surpassed the others as the basis for the quality of transformations. The conclusion was that the architectural strategy should factor the physical space necessary for the inevitable transformations. Recommendations included physical strategies and possible models.

1 THE INTRODUCTION

1.1 The Background

This study is about urban housing in a Third World city. It investigates its unsanctioned production through the dwellers' own initiatives. Situated in Kenya, the study offers vivid directions on the drivers that guide the phenomenon. Referred to as Dweller-Initiated Transformations (DITs), they provide dwellings that aid in bridging the deficit in formal housing stocks. The context is formal housing estates whose genesis was the production strategies of public institutions.

The country has served as a laboratory for a variety of these housing strategies throughout her life as a nation state (Syagga, 1979) (Makachia, 1995) (Syagga, 2003), whose results, however, have hardly matched the need and demand for decent housing of her ever-growing urban population. The common denominator of these strategies is their origins from the centre, which mostly downplayed the grassroots' positions.

Kenya's population of 37.2 million in 2007 (Republic of Kenya, 2008, p. 113), who live on a finite 569,250 square kilometres of land is urbanising rapidly but with no commensurate resources and urban services. Although, the urban population, projected at 32% by 2012 (Republic of Kenya, 2008, p. 114) is modest as compared to other regions, its growth rate and its distribution are more troublesome.

For instance, the capital city, Nairobi, with an official[1] area of 684square kilometres, and a population of about 2.1 million, is home to 7% of the national population. This represents 23% of the total Kenyan urban population. This growth of city's population is increasingly being attributed to natural factors (Riley & Wakely, 2005), unlike earlier trends that was largely about rural-urban migration. This implies an increasingly urban youth population, consuming spaces in neighbourhoods that they were born in, and helped form. Urban sprawl, informal settlements (Republic of Kenya, 2008)and formal housing transformations are some of the manifestations of this urban space.

Housing shortage is a direct consequence of the increasing urban density. One hundred and fifty thousand (150,000) houses are required annually, and yet only 35,000 (23.5%) are produced (Republic of Kenya, 2008). This production favours the affluent and works against the poorest urban dwellers, with under-investment in low and lower-middle income housing. Thus, only 6,000 (about 20%) of the houses produced target the low-income class, and yet the shortage disproportionately affects this group who require 48% more dwellings (Republic of Kenya, 2008, p. 115)[2].

Housing is a significant contributor to world economies with 4-8% contribution to Gross National Products Skotte, 2004, p. 43). In Kenya, for

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[1] This excludes the urban sprawl area (estimated at 10,000KM²) and the new metropolitan area, covered by the Ministry of Nairobi Metropolitan Development (created in 2008) which covers local authorities in the geographical vicinity.

[2] This situation was compounded early 2008 by the post election violence where many people lost their dwellings driving thousands to temporary Internally Displaced People camps. Nairobi, for instance, lost 9000 houses mainly in the slum areas, where the poorest live (RoK, 2008, p. 115).

instance, the construction sector[1], contributes between 2-8% per annum to the GNP. It is a leading contributor to Gross Fixed Capital Formation (GFCF) of between 10-30%. Further, investment in housing has a high 'multiplier' effect, reputedly as high as seven times of the initial investment. At the dweller level, it remains the household's most significant investment. However, the figures are heavily skewed in favour of developed countries where in Germany, for instance, housing contribution to GFCF stands at 30% (Skotte, 2004). This leads one to conclude that the potential contribution of housing in poor economies like Kenya is high, and this remains largely un-exploited.

1.2 The Problem Statement

The study is about how strategies in housing have influenced and contributed to the dwellers' actions. It is about the appropriate approach dwellers may adopt to manage this seemingly unavoidable housing production mode. The self-propelled transformation phenomenon is thus laudable for the attempt to bridge the housing gap, but is also condemned for the emergent environmentally wanting neighbourhoods.

The work comes in the wake of shifting housing production paradigms since the 1960s, away from the prescriptive approach, (the 'provider' strategies (Hamdi, 1991), whose genesis was Modern architecture (Frampton, 1992)[4]. The study is in the era of societal and institutional liberalisation[5], which had

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[1] that includes housing production.

[4] This was an ideology of universalising architecture, including housing, based on a mid-European template (Frampton, 1992).

[5] Conforming to mandates, like curbing public expenditure, tax reforms and privatisation of utilities, were part of Structural Adjustment Programmes (SAPs) advanced by the Breton Woods institutions in the 1980s

over spilled into housing production in Kenyan urban settlements. This has led to unforeseen neighbourhood functional mix and a consequent breakdown of any objective land-use zoning. For instance, this has led to proliferation of un-envisaged trade and other home-based enterprises (HBEs) in residential areas within the space generated in dweller-initiated housing transformations (DITs).

Transformations[6], manifested as spontaneous physical additions and modifications, are thus also functional where the dwelling assumes uses not hitherto envisaged. In Nairobi, transformations have resulted in estates sated with compromised aesthetic, congestion, and environments devoid of desired physical comfort and social privacy levels. The unilateral process has also lead work environment safety concerns and about the health effects of the dwellers. As Radford and Gero (1988) affirm, design in architecture, is 'a goal-directed activity in which decisions are made about the physical form of buildings and their components in order to ensure their fitness for intended purposes'. A design strategy for housing sets quantitative and qualitative goals and proposes spatial methods of attaining them. Indeed architectural design as an activity is often defined as a 'purposeful, goal-oriented search' (Markus 1972, 13) for physical and spatial solutions to problems within a resource envelope

Physically, these DITs are ill-lit, poorly ventilated, acoustically and environmentally polluted neighbourhoods (Ndung'u, 2008). They also are devoid of basic environmental amenities like solid waste and sewage disposal

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in the 1990s (Bohman, 2006) (Hewitt, 1992) for poor states to attract western funding. Others were deregulation of markets for production and services as well as trade liberalization (King & Mc Grath, 2004)

[6] Tipple (1992) defines transformations as "... an alteration or extension involving construction activity and using materials and technology in use in the locality" adopted in this work

(Huchzermeyer, 2006). Socially, reduced privacy and recreation space are some of the functional anomalies that now prevail. Transformations emerge on spaces reserved for common community or shared domestic use like open spaces on or outside the plot, actions that are often compromising to the environment.

From an investment perspective, a likely consequence is the lowered economic value of the houses; evidenced in middle-income housing like Buru-Buru (Gitau, 1999) and Koma Rock Estate (Ochieng, 2001).

Through commission or ommission, the architectural strategy used in formal housing contributes to the products. The strategy avails space and occasion which invites the dwellers to physically transform the dwellings provided and designer-projections of the living environments. The basic problem clearly is that the strategies do not envisage the transformation eventuality and that this culminates into the dysfunctional neighbourhoods now commonplace in formal housing.

Using the case of Kaloleni and Buru-Buru estates, the study was an explicit exploration and a reflection of strategies adopted in the design of housing and the inherent failures/successes culminating in undesirable or desirable dweller-initiated transformations.

1.2.1 Research Proposition

The research proposition was that housing strategies adopted in formal housing do not address the physical, social, and economic functional demands

for the target group among the urban dwellers leading to compromised quality witnessed in dweller-initiated transformations.

1.2.2 Aims and Objectives

The aim was to investigate how architectural strategy contributes to dweller-initiated transformations in formal housing. The objectives were then:

i. To identify the magnitude of transformation that emerge in Kaloleni and Buru-Buru estates,
ii. To identify the type of transformation that emerge in Kaloleni and Buru-Buru estates,
iii. To identify the contribution of the design strategies in the emerging housing transformations,
iv. To investigate the contribution of the design strategies in the emerging housing transformations,
v. To evaluate the contribution of design strategies has in the emerging housing transformations,
vi. To determine the architectural strategies which support the dwellers' spatial initiatives in formal housing transformation

1.2.3 Research Questions

Supporting research questions were then as follows:

- What was the magnitude of dweller-initiated transformations in Kaloleni and Buru-Buru estates?
- What was the type of transformation in Kaloleni and Buru-Buru estates?

- What was the contribution of the design strategies in the emerging housing transformations?
- In which ways did the architectural strategies used support the dwellers' spatial initiatives in the transformation of formal housing?

1.2.4 Justification of the study

The justification of the study was that no studies succinctly focussed on the architectural strategy as contributory to the dweller-initiated transformations in formal housing. It was therefore necessary to highlight strategic themes in conventional housing design and illustrate how they contribute to the transformation phenomenon. The focus on architectural strategy would aid in the design and policy formulation in housing production applicable to the formal housing sector.

1.2.5 Scope and Limitations

The study's scope reflected the architectural disciplinary background of the author and investigated housing generated through formal architectural practice through policies. Thus:

- The case study estates housed Upper[3] Low-Income to Middle-Income urban populations
- The genesis of the projects was public institutions using formal procedures, and
- The focus was the architectural and urban design of the dwelling as a building unit[4].

[3] Not the poorest, as their result in informal settlements on Kenyan [illegible] (Huchzermeyer, 2006, p. 4)

The limitations included time and resources to investigate more cases representing more architectural strategies.

1.2.6 Assumptions

The assumption was that prevailing demographic, economic, and human settlement parameters remain unchanged for the near future. For instance, that:

i. Current urbanisation demographic trends of rapid growth not matched by economic growth will persist,

ii. The scarcity of state financial capital for housing the city's majority will persist,

iii. The role of architectural strategy was benign; i.e. to optimise these scarce resources so as to realise a broader positive economic impact in formal housing production for the urban citizenry, and

iv. Dweller-initiated transformations help increase the housing stock for the city's majority dwellers needed in the absence of formal production alternatives.

1.3 Structure of Thesis

The thesis is in seven chapters, together with the front and the back matter. The front matter includes the Declaration, Acknowledgement, Abstract, Dedication, Tables of Contents, Figures, Charts, and Tables, used in the work. The back matter includes Bibliography and Appendices.

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[1] I.e. built form and site specific constraints and not the equally relevant component (engineering and technology), infrastructure (engineering and urban planning) nor locational (land economics)

In Chapter 1, the 'Introduction' is the outline of the research. It situates the problem within the housing context and the Third World scenario that is Kenya. It looks at the background of the study and housing in development. The study's fundamentals including: the problem statement, justification, research proposition, aims and objectives, scope and limitations and assumptions, so far presented.

Chapter 2 is on 'Housing Transformation Studies and Theories' and is a literature review of related writings. It reviewed literature based on others' empirical work and related them to the theories on housing and housing transformations' phenomenon. The thematic approach identified the economic and social motivators for Dweller-Initiated Transformations but failed to link it to the physical strategy, leaving gaps relating to the physical contextual impetus occasioned by the architectural strategy. It concluded by proposing a conceptual model that guided the study.

Chapter 3, 'The Research Methods' discusses the methods used in the study. It starts with a philosophical background to the methods used in research generally and then focuses on the specific choices made in the work. It also elaborates the techniques and tactics used for the choice of cases and units of analyses. The representational methods for data and the practical challenges encountered in study are part of the chapter. It also presents the background to the case estates

Chapter 4 presents the 'The Case of Kaloleni Estate' It looks at the background to the estate that includes its history, its physical, as well as the

socio-economic characteristics as ingrained in the architectural strategy. It then relates the empirical findings in view of the social, economic, and physical aspects of the architectural strategy as applied in the design and management of the estate. Where appropriate, the chapter adopts both descriptive qualitative analyses as well as analytical quantitative statistical measures. The second and third parts use physical architectural constants of the (1) urban design-grouping element (UDE) and the (2) Dwelling Unit (DU) as sub-units of analysis to illustrate their impact on the emerging DIFs. A summary draws conclusive statements about the case.

Chapter 5 is about the 'The case Buru-Buru Estate'. It presents the empirical findings and a background to Buru-Buru housing estate. Both descriptive and quantitative, it highlights the key design based strategic parameters that guided the transformations. The chapter also presents transformations graphically, with some explanatory prose, charts as well as descriptive and analytical statistical charts and tables. Among the sub-units of analyses, the study employs are the Dwelling Units (DUs) and the Urban Design Elements (UDEs). A summary draws conclusions from the case.

In Chapter 6, 'The Analysis' is a cross-case comparison and explanatory frame of the empirical findings and relates them to the theoretical grounding. The chapter discusses the contribution of the architectural strategy to dweller-initiated transformations; and its positive and negative potential as identified from the case estates. It sues the analytical frame of time, place, and agency. The phenomenon is evaluated for its potential in enabling dwellers generate

good housing and convivial dwelling neighbourhoods, through a clear understanding of the economic, social and physical roles and objectives of housing.

Chapter 7 is the 'Conclusions and Recommendations' of the work. It concludes the study and evolves a proposed conceptual frame applicable to formal housing. The primacy of the physical model is emphasised through the recommendations. The conclusions refer to possible physical, social, and economic models for transformations. The chapter concludes with suggested areas of further research. Figure 1-1 is a graphical illustration of this thesis structure.

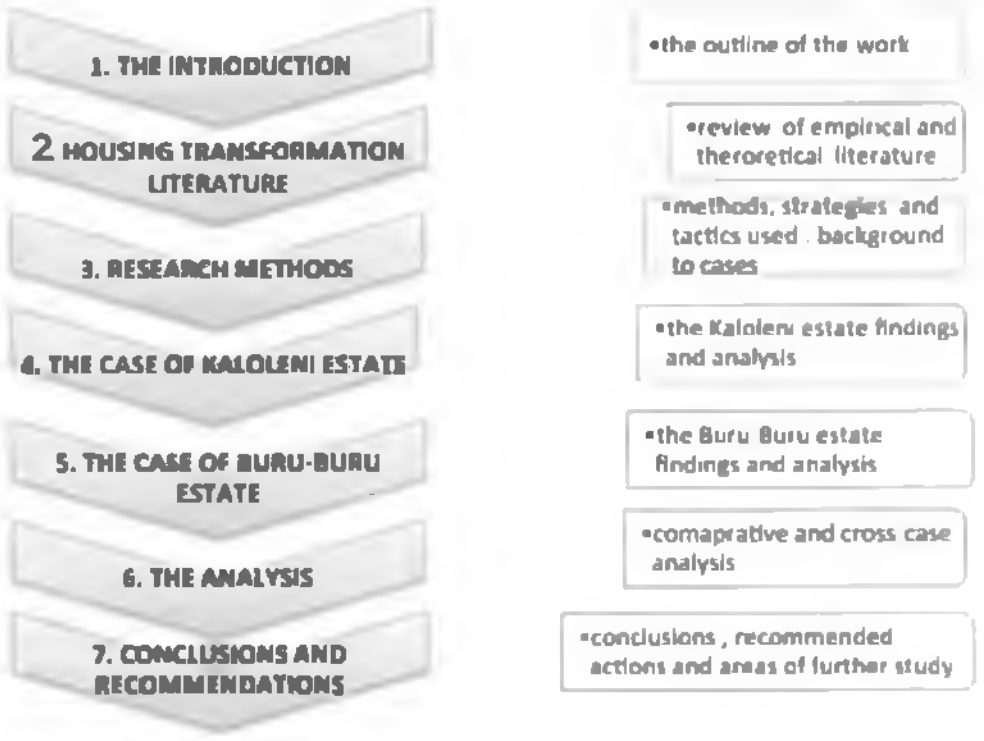

Figure 1-1 Thesis Structure
source: author 2010

2 HOUSING TRANSFORMATION LITERATURE

2.1 Transformations studies and theories[1]

The number of studies in housing transformation forged since the 1980s from Asia, Africa, and Latin America has brought to the forefront dweller-initiated transformations as an opportunity alternative to formal housing production methodology in the Developing World. The University of Newcastle-upon-Tyne's Centre for Architectural Research and Development Overseas (CARDO 1993) Reader is a compilation of most of the literature used here. Others include Nordic university doctoral theses at KTH Sweden (Nguluma, 2003) and NTNU, Norway (Tarekegn, 2000).

Hamdi's populist 'supporter' paradigm (Hamdi, 1991, p. 27) and advocacy of decentralised decision-making in housing production policies also serves as a vivid pointer to the dweller-initiated transformation model. As will be shown, this literature, significant as it is, however lacked an explicit focus on architectural strategy as a contributor to the phenomenon, which is the point of departure in the present work.

In Kenya, little housing research exclusively focuses on formal housing, leave alone dweller-initiated transformation in the housing estates. Gitau

[1] Theory here is 'scientific theory', a description of reality based on prior knowledge as captured in the transformation studies. This is unlike 'applied science theory' as a set of instructions, which is mainly technical (Mo, 2002 & 2004). This theory is research based that entails testing assertions against field data. The privilege accorded theory is questioned in this approach, whereby the empirical data found in the field instructs the theory, a position contradictory to the nature of 'technical theory' whereby if a practice fails, it is the methods that are faulted forcing the 'theory' reconnect. Indeed, in housing transformations the human actors and behaviour is under scrutiny and not natural phenomenon.

(1999), for instance, showed interest but only with regard to the real estate perspective of these transformations. The author observed that the effect of extensions in middle-income housing like Buru-Buru in Nairobi was 'to remove them from the middle income conventional housing sub-market to lower income housing sub-markets.' However, neither the author nor others quantitatively supported the assertion, and thus it remained only tentative. Other reports, mainly in the mass media, centred on the safety implications of this unsanctioned activity[10].

Shihembetsa (1993 & 1995) studies[11] on Eastlands' estates lamented the lack of involvement of the dwellers in the design leading to wanting environments. This retrospective view alienated the traditional architectural strategy, instead rooting for a more central role of the user, a position pioneered by Turner (1972)(1977)(1994) and supported by other adherents of participatory and populist housing strategies (Hamdi, 1991)(Alexander, 1985)(Habraken, 1972)(Tzonis, 1976).

Formal housing means different things to different actors. For instance, relocation into the formal house for the less affluent majority invariably signifies 'progress' to this dweller, from the original[12] dwelling. To the key production actors- developers and financiers, designers and policy makers, this is a culmination of their objectives. The designers view the move by dwellers

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[10] Safety in construction is not however reserved to unsanctioned activities as even approved building plans have cost lives due to a breakdown in the inspection roles by the Local Authorities, leading to often unethical building work procedures

[11] Having Nairobi estates of Pumwani flats and Bahati rental estates

[12] This may be an informal shelter in the urban areas, traditional dwelling in rural home, or indeed some form of squatting in others' houses

to the units as an approbation of their design effort, while policy-makers view this as affirmation of their development agenda.

Yet, as evidence from inhabited estates illustrates, it is but a genesis of the transfer of housing responsibility to the dwellers, and hardly an end. It is, but an opportunity to adjust housing demand and consumption to suit their felt needs. It recalls a classical Turner (1969)(1972)(1994) question: 'Success for whom?' On the production side, success is in the quantifiable units and space. This hardly mirrors the position of the dweller who consumes the space. The dweller's stake is overtly manifest in transformations, the changes in form and utilization of the house. Therefore, transformation studies and theories centre on this adjustment of their requirements, which are physically overt and inherently discernible in functional adjustments.

2.2 The housing mobility studies

Most transformations (CARDO, 1993)(Tipple, 2000) studies commence with Seek's (1983) study: '*Adjusting Housing Consumption: Improve or Move* . It also seems an apt starting point when addressing market driven housing mobility where we situate contemporary formal housing in Nairobi. In his studies in Australia, Seek (1983) compared moving house or transforming the same as an option for householders, and observed that typically 15% of Australians moved house annually. This compared unfavourably to 62% who transformed in this 1980 study (Napier, 2002)(Seek, 1983). This demonstrated that transforming was the main housing adjustment mode, and that this had been downplayed in policies.

He established that home improvements initiated and carried out by households emanated directly from their 'demographic and economic circumstances and the expenditure on improvement are constrained by its level of income, wealth, and financial commitments.' (Seek, 1983, p. 458). Seek stated that conceptually, housing adjustment was an outcome of two levels of decision-making:

> '[T]he first is the decision to adjust one's housing consumption and the next is the choice between the alternatives of moving or improving, or a combination of both. The first part results from a mismatch between the desired and the actual level of housing consumption; and second depends on the costs and the benefits associated with each adjustment alternative' (Seek, 1983 , p. 456)

These findings were reliant on a largely First World situation with stable household incomes and independent of the residential condition. It was in a predictable housing market and situated in a formal urban economy. It thrived in a functional private sector largely devoid of subsidised housing. The assertions seem applicable in contemporary Nairobi, but there are no such known mobility studies to corroborate. The same prevails across other Developing countries (Napier, 2002, p. 52).

Indeed, Third World household mobility studies have long been about regional translocations, often dominated by rural-urban migration. Andreasen's (1987) studies in Thika, confirmed a mind-set of the urban dweller who viewed their urban domicile as transient, and was therefore prone to translocation. That study confirmed that, in Kenya most urban dwellers rented spaces with a view of ultimate settlement in their rural, often ancestral, homes.

Such findings persuade the dwellers to place less weight on enhancement of space, preferring compromised quality (Burgess, 1982) for belated fulfilment in these country homes. The position was valid for the studies in the then urban Kenya with a large rural-urban migrant community in this early post-colonial urban profile. A reversed stance where an urban demographic profile with growth more correlated to natural factors than the rural-urban migration model (Riley & Wakely, 2005, p. 152), predominates contemporary urbanity.

The current reality is that of dwellers within the low income bracket statically linked to their housing environements due to the lack of economically viable alternatives. They thus are faced with having to adjust their housing consumption modes to match. This is also a reflection of the poverty levels, that has blunted housing consumption within Kenyan urban populations. These housing adjustment patterns in the 'immobile' tenant are often loathed by the authorities, occassionally culminating into cruel evictions and demolitions.

Another reported Third World mobility inclination is the transfer through sale by the low-income owners of purchased units[13] to higher-income speculators (Burgess, 1982)(Syagga, 2003) (Yahya, 2002). This is a highly complex situation with tranformations of the original units at the behest of the new higher-income investor. This has led to the tenement developments (Huchzermeyer, 2006) or 'container' blocks Tuts (1996) (1988) occurring at the exclusion of the original low-income plot owners. It is a purely investment trend that also excludes the tenant-dwellers.

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[13] Including site and service plots, starter Units (Makachia, 1995) and 'core' Units (Nagpal, 2002)

Huchzermeyer (2006) study on tenement blocks investiagted some of these trends but only focussed on the current dwellership in the block typology, that now dominates the Nairobi cityscape. It did not unertake mobility studies on the relocated original plot / house owners to appreciate their current housing consumption circumstances and the evolving models[14].

In the present study the selling options were limited because of the tenure and economic status of the dwellers. A further Third World rendition is the perception that the house in itself was income supplementing and thus an economic 'trigger' for transformation.

This economic dimension in transformations has had divergent outcomes. For instance, as already lamented by Gitau (1999), it was likely to lower the market value of the original middle-income housing. On the other hand, in lower income areas, it was viewed as consolidation or upgrading. This led to enhanced rent value of the houses as is the Umoja and Dandora estates (Kiamba, 1992) of Nairobi. The former case remained empirically unsupported, while the later ignored the ownership transfers. The transfers added a philosophical dimension alluding to the transfer of wealth from the poor to the less so, whose dynamics many are yet to appreciate or endorse.

However, outside of this league is Larsson's (1984)(1988)(1990)(1996) works in Botswana and Schlyter (1991)'s study in Lusaka on transformations of space and space-use of the traditional house. Their focus was on the gender

[14] Indeed some could have moved to another informal settlement, while others possibly upgrade to higher income human settlements or re-located to the countryside homes. Such studies could inform spatial priorities by the said dwellers

orientation in the traditional residential space. These were longitudinal studies of community dwellings and their transformation to low-cost urban housing in contemporary Central African cities. These however illustrated spatial patterns in relatively stress-free urban settlements in which vestiges of traditional and rural living were present. These studies remain laudable for their contribution to a narrative of the functional spatial qualities of residential space in gradually transforming urban societies[15].

The above positions by Seek (1983) and Andreasen (1987) of the First and Third World contrast explanations rooted in economic and social circumstance to the transformation phenomenon, and reach divergent positions. While former (Seek, 1983) rooted for transformations, Andreasen's (1987) work, rooted in the Third World, did not broach the subject and preferred to dwell on translocations and mobility . The Third World studies so far relied on contexts that precede the contemporary urban stress, and are inaccurate reflections of the present-day scenario of formal housing.

2.3 Housing transformation studies- Third world and global experiences

In studies on housing transformation, Tipple (1991) (1992)(1999)(2000) and others[16] explored the phenomenon across[17] the Developing World public

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[15] That consumed time and resources, hard to simulate. The case contexts also witness less demographic upheavals and rates of crime like Nairobi.

[16] Including works reported in the Reader ((ARDC), 1993); Blankson, 1988, Carmona and Gavinchi, 1987, Carmona and Osmani, 1986; Carmona, 1987; Carmona and Osmani, 1981; Kardush and Wilkinson, 1992; Kardush and Wilkinson, 1991; Osmani, Herbert and Wachsmuth 1985; Steinberg, 1984; and Tipple and Wilkinson, 1987

housing projects. Tipple's book: *Extending Themselves* (2000) used most of the empirical studies. It confirmed that transformations were prevalent and used as the normative alternative housing in many public housing projects in these deprived contexts. Later two other studies include doctoral works based on East African capitals by Tarekegn (2000) and Nguluma (2003) added to the equation. Within the cases, key thematic areas emerged that included: (1) tenure and ownership rights, (2) social and individual actualisation, local (3) political and (4) economic empowerment. The study also used discourses by eminent scholars in related fields and linked the theories to transformations.

2.3.1 The legal dimension- tenure and ownership rights

In a Western Cape study in South Africa, Andrew & Japha (1978) observed transformations initiated by the dwellers, and reported processes that improved the housing neighbourhoods. They however found that security of tenure a prerequisite for better quality. They asserted that ownership bestowed dwellers with authority and freedom consonant with their spatial aspirations. In their view, houses provided were a physical 'core', amenable to transformations in order to realise personalized space.

The paper was informative and had ample graphical illustrations of the physical nature and the intensity of the transformation activity occasioned by this secure tenure. The security tenure prerequisite for investments into capital assets has been cited by author De Soto (1989) (2000) (2002) (2004) (2006),

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[1] Other than Israel, the works were from Africa (Ghana, Zambia, Zimbabwe, Egypt, and South Africa) and Asia (Punjab Desh and India).

among others. De Soto's perspective[18], roots for the lack of ownership rights by the poor as a reason for the economically sorry state that persists in the informal settlements. His focus was informal economic activities in economically depressed areas of Third World cities. He advocated bestowing ownership rights as empowerment for the informal actors to make economically meaningful decisions that affected their environment.

The stance has however never really been empirically supported in the shelter programmes[19] implemented in the Kenyan urban context and only served to help understand the possible nature and magnitude of transformations in formal urban housing settlements. Further, not all scholars of dweller-initiated transformations relate tenure security as a pre-condition for transformations. Indeed, according to Tipple (2000) investments by dwellers in public housing transformations do so aware of the lack of security and despite the fear of losing their investments. This signifies that the legitimate desire for spatial quality was a greater need than the legal security.

The South African study however served to highlight the role of tenurial rights in 'owning' space. Thus, an important legal aspect that would influence the result not discussed in most transformations studies was the role of legislation governing development. In addition to ownership rights, other legal dimensions include the regulatory regime within which formal housing

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[18] Globally used a basis for investments in settlement upgrading schemes supported by the World Bank and International Monetary Fund

[19] These include upgrading schemes, core and 'starter' housing and Site &Service schemes for the poor, which have often resulted in transferred rights through sale to higher income dwellers than for their own economic prosperity

operates. Indeed, most formal housing estates operated as mono-functional entities that presumed minimal functional mixes as governed by development control laws captured in the Building Code (RoK, 1997) and Planning Manual (RoK, 2004) in Kenya[20]. A few authors[21] in Kenya and elsewhere have referred to these legislations as insensitive to local requirements and alien to most low-income dwellers in Third World cities, and this might have contributed to the transformations in formal housing estates.

Andrew and Japha (1978) studies did not however pinpoint the essence of the physical definition of the dwellings through architectural strategy as a basis for the actions. Indeed, only clues could be 'read' from the paper. For instance, the 'core' house concept that they refer to signified the physical strategy in provided house. Another hint was more through their graphical illustrations of the transformed environments, where they show bungaloid dwellings on fenced individual compounds. This was land on which these transformations were only possible, which catalysed the processes.

2.3.2 The social dimension

The social dimension infers the very essence of individual household livelihood and survivalist activities at home. Indeed, some view this dimension, as the core to ultimate housing fulfilment, and consequently transformations are the latitude that envisions the social deficits in formal houses provided.

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[20] These development controls include: Plot Coverage, Plot ratio and Building Line setbacks.

[21] Like: (Agevi, 1998) (1989) (Agevi & Moon, 1993) (Agevi & Syagga, 1988) (Agevi et al., 1989)

2.3.2.1 Studies from Ghana

In Ghana, Blankson (1988, pp. 66-67), identified the socially inappropriate designs as transformtion incentives. The author asserts tha the gap could be bridged by incorporation of socio-spatial studies in housing process. Accordingly, the architecturral strategy was tasked to be socially inclusive of local practices. A further finding, was the ineffectual housing and planning agencies; are-affirmation of the social dimension, twinned to governance.

Another paper within the Ghana context by (Owusu & Tipple, 1995) goes further to recognise social dimension to the technological processes involved in tranformations. Thus they state that such processes engaged the local human and physical resources , and was socially and economically empowering as it involved the users. This was unlike the alienation of the users in the building process which was the bastion of Modern architecture in government-built housing. Though the insinuation of using social spatial standards is broadly supported, the two studies offer few tangible lessons that would guide design strategy.

The social dimension however opens discussions of the bonding of the built form and traditional cultural practice. Here, vernacular architecture mirrored this primordial objective of humanity. Further, formal housing did not, as the next sections demonstrate.

2.3.2.2 Space among the Berbers

Among the scholars, include Pierre Bourdieu's (1972) anthropological studies among the North African Berbers. An architectural and graphical

methodological follow-up by Loeckx & Vermeulen (1986) of vernacular housing recognise its architectural basis as biased not just in the physical form but also the long-held metaphysical conceptions of a world-view by the people. The findings implied that the physical form owed much to these non-material conceptions by the dweller. Outside the individual domain, the relationship to other dwellers was also as defined by the society through the architecture. This pointed to the symbolic reality of the physical dwelling and went further to restate the role of symbolism in architecture.

Encapsulating this direction, Bourdieu (1972) developed the *'habitus'* concept[22], which served as an explanatory frame linking the relationship between people and physical space through what he termed as 'dispositions'. These long lasting 'dispositions' is a form of social contract adhered to by societies, which formed perspectives, evolved over time fulfilling relation strategies. In this position, the actions between members of a society make sense in their relations in their 'social field' but not necessarily to outsiders.

However, the *'habitus'* perspective is exclusive to the relationships amongst members of a rooted cultural community and to an already defined geometrical space. The position here that this is only partial; and that one can also

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[22] He defined it thus "The structures constitutive of a particular type of environment (e.g. the material conditions of existence characteristic of a class condition) produce habitus, systems of durable, transposable dispositions, structured structures predisposed to function as structured structures, that is, as principles of the generation and structuring of practices and representations which can be objectively 'regulated' and 'regular' without being in any way the product of obedience to rules, objectively adapted to their goals without presupposing a conscious aiming at ends or explicit mastery of the operations necessary to attain them and, being all these, collectively orchestrated without being the product of the orchestrating action of a conductor." (Bourdieu, 1972, p. 72)

understand meaning as the way a society or an individual respond to a provided space as is the case of the constructed society within a formal urban housing.

Laudable however, is that though Bourdieu (1972) based his thesis on a society (the Berbers), still stooped in traditional ways, it served to place the non-physical and metaphysical values to the forefront. Modern architecture had ignored this direction; and instead opted for common spatial and economic templates realised in the modern functionality in modern housing.

Bourdieu's investigations are about the role man infers meaning in the built form and how subsequent generations conform to the intangible social and metaphysical template, through the '*habitus*'. This was an inventory gathering exercise, coupled with western scholarly understanding of a society with long-established patterns of non-western cultures.

Others[n] have explored the same theme of meaning in architecture of the non-classical type (architecture with a small 'a'), to differing depths. It is a helpful tool in understanding why modern architecture inevitably leads to transformations to enable dwellers re-assert their meaning to space.

2.3.2.3 Study of the built environment

Another scholar who attached social meaning to the transformation phenomenon is John Habraken in his works (1998) (1972) (1981) (1976). In the early work (Habraken, *Supports: An Alternative to Mass Housing*, 1972) he laments the divorce of role of the dweller to the modern architectural product of mass housing. He advocates the introduction of 'supports' as structural

[n] See Oliver (1981)(2003)(1997)(1978), Preiser (1995)(1969), Fathy (1973), Dreyer (1978), Rapoport (1969) and Asakura (1977)

framework to gives space to the dwellers for personalisation. In the latter work, he evolved three 'orders' in the transformation of the built environment. He came up with a conclusion that dwellers aim to exercise control through these acts of transformation.

The built environment for Habraken (1998) is composed of form as manifest in the buildings and as acted upon by people as change-agents. The physical forms, which include the various hierarchies of the (1) buildings, (2) streets, and (3) infrastructure, are given life through the acts of transformation by dwellers. Growth and change are the basic ingredients of the built environment that make it an organism, prone to subjective values, as opposed to an inanimate object- passive artefact.

He states that the act of designing and planning that sets *a priori* a static state through programming and design ignores this reality. To appreciate this reality of the built environment one needs to understand the need for control that dwellers aspire for: 'Control thus defines the central operative relationship between humans and all matter that is the stuff of built environment' (Habraken, 1998). He defines three 'orders' of 'form', 'place' and 'understanding' that reveal the structure of the ordinary built environment.

The first 'order' of 'form' engages the physical attributes of the environment. The physical attributes are identifiable at distinct levels in which the dweller can exercise control, based on the hierarchy, through transforming. The dweller as the agent interacts with others and this in turn influences the scope and act of transforming.

The second 'order', of 'place' is of territorial order that echoes the concept of 'defensible space' (Newman, 1972). This is not the control form, but space and is a choice about what constitutes it. Territorial order is the interaction of the form and its human occupant to create 'place'. It is hierarchical as was 'form' but needs not directly parallel the form hierarchies. The form and territorial hierarchies define and interpret each other.

The third 'order' is about the covenants that govern the relationships between the agents in managing territory and form- an 'understanding'. This is purely a human organisation, unlike the other two. It is about judgement by the agents and creates themes, patterns, types, and systems that recur in the built environment. The people's culture, that normally signifies consensus, is essence of this 'order'. Viewed from the perspective, transformations are complex natural phenomena in the built environment which 'grow', 'renew', and 'endure' millennia (Habraken 1998, p6.). The 'organic' nature of transformations is possible, not just because of the physical forms, but also through human agency that act upon them.

Based on Habraken's earlier critical position of Modernism (Habraken , 1972), the method proposed support systems that permit maximum choices by the dwellers. It was reliant on structured modular systems of modern architecture, and suited the 'structure-and-infill' systems based on reinforced concrete framed buildings. Within these frames the dweller would exercise various latitudes for self-initiated transformations; a subtractive model for

DITs that fits within the 'subdivision and sequential completion' Oxman (1985) terminology.

The approach rationalised provided plans into zones of space, with different zones possessing different attributes that were suited types of transformations in form and function (Fig. 2-1). Thus, a zone adjacent to an external wall would be suited for a living space-use extension. A zone adjacent to a service duct would be useful for service space addition. In this model, spaces used for circulation that occur between zones called margins, and together zones guide the use and

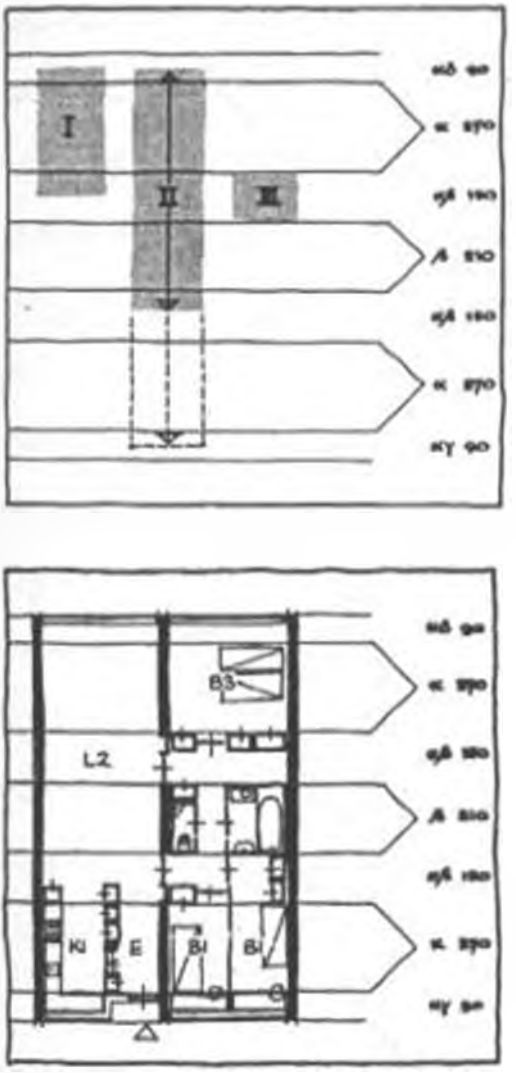

Figure 2-1 Transformation zones and margins from SAR (source: Habraken et al., 1976, p. 104)

thence transformation propensity.

Scaled upwards, in an estate context, these zones were suited for functional planning zones, like residential, social, and commercial uses. The circulation arteries still form the margins. Within this framework, it is the position that only certain transformations were possible, and as possible at the lower scale of the clusters and building blocks.

Outside such standardised constructions, transformations are the result of the original house, the DU, and the site extents. These form the 'supports' the dweller base their DITs on. The functional zoning defined by the DU space types thus guide the product. Their relation to the circulation artery, the 'margin', similarly guides the DITs. SAR's approach charted zones of opportunity that include all the spatial possibilities open to each household and explored the form the transformation took. The provided estate, cluster or other grouping formation and the DU thus form the starting point for the present DITs' investigation.

The Third World scenario portrays the peculiarities of the phenomenon specific to poor economies. The position here is that, though the 'orders' are granted as relevant, the forces of the new urbanism of poor economies are even more imposing. Thus, the role of transformation to support a largely 'basic needs' approach of income generation are equally weighty as the natural relationship between form and humanity in the built-environment that Habraken (1998) elucidates. This study, therefore recognised these quintessential forces of form and human agency implicit in transformations,

but also delved into the recognition of the economic forces that prevailed. Further, the formal origin of the study objects, the estates, also calls to scrutiny the role played by architectural design and synoptic planning.

In addition to the empirical findings from Ghana (Blankson, 1998) (Owusu and Tipple, 1995), the positions by Bourdieu (1972) and Habraken (1998) infer and place value to social and metaphysical meaning to a dwelling, and as such central to primordial expectations of shelter. The position of modern architecture was to remove this link, preferring to use mechanistic template in order to match human functional needs[24]. The theories were well explored, but the reality of the modern housing that confronts many third world cities still use the modern template for urban development. The social/metaphysical model serves only to explain why the dwellers would negate what was provided in modern space.

2.3.3 Grassroots' empowerment in housing

Transformations also are transference of housing responsibility to the user in lieu of failed institutions. To that extent, they address Habraken's (1972) 'alternative ways of housing' to the extent that provided housing act like the 'supports' he advocates in his seminal critique of modern housing solutions. This position was also echoes Turner's (1972 & 1977) call to engage the dweller in shaping their environment. This was a 'process' advocacy for the

[24] A premise of housing modern architecture was mechanical assumptions, in which people are treated as classified objects characterised by certain needs, and space is described by standards and books, grids, types codes and patterns sub-ordinated to functions and formal conventions (Kwartkowska, 1999, p. 95)

link between the physical form of the house and process of its attainment in order to create more acceptable spaces.

2.3.3.1 John Friedman

Similarly, Friedman's (1992) discussed the 'empowerment' concept and rooted for grassroots' organisational control in his assessment of the Latin American city. He explored grassroots' empowerment as an alternative strategy in planning in the urban space formation. He defined this new mode as "....a mode of inhabiting, participating in, creating, living, and imagining the city, the urban stage, new forms of space..." (Friedman, 1992).

This would entail popular participation in decisions: on city government, location of public services, appropriation and structuring of urban space and relationship among citizens and their expression through urban space". In essence, the citizens would supposedly'...reclaim the city from real estate speculators and to restore its 'use value' as a generator of a public- that is, of a civic and convivial life...' (Friedman, 1992)

2.3.3.2 Nabeel Hamdi

Another author, Nabeel Hamdi (1991) defined this as the 'supporting' stratagem whereby the users assumed a central role in the formation of their dwelling built environment. This stance contradicted the 'providing' strategies that were the bedrock of the modern paradigm. Hamdi (1991) discussed public policy and the concept of local empowerment in housing as illustrated in

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[3] In planning of housing, this movement, that largely dominated Latin America during the democratic transition years from the military junta dictatorships in the 1970s and 1980s, developed and was supported by Turner's (1969)(1977)(1972) writings

Figure 2-2. Thus, 'providers' paradigm entailed the synoptic planning approach in the modernism, and its goal was reducing housing deficits in numerical terms through the formal agents.

The approach was a centralised, top-down approach. It entailed standardization of technologies, space, and even linkages amongst members of a community. The stance also meant that unlike the piecemeal and incremental production by individuals, here housing was wholesome and thus instantly provided. The approach envisaged a consolidated building industry. These projects were often capital-intensive and required expensive imported technologies that in turn displace local skills. Any negative environmental impacts were often hard to mitigate, in this 'providing' stratagem

The alternative of grassroots' empowerment through 'supporting' held that

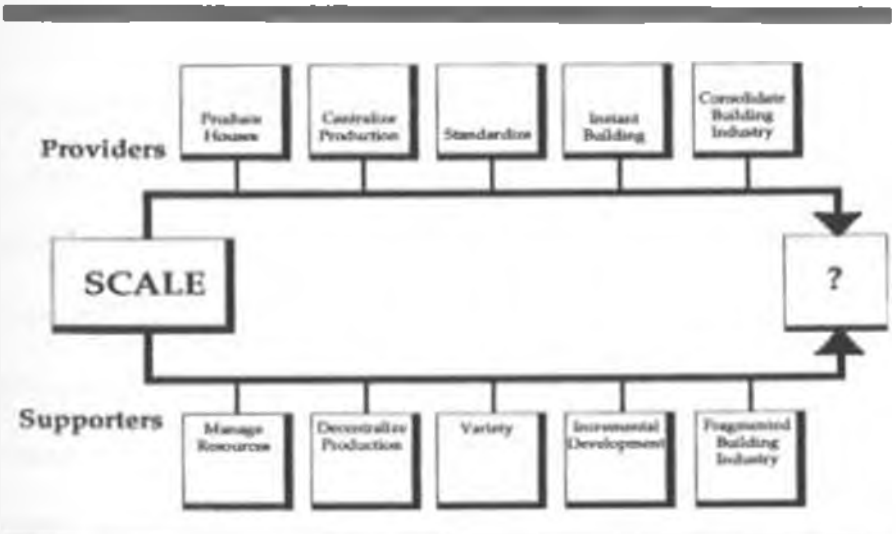

Figure 2-2: Hamdi's 'supporter' vs 'providers' housing model
source: Hamdi(1991)

de-centralized control created an enabling environment for community action. In this approach the management of resources through enabling policy frameworks like legislation, financial policies, building standards, access to credit, tenure rights, labour and skills development, as well as providing trunk infrastructure like roads, energy and sewerage systems could promote community empowerment which would in turn generate conducive housing.

Friedman (1992) thus advocated an avenue for civil society agents like NGOs and CBOs to prevail in mobilizing the community and local resources. This created room for aesthetic variety in the products and their fine-tuning to suit the local conditions. Probably because of their scales, these projects have short start-up time unlike the 'provider' options. The use of local technology of materials and skills is often the case and encouraged as an extension of existing technologies.

DITs epitomize such local empowerment strategies, ill addressed in the architectural strategies. However, Friedman (1992) cautioned that 'small' was not always 'beautiful'[26], and to support this case, he cites lack of economies of scale, the local-specific impact of micro-projects, their higher transaction costs, and the difficulty in coordinating them. Thus, that was why small locally empowered development was neither appropriate nor guaranteed of successful outcomes. His conclusion that such community empowered projects work primarily because they are small and that one should not view them as an

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[26] ...diametrically opposed to Schumacher's (1973) Appropriate Technology (AT) philosophy

alternative to formal large-scale interventions has qualified validity in schemes outside of the housing problematic.

In housing, individual households or local communities consume the commodity directly. This is unlike massive projects like infrastructure plants[27] that may have little trickle-down effect. In Nairobi, for example, between 1976 and 1987 only 10% of the increased urban residents resided in publicly produced formal housing estates (Ondiege 1989) (Rakodi 1997), preferring self-generated individual dwellings. Further, as Rakodi (1997) observes:

> 'Whether in the serviced plot schemes that have typified recent public housing programmes, in areas of illegal subdivision, or in areas with tenure based on indigenous systems of land allocation, the majority of houses in both the formal and informal sectors have been built on individual rather than mass produced or speculative basis.' (Rakodi, 1997, p. 392)

Rakodi (1997) also confirms that most construction is incremental using local small-scale 'labour-only' contracts and self-managed construction (Rakodi, 1997, p. 392). DITs thus accord space and time for self-help[28] productivity (Erkelens, 1991).

2.3.4 Economic motives

The literature on Third World transformations studies always broached on the economic values; the economic benefits and incentives to transformations. This assumed two economic scenarios of the 'backward linkages' and 'forward linkages' (Skotte, 2004). The former infers the use of the added housing space

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[27] ...on which has (Friedman, 1992) reservations are based

[28] Autopromotion and autoconstruction

for direct household economic benefit, while the later is the broader macro-economic benefits of housing to society.

The 'forward linkages' (Skotte, 2004, p. 46), the macro-economic benefits of housing to the general economy are many and have significant multiplier effect to society. Housing thus serves as an empowering tool to the householder in realising economic success. The DIT activities that emerge in formal estates are localised and self-instantiated aimed at harnessing this economic potential in an individual household based on their priorities. In their initiation, formal housing distances the dweller from directly contributing and benefiting from the proceeds of housing.

In her writings, Wells *et.al* (1993) illustrated how these 'forward linkages' generated jobs ranging from material production, building activity and capacity building. Although at the macro-economic level the positive societal impacts are good for the economy, however, they also exclude the dweller. This is supported especially if these dwellers are of the lowest non-monetary economy. DITs bridge this gap as the dweller directly contributes to the housing production.

The 'backward linkages' in grassroots' empowerment is about the economic use the DITs' space was subjected. Whereas the forward linkages recognised the poor dwellers yearned for a role in the process of the housing development, the economic use of DITs' space in the 'backward linkages' enhanced their incomes directly. This aimed to accord housing a role as a productive good, a means to economic empowerment, and not merely a social service.

The economic dimension has without doubt, a clear component that entrenches transformations in the Third World housing scenario. The examples from several African capitals, further illustrate the economic motive.

2.3.4.1 Addis Ababa studies

In Addis Ababa, Tarekegn (2000) already found that *kitiya* was space for home based enterprise (HBE) and subletting for added rental income. This study, which also offered a spatial guide on the location of DITs used for economic benefit, more fundamentally reiterated the economic benefit as a direct functional imperative of the emergent DITs in the housing estates.

For instance, the DITs accommodated extra households for both use relatives and rental income. Physically, this was often at the expense of incorporation of external shared or common space, through encroachment. However, the marked utilisation of temporary technology in these extensions, ostensibly due to the low economic wherewithal of the dwellership, physically deteriorated the living environment and downgraded the value of the estates.

It is notable that these transformations were happening in both owned and rental dwellings. In Addis Ababa city, formal housing in 1970s to nineties was mainly through the cooperative movement, and middle/low class dwellers owned these dwellings. The Agency for the Administration of Rental Housing (AARH) (Gebrewold, 2009) was responsible for Rental housing. The combined production of this formal housing accounted for only 21% of housing demand and thus occasioned the emergence of transformations and informal settlements sin the city.

Some writings based on this formal housing in the city address physical approaches in addressing transformations through upgrading schemes. Gebrewold (2009) anchors for a participative approach and NGO involvement in a housing proposal aimed at the rehabilitation for ex-commercial sex workers in city. Another author, Feleke (2009), proposes some physical transformative approaches, suited for upgrading programmes, to the physical design of similar neighbourhoods in order to realise more homely environments in the housing. Gebrewold (2009) and Feleke's (2009) papers stress the social dimension and lays minimal emphasis on the economic dimension preferred by Tarekegn (2000).

2.3.4.2 Dar es salaam studies

In Dar-es-salaam, Tanzania, transformations occurred as 'modernisation' and reflected the use of more durable materials (Nguluma, 2003) within the largely traditional Swahili human settlements that dominate the city (Mbisso, 2005). The 'modernisation' created economic space used by the dwellers for mainly informal trade and other enterprises. The studies informed that transformations served to regenerate the neighbourhoods.

They occurred as physically enhancing the informal settlement, 'modernisation' and thus marked the contrary development to Tarekegn's (2000) deterioration of formal housing in Addis Ababa. Though singularly accommodative of local dwelling architecture and space use, it also veered into the economic motivation occasioned in the extensive use of the additions for HBE's. As illustrative as it may be of the economic strategy, the lessons the Dar

es Salaam study offer a vestigial guide to the present study because of the informal genesis of the Swahili typology used in the study.

Other studies by Mbisso (2005), Kassonga (2009) and Rweyemamu (2009), also based in the Tanzanian capital, focus on adjustments in formal housing by the National Housing Corporation of Tanzania. In Mbisso (2005), the social and cultural values influence the spatial adjustments observed in the two schemes of Ubungo and Ilala, two modernist housing schemes by the Tanzanian NHC.

Further, the spaces remained residential, albeit modified to suit traditional residential uses, which mostly defied the modernist stipulations. Kassonga's (2009) study in Ubungo corroborates this finding but also illustrates some informal additions that served a commercial function, albeit illegal. In Ilala, Rweyemamu (2009) also show some additions used for economic purposes.

The key aspect of the schemes is the apartment form, which seemed to curtail any inclinations for transformations by the dwellers. This seemingly reduced the functional and physical adjustments to the internal modifications and for social and cultural reasons, but not for economic reasons. The open space between the blocks was the main avenue for economic additions.

These findings in the modernist blocks confirm the supposition that the physical form was predominant in the transformations propensity. Indeed, the Swahili blocks, ground-based (bungaloid) and organic in form accorded more room for transformations as reported in Nguluma (2003)'s thesis. The

economic[29] considerations are also equally significant in the physical formations, with the cost prohibitions being the main impediment to any form of transformations in the vertical blocks in NHC schemes of Ubungo and Ilala.

2.3.4.3 North African studies

Some North African experiences offer a different perspective. Contrary to the Dar-es-salaam findings above, the studies in Egypt gave further insights in the phenomenon by introducing its prevalence un-inhibited by the physical strategy used in the provided dwelling morphology. Steinberg (1984)studying in the urban block, reported transformations in these high-rise blocks in Cairo City. The graphical images accompanying the paper show blocks sated with informal technology extensions, non-standardised form, and visual variety.

Functionally and aesthetically, transformations served to negate the 'boring' modernistic apartment blocks provided by the government through personalisation, art and use, reported by Steinberg (1994). The author, 2010 criticised the architectural strategy enshrined in modernism[30] and vouched for the 'architecture of poverty' exhibited through these transformations. The criticism is of the architectural strategy using the monolithic and tyrannical dwelling blocks that modernism espoused.

Elsewhere in Helwan, also in Egypt (Tipple, Wilkinson & Nour 1985; Tipple & Wilkinson 1986; 1987) other studies were supportive, through the increase in housing stock, and improvements in the quality of neighbourhoods.

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[29] Another economic factor was the rental nature of the estates which also reduced the transformation potentials.

[30] These blocks reflected the urbanist ideology of the CIAM Charter of Athens (Frampton, 1992), where the blocks were meant to house large numbers of the working classes.

Thus, the dwellers' changed 'the functional characteristics of this low-income government housing in such a way as to greatly increase the market and use value of the dwelling at no cost to the government' (Tipple & Wilkinson 1986).

The authors advocated flexibility in the physical design strategies for blocks as an antidote to static rigid form that prevailed in the existing modernistic blocks. This flexibility would recognise the potent energies of the users of housing environments to 'contribute through alterations and extensions to their homes' (Tipple & Wilkinson 1986, p.302).

A further reaffirmation of the design trajectory is the provision for '...internal spaces flexible enough to be adapted for alterations, addition or removal of walls and other fittings, and external spaces with the capacity to allow for future extensions...' (Tipple & Wilkinson 1986, p.302).

A key lesson here is that dwellers are uninhibited by the form, here a mutli-storey form, and the the authors want this to be entrenched and facilitated through design flexibility. Kardash and Wilkinson (1992, p. 17) further the ideal by proposing a participatory approach, a social trajectory, where the dwellers and professionals (architect, planner, technician, social worker and engineer) were put together to realise a solution applicable in new settlements[31].

These 'soft' strategies however need the 'hard' design direction to better harness these energies. An understanding of the design strategies is therefore a

[31] The study in 'old' projects of Helwan, El Tebeen and Imbaba was viewed as equally applicable in the new projects of 15th May, Sadat City and 6th October (Kardash and Wilkinson, 1991, p. 17)

pre-requisite to ensuring convivial neighbourhoods within these urban blocks. These studies illustrated the prevalence of transformations but lacked the essential dimension of the physical design implications and contributions to the resultant form and quality.

2.4 Architectural strategies for Transformations

The proposition of the present study is that transformations respond directly to the physical frame of the provided dwelling. They respond to this form by virtue of the restrictions imposed by the geometry, composing materials and technology, land and locational limitations and opportunities. In the shaping of the built-environment, Habraken (1998), viewed the form and physical 'order' as the primary level of intervention by the human agents of change; thus, 'The order of form engages the built environment as part of all physical matter'. The shelter represents the physical form of a house that protects one from elements of nature- a Vitruvian concept. Indeed, Vitruvius[1] conception of architecture rested on three tenets; *'firmitas'*, *'utilitas'* and *'venustas'* that have been translated as 'firmness', 'commodity' and 'delight'[2]. They are the three pillars of architecture.

The question; "How do transformations respond to this provided physical nature?" is as relevant and equally valid as the opposite is- "How does the transformations affect the provided dwelling as a physical object?" The study

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[1] Marcus Vitruvius Pollio (Vitruvius, 1960), known to the world as Vitruvius, was a Roman architect and engineer in the first century, and was the author, 2010 of the oldest and most influential architectural theory work in existence *De architectura* (Vitruvius, 1960), which was composed about 30BC and later translated to English by Morris Hicky Morgan as 'The Ten Books on Architecture'

[2] They approximate to the physical nature, functional use, and aesthetic meaning of the building, as reformulated by Sir Henry Wotton in the 17th century (cited from Skoda 2004).

bases itself in the former. The form of housing is an architectural act, adhering to performances of a physical nature. All housing is foremost, physical endowing comfort, a physical environmental quality, and privacy as basic human requirements[34]. Privacy imbues understanding and meaning to the form, manifest often as hierarchy, procedure, values, and difference. The later, in essence, is what distinguishes architecture from other artefacts.

Some informative studies on transformations from Israel were helpful in understanding the architectural strategies' guide and influence on the results. Carmon and Gavrieli (1987) compare housing choices for dwellers between relocating to new housing and spontaneous self-help transforamtion. They found that a better quality product was realised in the later and at a lower cost. They vouch for the recognition and hence mainstreaming of the transformatin process. Other studies by Carmon and Oxman (1981)(1986), vouch for the transformation as an urban renewal strategy.

2.4.1 Transformation physical strategies.

Oxman etal., (1981)(1986)(1987) offer deviation for the now accepted DIYs' message to physical strategies. This vouches for for new innovative designs and design management process for housing that enshrined flexibility to accommodate the dwellers' changing needs. They re-affirmed that a neccesary condition for the envisaged transformation regime was the

[34] As Rasmussen and Gero (1988) (1988) affirm, design in architecture, is a goal-directed activity in which decisions are made about the physical form of buildings and their components in order to ensure their fitness for intended purposes

supportive system of laws and regulations (Carmon & Oxman, 1981, p. 18) and other incentives[15].

The architectural import to the otherwise broad institutional support they advocated was what they considered the necessary spatial provisions that included:

> "-create land reserves for enlargements beyond present building lines
> -Build on rooftops, when building structure permits;
> -In certain conditions, permit expansion on the sides of the building which would join adjacent buildings."
> ((Carmon & Oxman, 1981, p.18)

This was a pointer to the available spatial choices for mainstreaming[16] the phenomenon in housing strategy. Through design and institutional incentives, Carmon and Oxman (1986) argue that tenants become active and participative users contributing to their own welfare and the public in general.

Moreover:

> "The results are significant amelioration in both objective dimension (maintenance) and subjective dimension (satisfaction), which leads to alleviation instead of deterioration of housing conditions and elevation of neighbourhood status"
> (Carmon & Oxman, 1986, p. 258)

The key lesson in the Israeli studies was that, to rejuvenate existing neighbourhoods the dwellers could be useful in engagements through DIIs.

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[15] These included from low purchase prices discounts for senior tenants, reduced payments for units in poor condition, temporary forfeiture of rent payments by tenants in exchange for rehabilitation.... amongst others (Carmon and Oxman, 1981, p.18)

[16] This envisages evictions that could be condoned in formal housing neighbourhoods

The authors argue for physical designs that support the energies by the dwellers in the housing renewal and rehabilitation so envisaged.

In the studies, Oxman *etal*, (1985) evolve physical architectural models under which transformations in housing can happen. They identify three categories of classifying the phenomenon as: combination, subdivision and addition (Oxman *etal*., 1985, p.26), explained and illustrated here.

2.4.1.1 Transformation by Combination (Fig. 2-3)

This uses rearrangement or portioning between units as a means also to increase and decrease the floor area between adjacent dwelling units. Adjacent spatial units thus trade between them without overall enlargement or reduction of the combination. This condition envisages no structural changes. The space exchange can take place in plan or / and in section. Four sub-categories are possible:

(1) *Combination* by *fusion* involves two adjacent units that merge to form a larger unit.

(2) *Combination* by *conjunction* – reduction involves borrowing from adjacent unit. Through removal and replacement, a partition between units is re-placed elsewhere.

(3) *Intercalary space* occurs between major served space because of a module e.g. structural cross walls or service ducts. The action involves closing or opening the voids in cross walls, and this adds or subtracts space to what was available.

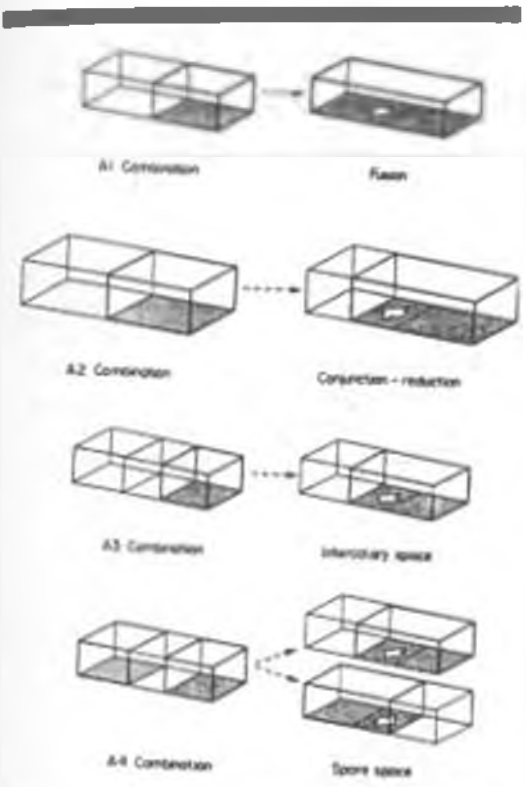


Figure 2-3: Transformation by Combination
source: Oxman *etal.*, (1985)

(4) *Spare space* is a zone for flexibility between units. One or the other units adjacent to each other can appropriate the space. Unlike the intercalary space, this is can be an outdoor space, communal space, or rentable room.

2.4.1.2 Transformation by Subdivision and sequential completion (Fig. 2-4)

This is defined by Rabaneck *etal.*, (1973) (1974) as, 'the gain of usable space without actually increasing the ground area occupied by the house'-add-in. This can be a strategy for multi-family dwellings. Thus Oxman *etal.*, (1985, p. 27) state: 'The economic rationale is that within the total cost of the unit, including land, site development costs, interest payments, and provison of general utilities systems, the relative cost of the incremental space is small and worthwhile with respect to the adaptability it adds to the dwelling'. The strategy uses space provided in the orginal unit but exploited as living space, e.g. an attic in the roof. Four categories used were:

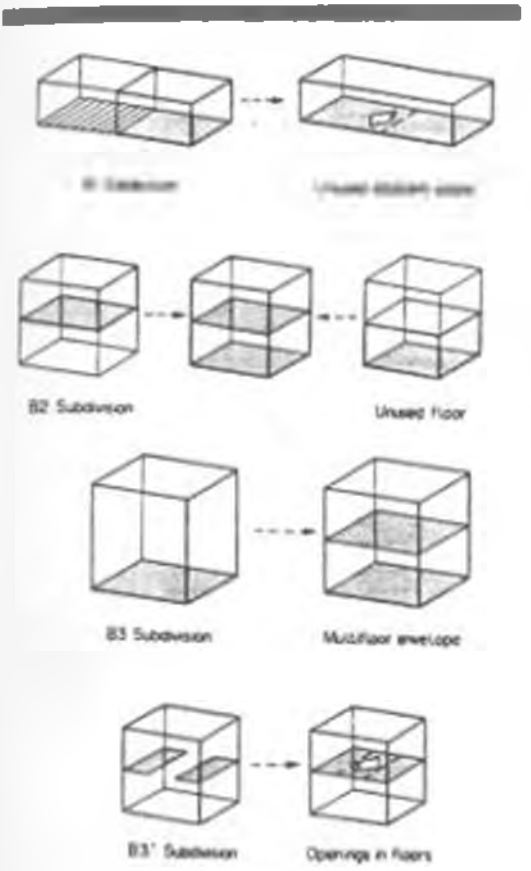


Figure 2-4 Transformation by subdivision and sequential completion
(Turner and Fichter, 1985)

(1) *Unused adjacent space*: This growth by expanding into adjacent space which could be open or enclosed. This could be a terrace and the growth is horizontal.

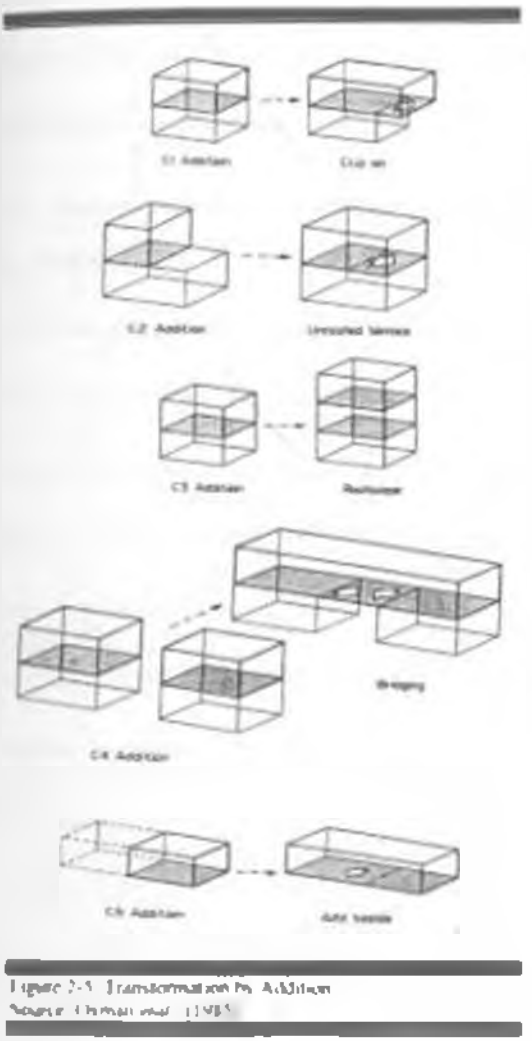
(2) *Unused floor*: The dwelling grows vertically into unused and unfinished floor, e.g. an attic space or basement are possible examples.

(3) *Multi-floor envelope*: The dwelling envelope is designed to take more than one floor

(4) *Infilling layers or adding layers*: The dwelling comes without subdivision of floors and partially so. The transformation adds these later.

2.4.1.3 Transformation by Addition (Fig. 2-5)

This is the strategy of expansion, and may be horizontal or / and vertical. These strategies are possible in isolation as much as in combination in housing transformations. They involve different levels of complexity and cost.



(1) *Clip-on:* This involves adding a space using the existing as one or more walls. It uses the existing structural system.

(2) *Unroofed terrace:* This building on projections adjacent to provided unit. A floor exists but a roof and some walls do not.

(3) *Roofscape:* This is transformation by adding space of enclosed space on a rooflop.

(4) *Bridging*, is realised by lateral expansion of dwelling between two units or building modules.

(5) *Add-beside* is the process of transformation by erection of an independent unit in addition to the original DU.

However, the reported work was largely theoretical, and indeed, no understanding of the necessary conditions that guided the choices by the dwellers' made was possible. The studies informed on the need and method of

transformations studied in the depressed context that was only helpful in the analysis of the findings of the empirical work fieldwork and methodology used in the Nairobi cases.

2.4.2 Steward Brand's Shearing Schemata

In assessing the physical nature and change in dwelling, one author, 2010 who delves deeply into how physical layers inform change, is Steward Brand (1994). The theory advanced (Brand 1994, p.2) is about how buildings behave: in a 'spatial whole' as well as in a 'temporal whole'.

Thus, 'Whereas "architecture" may strive to be permanent, a "building" is always building and rebuilding'. He proceeds to investigate different building types and their longevity and hence transformation trends. For instance domestic buildings like housing, respond 'directly to the family's ideas and annoyances, growth and prospects' (Brand, 1994, p.7).

Thus, he states that, 'The unit of analysis for us isn't the building; it's the use of the building through time' (Brand, 1994). He develops a model- a 'shearing schemata', in which the unit of analysis is not just the building but also its use over time. In the model, six layers compose a building and transformation affects them discriminatively.

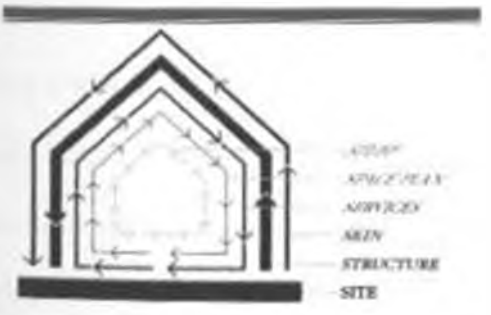


Figure 2.6: Brand's Shearing Layers
source: Brand (1994)

The six 'S's defining the model includes: 'Site', 'Structure', 'Skin', 'Services', 'Space Plan' and 'Stuff'. The layers represent the building elements that are subject to change at different rates and phases of the building's life. Figure 2-6 illustrates the 'Shearing Schemata' explained henceforth.

2.4.2.1 The 'site'

The '*site*' as a variable in the housing is the land, i.e. 'grounding' of the building. It however also connotes value systems and meaning associated to the land. Thus the 'groundedness' of housing alludes to plot and boundary definition in an effort to impose territoriality and 'defensible space' (Newman 1972). The physical aspects of land include the topography and relation to other physical environmental aspects. Indeed any intervention on land for housing development takes cognisance of this physical presence of the 'site'. Though according to Brand (1994, p.13), subjected to a time-scale the 'site' is eternal, the non-physical and economic connotations which affect perceptions and use of the land change with the times.

The design intervention in housing starts with this 'grounding' and the distinction between what belongs to the householder or what is common. In the Addis Ababa DIIs, Tarekegn (2000) showed that transformation trends were in stages. Thus, this was initially within the plot boundary and succeeded later by encroachment on public land. The indication was that the confines of the site provided the first impetus to transform. Tarekegn does not dwell on the locational aspects of individual plots and the propensity for the phenomenon. He illustrates that the locational factors determine by function. Thus, the

frontal location was mainly for commercial purpose and inner ones were for liveable space and for residence.

However, the site *per se* is of defined value for housing; it has to be equipped appropriately through the introduction of infrastructural services; water, roads, sewerage and other services. The positioning of these amenities contributes to the DII type. The Addis studies did not view it as significant and Tarekegn hardly discusses them. Similarly, development control guidelines govern the site that the developer adheres. It also imbues a history and values that qualify it as the place, the 'home' for some while others perceive it as a transitory spatial location. The discussion of the 'site' also relates closely to Habraken's (1998) theories on 'zones' of control

2.4.2.2 The 'structure'

The '***structure***' is the building element that physically supports the dwelling, and to some constitutes 'the building'. To most dwellers, it has longevity of the life of the building, and Brand (1994) asserts that it has a life of between thirty to three hundred (30-300) years. Two strategies represented by Brand (1994) and in other literature on the 'structure' of building include, an independent *structural frame*

Figure 2.7 Le Corbusier's structure and infill model source Frampton (1992)

furthered by modern architecture (Fig. 2-7) and the *composite* load-bearing and space-defining system extensively used in vernacular design.

The vernacular structural system, the *composite system*, restricts transformation to an 'additive' process. Thus, due to the nature and hence stability, no alteration of the basic structure was possible. Transformation in this pre-modern era architecture was manifest as cellular additive processes with new spatial units (huts, rooms..., or even homesteads). This growth can be viewed as responding to a 'morphic language' (Hillie, Musgrove, & O'Sullivan, 1984)- a biologically induced idiom.

The 'additive' strategy is viewed as an impediment to transformation, in fact Skotte (2004) restricts this form to rural traditional homestead, for 'add-ons' in contexts where restrictive plot containment were absent. Transformations studied in the urban Third World contexts by Tipple (2000) and others (CARDO, 1993) prove him inaccurate, as additive transformations are the norm and not the exception.

Indeed, informal settlements still use this method as the only transformational mode for their growth. In the modern estates, this is also prevalent and in most of the Third World studies by Tipple (2000); this was the mode of DITs. The case for Addis Ababa (Tarekegn, 2000) and the Swahili typology in Dar-es-salaam, similarly aver. Of course, this is dependent on the form strategy used; and most examples in the literature studied preferred singular and detached units, which encouraged 'additive' DITs.

The *structural frame*, perfected in modern architecture separates 'structure' from 'infill', to borrow from Habraken (1972) (1976) (1981) (1998) 'supports' concept. It rests exclusively on the use of reinforced concrete frame. Modernist architect, Le Corbusier illustrated the 'plug-in' principle and was demonstrated in the built projects like the *'Unite 'L habitation'* at Marseille and Berlin (Panerai *etal.*, 2004)(Frampton 1992) (Fig.2-7).

Theoretically, this implies a capacity for transformation, in a 'subtractive' (sub-division and combination) system; modification within the shell provided. Despite this 'subtractive' potential in modern architecture, few large-scale and significant examples exist of such a strategy in mass housing. Indeed, modern buildings confined the dweller to within the envelope.

Indeed, Habraken (1972) commentary on modern architecture was but a criticism of the restrictive nature of mass housing and the built environment *per se* His later writings and experiments (1981)(1998) profess the accommodation of change in buildings. In these theoretical explorations, he attempts to exploit the 'subtractive' flexibility of the reinforced concrete structural frame in modelling DITs. The 'open building' concept has broadened into a network to include technological solutions to accommodate transformations[17].

The two systems are valid in the contemporary housing but most houses in contemporary low-cost human settlements adopt a 'hybrid' system; that

[17] Including products processes, systems design, on-site and off-site building production, deconstructing and [illegible] and general management of the building stock

accommodate change by addition and through internal modification. Skotte (2004) and Brand (1994) term this as 'the modern vernacular'.

2.4.2.3 The 'skin'

The '***Skin***', representing the external presentation of the building and its transformation is more frequent and is for addressed for maintenance and decorative purposes. The appearance may represent symbolic value, meaning, and image formation by the dweller. Change for the 'skin' recurs every twenty years (or so), according to Brand (1994, p.13), and the changes aim to keep up with 'fashion or technology, or for wholesale repair'.

2.4.2.4 The 'services'

'***Services***', at various scales of planning and unit design form major morphological limitations or opportunities for transformation of the house and its environment by the dweller. Brand (1994) defines services as the 'guts' of a building. At planning scale, the provision of services- their adequacy or inadequacy, may be the impetus for transformations. On the other hand, transformations strain services at the dwelling and planning levels. Brand (1994, p.13) gives a life span of services as seven to fifteen (7-15) years. As seen in Habraken's (and SAR) (1998) 'open' systems 'services form avenues and zones for DITs.

2.4.2.5 The 'space plan'

The '***Space Plan***' reflects the layout of the unit and forms one basis for DITs. The formation of 'place' emanates largely from the space plan. This level links of the physical form and the human values. The control of space

motivates transformations in line with Habraken (1998)'s zones of control. This control translates it into 'place'; that then ceases to have purely geometrical properties. 'It reflects territorial behaviour observable among all human creatures and thereby connects the environment to the biological realm'; he states (Habraken 1998). According to Brand (1994, p.13) 'exceptionally' quiet homes may take up to thirty (30) years before change can recur at the 'space plan' level.

2.4.2.6 The 'stuff'

The '*Stuff*', representing the moveable parts like furniture, in Brand's schemata has shortest lifespan. The main focus in the study were transformations captured in 'site', and the 'space plan', and as were to some 'skin'-based extent, aspects of the 'skin' and 'services', but not the ephemeral 'stuff'.

Brand's model introduces the variables that act on the various layers of the physical building leading to transformations. The first is the human agent (user and the societal controls guiding them), the second the place (site and design form) and the Third is the effect over time. The use of building is thus its physical nature including its location (site), structure, services, architectural layout (space plan), finishes (skin), and the use items (stuff). These are subject to user agent over a period. These combinations inform transformations and the 'learning' process of a building. These form the variables that guided the DIT's investigations here.

The basic import of Brand's model is that subjected to time the physical layers of the building will inevitably transform. He gives time spans under which each 'layer' will 'shear' when subjected to the human agent and within the contextual place. Placed in the Third World city, one questions where and which layer when subjected to the various agencies at hand will yield through transformations. Thus, it is queried how a given physical form influenced the transformations.

Brand's (1994) 'shearing schemata' identified the physical layers that constitute a building which are continually changing. The study broaches time, space and the agency that guide the resultant. The key import of the work was that a building, here understood as a housing estate and / or unit, is transformed over (1) time, in a given (2) space and through the actions of a human (3) agent. Theoretical explorations in Oxman's *etal.*, (1985) work were useful in operationalizing the present study.

2.5 Emerging Directions in Transformation literature- a summary[11]

The literature in this chapter highlighted several aspects that govern transformation globally, and these were mainly the social and the economic. The physical dimension for DITs indirectly broached and in the theoretical

[11] A different approach, not broached albeit also theoretical, was that of Donald Schon (1991), was more into meta-theory by which the process of design was the subject and object of inquiry. In 'reflective' design by the practitioner, the object of design 'talked back' through transformations. The position taken here was that transformations guided the precept of design as an on going process and not state that most design solutions presumed.

explorations in Oxman's *etal* (1985) studies, this dimension had an operational basis. The summary captures the salient features of this literature exploration.

The economic factors are central to any decision to alter a household's housing circumstance as highlighted in Seek's (1983) Australian housing mobility studies. Thus improved or diminished economic circumstance guided transformation propensity. In Addis Ababa studies, Tarekegn (2000) observes that transformations enhanced the economic fortunes of the householder through its use for home-based enterprises (HBEs). Tipple's studies (2000) aver and confirm the micro-scale economic activity prevalent in transformed spaces as a way enhancing the use value of the houses. With others (Wilkinson (1987), Wilkinson and Nour (1985), Tipple illustrates that transformations in high-rise apartment blocks enhanced economic value and changed the dwellers' economic fortunes.

This economic dimension was thus clearly a motive for transformations, but the studies did not clarify how the provided physical structure contributed to the quality of the ensuing product. They however offer glowing tribute to the aesthetic variety that resulted, which was however, only subjective and could not be objectified. Further, these studies did not highlight safety and other environmental dangers of the processes and resultants. They also ignored the economic cost occasioned by the typology and the ways it promoted the nature of transformations. The position in the present work was to investigate how the physical strategy contributed to the quality and nature of the transformations, within the economic circumstances prevailing.

At theoretical level, the 'forward' and 'backward' linkages highlighted by Skotte (2004) served to illustrate that housing served a developmental role beyond pure shelter. The use of the unit for economic purpose and spur indirect economic benefits (forward linkages) were central to the resettling of war-ravaged societies he studied – lessons reminiscent and found relevant to any housing deficit situation. The use of the construction of the unit to empower the grassroots' community external to the formal labour markets was another economic dimension captured in the 'backward linkages' theorem.

The social dimension is another primordial demand by humanity and it was clearly a motivator for transformations in the literature reviewed. The longitudinal studies by Larsson (1984) (1988) (1990) (1996) offer a sequential social evolution and the impact on the house morphology. Similarly, Schlyter (1991) undertakes time series studies in Zambia that aver that the social dimension was part to the move to transform in emerging country cities in Africa. The studies, which have the benefit of time, however do not form a sound basis for formal housing schemes that are the result instant building and through direct investments. They only highlight the need to mainstream the social dimension as a precondition for successful urban housing.

Blankson (1988), Owusu, and Tipple (1995) pick up the social theme in Ghana in further studies. They investigate transformations in govern-built housing in which transformations occasioned by the lack of social appropriateness of the provided design types. Owusu (1995) goes further to highlight the need for local tradesmen as part of the design and development of

the houses to avert social alienation. These studies stress the social dimension and yet at issue is the physical relevance or otherwise of the provided design solutions. The position taken here is that social dimension is a necessary functional need common to all humanity and that design strategy manifest physically is the premise under which it is fulfilled or otherwise.

Steinberg (1984) stresses that transformations accorded the dwellers an opportunity to personalize their dwelling space in the transformations. In the Dar-es-salaam's studies undertaken by Nguluma (2000), the social dimension was evident in the modernization of the traditional Swahili house. This modernisation was thus social enhancement in these formerly traditional settlements. Located in established societies as in Seek's (1983) findings, transformation was preferred in place of moving as a way of keeping social networks within the neighbourhood. The case in Cannon and Gavrieli (1987)'s Israeli work, in which neighbourly relations were re-established through transformations within the units rather than physical translocation, was supportive of the case.

In Andrew and Japha (1978), the tenure status was primary to the quality of transformations in their South African studies. This position broaches on De Soto's (2000)(1989)(2002)(2004) pitch for secure tenure as empowering for the poor. This security of tenure, he opines, enabled them invest their meagre resources meaningfully and thus enabled them stake a role in liberal capitalism of the western society.

At theoretical level, Habraken's (1998) position was that meaning was established through three 'orders' including 'understanding'- a cultural order. Others included, establishment of 'place' the 'territorial order' and through control of 'form'-the 'physical order'. These form a basis for transformations in provided housing that the present work sought to establish. Bourdieu (1972) anthropological studies bring out the special relationship between dwellers and space in the concept of the *'habitus'*. Transformed in modern housing one can link the transformation propensity as way of seeking to re-establish this primordial link.

The physical dimension was peripheral and downplayed in the above studies. They broached only theoretical value to the phenomenon of transformations. The formal provider in modern housing was as alien to the dweller and did not understand the felt needs of the dweller, leading to the transformations. The position echoed Hamdi's (1995) dichotomy of 'provider' and 'supporter' paradigms. The former merged the formal housing schemes investigated here where the dweller was not part of the process leading to the transformations aimed at fulfilling functional needs. The former approach was the basis for advocating a different development paradigm at the grassroots' level in his other book: *'Small Change'* (2004). These studies however lacked any empirical rigour that the present study aimed to bridge.

Steward Brand (1994) introduced the physical form of building not as its three-dimensional characteristics but also subject to time and agency. He disassembles the built-form into 'shearing' layers that are subject to change

through dweller transformations over different time regimes. The human agent is the core with varying functional demands, all which are the subject of differing design strategies. His studies were broad and applicable to all types of buildings and the changes possible. In the present study, these variables are within the case study housing environments of Nairobi city.

The research proposition (Fig. 2-8), is that housing strategies adopted in formal housing do not address the physical, social, and economic functional demands for the target group among the urban dwellers leading to compromised quality witnessed in dweller-initiated transformations.

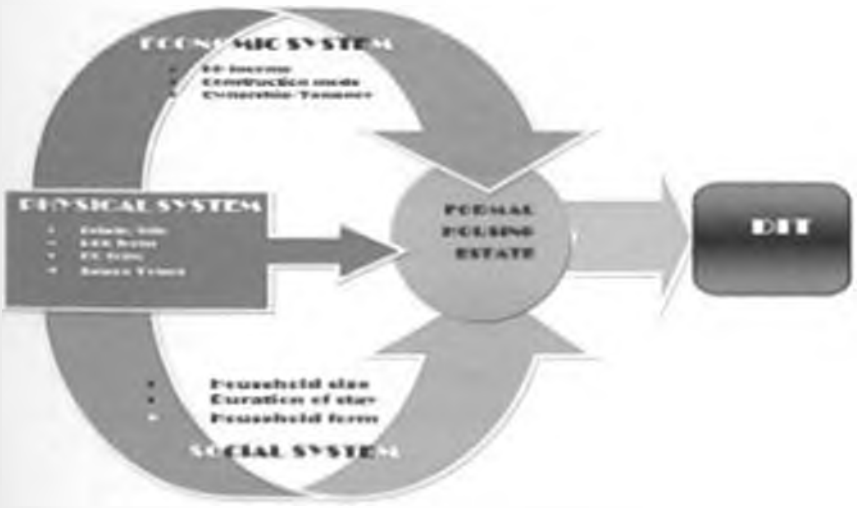


Figure 2-8: Housing Transformation Model
Source: author, 2010

2.6 Dweller-Initiated Transformations in Housing-

2.6.1 A Conceptual Model

As stated, the basic themes of transformations' studies and the related theories were economic, social and the physical. The conceptual model (Fig. 2-8) illustrates the position as per the transformation literature explored and forms the basis for the research. As seen in the literature the emphasis was mainly on the social and economic, and downplayed the role of the physical dimensions, which this study aims to bridge.

To operationalize the three variables of the economic, social and physical systems that influence transformations several surrogate variables are below:

2.6.2 Transformation variables

2.6.2.1 Economic factors

- Income of household (HHH-income)
- occupation of household head (HH-occupation)
- rental / mortgage repayment of main house
- income from rent from DITs (DIT-rent)
- income from business in the DITs
- cost of transforming unit
- technology of DITs (DIT-technology)
- materials used in DITs (DIT- materials)
- Financial costs- interest rates, inflation, and growth of construction costs

2.6.2.2 Social factors

- household size (HH-size)
- household head gender (HHH-sex)
- householder duration of stay (HH-duration)
- household structure
- socio-economic bracket of estate dwellership
- social organisations within the estate- through Residents' Association (RAs)

2.6.2.3 Physical factors

a) **Dwelling Unit (DU) parameters**

- type
- size
- storeys
- space types
- boundary definition
- location

b) **Urban Design Element (UDE) parameters**

These included the location, circulation types, extent, and layout below:

- Cluster
- Apartment

c) **Estate parameters**

- Boundary definition
- Location
- Social amenities provision and location
- Commercial amenities location and provision
- Transport nodes, Street types and location

3 The Research Methods

3.1 General

At a broad level, the philosophical discipline under which research is undertaken refers to the system of inquiry, a paradigm. It is within this umbrella that one employs the methods, the actual strategies in scientific research. Groat and Wang (2002) further reduce the strategies to empirical techniques and thus the tactics. The strategies then are the 'skilful management and planning' of the research, while the tactics are 'any skilful move' (Groat and Wang, 2002, p. 10) (fig. 3-1).

In architectural research, a dichotomous framework has often emerged in defining the paradigms that guide any inquiry. They differentiate what constitutes acceptable explanation and the reasons of such a position in the discipline. The differences emerge from what is constitutive of scientific explanation. Common to other disciplines in social science research, the terms used in architectural study are qualitative and the quantitative paradigms or 'myth' and 'science' (Robson, 2002) (Table 3-1).

The latter, quantitative approach is mathematical, reliant on 'atomistic', 'reductionist', and 'convergent' approaches. This is appropriate in guiding research in architectural technology and engineering as well as some behavioural and environmental issues (Wang and Groat 2002) (Zeisel 2006).

The former, qualitative alternative, sometimes even referred to as the 'mythic or poetic' (Groat, & Wang, 2002, p. 25) explanation, is continuous,

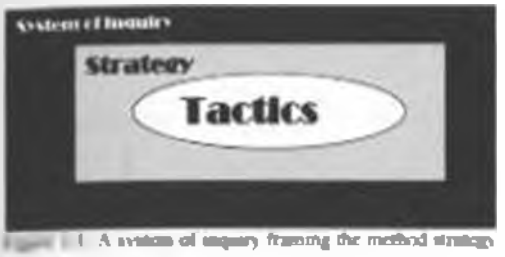


Figure 3-1 A system of inquiry framing the method strategy and tactics
Source: author, 2009 (adapted from Groat & Wang 2002)

holistic, divergent, and generative. Research in architecture associated with the arts and humanities as well as scholarly works in architectural history and theory are within this paradigm. The assumptions used in the dichotomy can be narrowed to three levels: i.e. the nature of reality (ontology), the relationship of the researcher and what is studied; the subject or object (epistemological) and the methods used (methodology) involved. Table 3-1 summarises these positions based on literature on methods by Wang and Groat (2002).

Table 3-1 Quantitative vs. qualitative paradigm

Assumptions	Question	Quantitative	Qualitative
Ontological assumption	What is the nature of reality?	Reality is objective and singular, apart from the researcher	Reality is subjective and multiple as seen from the participants in a study
Epistemological assumption	What is the relationship of the researcher to the research foci?	Researcher is independent from what is being researched	Researcher interacts with what is being researched
Methodological assumption	What is the process of research?	Deductive process Cause and effect	Inductive process Mutual simultaneous shaping of factors

Source: Groat & Wang (2002)

At ontological level, the quantitative researcher assumes an objective reality that is singular and set apart from the researcher, while the qualitative alternative's reality is subjective and plural as perceived by the study's participants. It points to the epistemological dimensions where a researcher is independent to what the research is about in the quantitative paradigm while in the other; the researcher interacts with the researched. The methods are

deductive processes, which seek cause and effect approaches in the quantitative paradigm.

The qualitative methods rely on inductive processes that seek explanation from multiple critical factors affecting the phenomenon. In reality, the distinction of paradigm is the empirical tactics employed in gathering data and / or interpreting evidence. In reality, most architectural inquiries rely on both tactics within the same research project in seeking explanation of most phenomena in the built environment.

In this study a case study method, which is classified in qualitative paradigm, used quantitative tactics; i.e. enumeration, observation and measurements of dweller-initiated transformations. This study in architecture, aimed to be relevant- broadly and holistically addressing the built-environment. It aimed to "…. synthesize a series of technical, aesthetic, social, functional …" (Reutersward, 1984, p. 9) factors into and for use in a building[19].

3.1.1 The qualitative and quantitative approach for DITs' study

The combination of the two paradigms in the choice of method employed exploited the benefits of either approach to disentangle the phenomena behind the propensity for DITs in formally design housing. There were operational limitations of both approaches. Majale and Payne (2004) advocate the combination of the methods for both, an in-depth understanding using

[19] The traditional scientific approach, on the other hand, instead limited the problem at the cost of relevance. "a narrow and deep" approach as opposed to the preferred professional "shallow and wide" approach, adopted in this study (Reutersward 1984, p. 9).

qualitative case study method and surveys for a quantitative take on urban housing phenomena.

The surveys needed more time and cost more without necessarily realising a complete appreciation of the phenomenon under review. There was general fatigue, cynicism, and even hostility in the lower and middle-income neighbourhoods for reasons of, among other, invading in their privacy, the feeling of exploitation by researchers and the professional class. Some interviewees even demanded payment, 'a listening allowance' away from their 'work'. This was likely to compromise the results and as such was a factor in the discussions and their interpretation. The approach used was in line with Kvale's (1996, p. 5) 'semi-structured life world view'[4].

The quantitative or survey ('questionnaire' method (Mo, 2004) approach demands large numbers of study subjects, a large '*n*' and was used to accord a (Johansson, 2003) (Yin, 2003) quantitative value to the various aspects of the DIT phenomenon. The statistical analyses were both descriptive and analytical, and illustrated the gravity of aspects the phenomenon. According to Yin (2003, p5), the 'who', 'what', 'where', 'how many', 'how much?' questions suit the survey method (Table 3.2).

[4] This is defined as 'an interview whose purpose is to obtain descriptions of the life world of the interviewee with respect to interpreting the described phenomena' (Kvale, 1996, pp. 5-6)

3.2 Research Design - The case study method

The case study[41] method, found appropriate and used for the inquiry of the influence of design strategies to transformations in formal housing estates, was also used since this was a contemporary phenomenon and was situated within a real life context. It is relevant when, a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no control' (Yin, 2003, p. 9).

Indeed, this work sought to understand 'why' and 'how' dweller-initiated transformations occur in formally designed housing estates in urban areas. The case study use involved in-depth understanding of the phenomenon with fewer subjects, a small '*n*'. Semi-structured questionnaires, protocols, and data sheets in gathering historical and biographical data[42], as well as observations were employed (App. 1).

Table 3-2 Relevant situations for different research strategies

Strategy	Form of research question	Requires control of behavioural event	Focuses on contemporary events
Experiments	how, why?	Yes	Yes
Survey	who, what, where, how many, how much?	No	Yes
Archival analysis	who, what, where, how many, how much?	No	Yes/No
History	how, why?	No	No
Case study	how, why?	No	Yes

Source: Yin, 2003, p.5

The case study method is a more cost effective approach and saved time. The use of observation, that exploited digital photography, sketches and measured drawings, freed the respondents from answering questionnaires

[41] According to Yin (2003, 1) other methods in social science research include experiments, survey, 2010s, histories, and the analysis of archival information.

[42] Based on and modified from the AGLVEN (Amole Ademola, et al. 1987) (Owoeye & Gidaz, 2008)

relating to observable facts of transformation. This was in line with Zeisel's (2006) 'physical trace' environmental behaviour study methods. He supports the approach as meant to 'gain unobtrusive insight into the meaning or use of environments so that quantitative methods could later be used to measure frequency of traces and related attitudes' (Zeisel, 2006, p. 179).

Zeisel (2006, p. 180) goes further to state this method is increasingly relevant in environment and behaviour (E-B) studies by scholars like Brand (1994) in his discourse on buildings as learning organisms. Zeisel cites studies by Banning (2000) on space use by student communities that helps shape strategies for physical improvements. Other uses of physical traces are by Brown, Perkins and Brown (2003) who study neighbourhood actions as pointers to the way dwellers use and would prefer the spaces and to help evolve rehabilitation and improvement strategies.

An added dimension to 'physical trace' used in the study is Geographical Information System (GIS) images based in satellite[43] and aerial[44] photographs in the case estates. It compared these images with archival records from databases at the NCC and elsewhere as well as interviews, to understand the DIT phenomenon. Zeisel's 'physical trace' method exploits physical evidence of space use, used in the present study. The work however went further to recognise that the evidence of extensions also reinforced the dwellers' intent of changing the environment.

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[43] Google Earth® and Quick Bird® images

[44] Prior the 2003 JICA/RCMRD Nairobi colour aerial photo project, black and white images of the city were regularly taken by the Survey, 2010 of Kenya (SoK) department

The study however, adopted a vestigial deviation from Yin's definition of the approach, by which it argued that the influence and control of the DIT results was possible through architectural design intervention. This was because unlike what Yin discussed, the 'experiment' is over the length of the project and not test-tube based, a 'quasi-experiment' (Johansson, 2003). This is contrary to Yin (2003, p. 1), who posits that the approach prefers a somewhat docile actor who exercises little or no control over the evnts presented in the case. It however still has a focus on a real life issue, in line with Yin's definition(2003, p.1).

A key proponent of the application of 'case study' in practice-oriented fields Johansson (2003), defines the 'case' as 'a complex functioning unit', that is 'investigated in its natural context with a multitude of methods', and it must be 'contemporary' (Johansson, 2003) . The emphasis according to Stake (1998) (1995) is not in the methods but the interest in individual cases. Yin (2003) lays more emphasis on the method and technique. The feature that defines the methodology used is its multiplicity of techniques that combine to illuminate the case: triangulation.

Groat and Wang (2002) identify seven strategies used in architectural research and their inter-relationships as illustrated by Johansson (2003) in figure 3.2. They (Groat & Wang, 2002) list the methods as Interpretive-historical, qualitative, correlational, experimental, and quasi-experimental, simulation and modeling and logical argumentation In their argument, they

explain the relations between methodologies, that those close to each other have more similarities than those that are further apart.

Thus, Qualitative and Interpretive research have in common a holistic approach to the research subject, but with differing time perspectives. Correlational research, on the other hand, shares with qualitative research a focus on naturally occurring circumstances, but is dependent on quantitative data. Experimentation is also dependent on quantitative data, but with the requirement that the researcher must be able to manipulate isolated variables. Likewise, simulation requires control and manipulation.

Logical argumentation, which includes, for instance, space syntax analysis (Hillier, & Hanson, 1984) — shares with simulation an emphasis on abstraction. In addition, interpretive-historical research is dependent on a constructed logic of interpretation. This completes the circle, shown Table 3.3, the nucleus of which is the combinations.

Figure 3-2: Multiple facets of the Case study methods
source: Johansson (2003)

Case Studies combine different portions of these

methods and in practice-oriented fields as architecture and planning have special value, as Groat and Wang (2002), correctly, place it central to the other methods. Indeed, the ability to act within professional practice depends almost exclusively on knowledge of a repertoire of cases. These cases are based either on personal experience or are model cases established within the profession. Case studies contribute to the building of a professional repertoire. A designer's work relies on comparisons between known cases from the repertoire and the actual design situation (Schon, 1991).

Although the Case Study methodology, developed within the social sciences, a prerequisite was the focus on contemporary events, within research in the field of architecture and planning, like in this work a building artefact served as the focus of attention. This connoted historical data. As Johansson (2003, 5) affirmed, 'when a physical artefact is the case (houses or housing areas, for instance, instead of an individual or a social group) the gap between case study and history tends to diminish.

A house as an artefact becomes the carrier of its history' He further asserts that 'The context of design and the context of use may be separated in time, but are often equally important to the understanding of the case of an artefact. In architectural research, when the case is a physical artefact, case studies often become historical case studies' (Johansson, 2003, p. 5).

The investigation assumed an active design theme in which the design actions can be used to influence the results. The case study design used involved multiple cases (the estates) in which the grouping element, UDH: and

Unit were various sub-units of analysis embedded within the cases, and varied to reflect some control over the results.

The use of various estates created a comparative logic between them in situations where a limited set of conditions, here the design strategies, are different to assess their impact on the ensuing DU's. The conditions were *different*, not *varied* as in controlled experiments, reflecting the different design strategies. Urban Design Elements (UDEs)[45] and the Dwelling Unit (DUs)[46], the sub-units of analysis, reflected the spatial hierarchical scale levels that contributed to the results. As will be evident, though the scale levels are spatial, they also reflected the social and economic hierarchies that formed housing decisions. The multiplicity of methods adopted here is in table 3-3.

3.2.1 Choice of cases: Kaloleni and Buru-Buru estates

The deliberate choice of the two case estates to uncover aspects of the strategy and followed a replication and not a sampling logic. Yin (2003, p. 47) explains the distinctions thus: while, to achieve 'literal' replication, the same conditions prevail and the results are supportive of each other. For 'theoretical' replication, one varies conditions to draw linkages between the cases.

Yin (2003, pp. 48-49) argues against the use of sampling in case study selection, stating that cases are ill prepared for searching the frequency of a phenomenon, as impossibly large numbers of variables would be required and,

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[45] UDEs are the architectural physical grouping strategies that in cases included the clusters and apartment blocks

[46] The DUs were the house types and in the case varied in magnitude (number of space types and areas) and storeys

for some topics, impossible to realise[41]. The number of two (2) estates studied, was deliberate, and aimed to create theoretical replication logic. This was realised by ensuring the conditions prevailing in the design strategies of each of these estate was different. This was to create this theoretical linkage between the findings

The research design used here entailed an exploration of theories on positions taken by others, including authors, architects and institutions, the basis of which the selection of each case was established and a data collection protocol evolved. Through these studies, the ownership and tenure system adopted in the two estates was the basic difference between the cases was established. Thus, the choice of Buru-Buru was because it was a privately owned mortgage scheme while Kaloleni was not. The later was a rental scheme managed by the Nairobi City Council. The theory parts prior to this section helped articulate the design used. The research questions and objectives informed the strategy adopted.

3.2.2 The Units of Analysis

The units of analyses are hierarchical to reflect the spatial levels and scales environment in housing estates. The assumption is that the total environment is a composite of these layers and their inter-relationships. The estate, the Urban Design Element (UDE) and Dwelling Unit (DU) are the layers further elaborated below. A basic premise in the choice of the units of analyses was

[41] Like historical case.

that they formed not only a physical strategic objective, but also possessed social and economic qualities.

3.2.2.1 Layer 1: The General Survey at the Estate level

Generally, the investigation broadly gathered qualitative and quantitative information on; the frequency of transformations (numbers, percentages), the predominant forms evident in the transformations (storeys, typological, articulation), the technology (permanent, temporary) used and the uses (commercial, residential, other).

The choice of the estate respected set criteria of age, public origin scale, and population. The size of the estate exceeded one hundred (100) houses. This meant a scheme conceived as an estate with all the infrastructural services for an estimated population of more than 1000 persons. The affordability of units was restricted to between low to middle-income brackets. This was mainly through the technological and spatial standards that conformed to the Building Code (RoK, 1997) and Planning Manual (RoK, 2004); all requirements set by Nairobi City Council (NCC) By-laws. Thus, they were modern buildings, conforming to urban development standards.

3.2.2.2 Layer 2: Urban Design Element (UDE)

Because the magnitudes of the case estates, a spatial segment (UDE), the sub-unit of analysis was found useful. The Urban Design Element (UDE), defined as the housing unit grouping element fulfilling community and physical objectives.

Table 3.3 Research Tools and Data Sources for Cases

TOOL	ASPECT	SOURCES	COMMENT
Literature	Design strategy, policy, design theory, methodology, urbanization, Nairobi Kenya	Planning and architecture departments at UON NTNU, NAI (BIBYS library) Internet	Chapters 1,2 & 3 of the study, Appendices Analysis and Conclusions and Recommendations
Architectural drawings	Spatial design strategy, form, magnitude, types, forms	MMI, NCC, Books and other documents	Limited measured drawings, they were not available for the cases
Semi-structured interviews (App. 2) / AGEVIS (App. 1)	Household data, household data, house mobility narratives	Field	key informants and
Paper / digital photographs	DFI type, extent	Field	Due to duration of the study not all reflected current physical state
Aerial photographs, satellite photographs	Magnitude and type of DFIs at estate scale	SoK, JICA, RCMRD	Mainly 2001 aerial photograph from JICA, SoK, and RCMRD Earlier aerial photographs were limited and of compromised quality
Digital Maps	Magnitude and type of DFIs at estate scale	SoK, JICA, RCMRD	Old maps and some 2003 digital maps from JICA, SoK, and RCMRD were used
Measured drawings	Magnitude of DFI, technology and specifications, cost data	Field Measurements	Because the DFI time dimension not all were dated the same and some may have changed in the duration of the study
Statistics and policy documents	Production figures, demographic data	CBS, libraries, Internet	Used but Reliability questioned in the relevant section
Archival data	Original design data, concepts, and policies	NCC, MMI (consultants)	Dating difficulties encountered but corroborated with measurements

Source: author, 2010

n the two cases, it was the cluster and a few apartment blocks. Through physical measurements of the modifications and their concretisation, the DFI study related the spatial grouping strategy to the actualised alternative as transformed by the dwellers.

The UDE best reflected the spatial concepts employed by the professional designers hence the design strategy. They were spatial elements exploited at planning stage of the estates and relate to,

i. Circulation requirements (roads and footpaths),
ii. Key infrastructural features (electricity lines, storm water drains, railway and others),
iii. Open spaces, social facilities (schools, sports grounds and others),
iv. Commercial facility (shops, markets, light industrial production and others) and,
v. Topographical / landscape features (groves, trees, rivers, water masses and others).

3.2.2.3 Layer 3: The Dwelling Unit (DU)

The house, the physical entity defining the extent of the individual dweller's control and use of space, was the next unit of analysis. Transformations at this level reflected the individual nuances and efforts to personalize individual space: physically, socially, and economically. The case study estates had bungaloid, maisonette, and apartment-type house typologies, which formed the units of investigation. Within the DU, the space types formed another level of transformation. The key Space types distinguished were public spaces (living and dining spaces), private spaces (bedrooms, study), utility spaces ('wet areas'), and ancillary spaces (store, verandah, corridors, and others). Their magnitude, use, location and other qualities guided their assessment. Technology and materials used were the subjects in understanding the Building Element Types.

The physical aspect of DUs at these layers was operationalized using from Brand's (1994) shearing schemata but adapted to suit these layers (Table 3-4).

3.2.3 Data collection techniques and strategy

Table 3-5 summarises the multiple methods, techniques, tactics, and instruments, as well as the populations studied. Brief explanations of the same are in the next sub-sections:

3.2.3.1 Kaloleni data

The case of Kaloleni estate provided unique challenges that demanded a special sampling approach in order to understand the nature of DITs. This was because of her longer history, special tenancy structure and the experience of demolitions, often meted out by the authorities (NCC, GoK) in un-author. 2010ised developments. Further, the low-income status offered challenges often-associated conducting interviews in similar neighbourhoods including 'research fatigue' that inevitably led to non-cooperation with the researcher.

The Several methods

Table 3-4 Units of analysis operationalized (constructed by author, 2010)

Brand's (1994) 'shearing layer'	LAYER 1: THE ESTATE	LAYER 2: THE UDE	LAYER 3: THE UNIT
Site	Estate Location	UDE Location	The 'Plot'
Structure	Estate Circulation infrastructure	UDE Circulation infrastructure	House Structural type
'skin'	Estate Edge definition	UDE extent definition	House envelope
Services	Estate Infrastructural services	UDE Infrastructural services	Services
Space plan	Plotting and layout	UDE layout	Space plan

Source: author, 2010

used ensured reliable data for the analysis. For the physical transformation data, the study used measurements, digital and paper photography. Archival records enabled a time-based longitudinal study. In a detailed survey to a smaller sample[48] of twelve (12) respondents (representing 1.42% of the population), details of physical transformations, as well as their bio-data was

[48] Thus in addition to the interviews, measurements and further technological details were undertaken for the provided unit and the extensions

the basis for case study DUs. A total of 52 respondents' DUs were visited formed the total sample[49]. Modified AGIEVEN data sheets (Appendix 1) used to access historical biographical data from the respondents' ownership, tenancy, and transformations dynamics. Through assessing layout plans and aerial images, three clusters, the basic UDH in the estate were the subject of the detailed study of the DU groupings. This sample constituted fifty-two (52, hence 6% of the population) respondents. Estate-wide (100%) survey was base on satellite, aerial photography, and archival records.

3.2.3.2 Buru-Buru data

In Buru-Buru, a questionnaire (Appendix 1) was developed and used. This captured bio-data of the dwellers, and economic information. The questionnaire also captured the physical status of the dwelling as provided and as transformed.

Aerial photographs and the consultants' blueprints were at hand for the analyses at the unit and cluster levels. Key informant discussions included the consultants and residents' association leaders. The main handicap was that most respondents found the inquiry too detailed and intrusive.

A few respondents treaded the discussions for fear of self-incrimination since the extensions were mainly illegal. The other operational handicap was the security guards that guarded the cluster courts. They disliked our presence for fear of a security breach and privacy of their clients.

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[49] This was a survey, 2010 which was used statistical measures as tabulated at Appendix 5

Table 3-5: The hierarchical units and sub-units of analysis, sampled units in the case estates

	LEVEL 1: UNIT SURVEY		LEVEL 2: UDF SURVEY		LEVEL 3: GENERAL SURVEY	
	KALOLENI	BURU-BURU	KALOLENI	BURU-BURU	KALOLENI	BURU-BURU
Description	Use of case study DUs, interviews for bio-data and mobility of the dweller. Randomly identified the initial sample advanced through a snowballing effect – used for unit level analysis		Use of case study UDF's- physical observational data only of units within a cluster, both quantitative (counting) and qualitative approaches (sensorial) were used		Use of reconnaissance surveys, problem formulation, pilot study, media reports	
Number	73	103	52	310	534	534
Percentage	14.6%	2.06%	6.13%	6.20%	100%	100%
Data	Questionnaires (Appendix 2) data sheets, photographs and measurements	Questionnaires (Appendix 1) data sheets, photographs, and measurements	Photographs and measurements	Photographs and measurements	Satellite maps, aerial photographs, Archival drawings, aerial photos, books and fiction literature	Satellite maps, aerial photographs, Consultants drawings aerial photos media
Data type	Detailed study of DUs, type (ABCD), technology, units area estimated cost, dweller bio-data dweller mobility, function of DU		Cluster form, technology of DU, function in DU, number of quantitative DUs		Evidence of phenomenon, use of common space, street, edge nodes for DUs, demographic statistics	
Sources	Individual dwellers		Buildings - Visual observation and archives, some interviews		Archives, satellite images, aerial photos	

Source: Author, 2016

One hundred-and-three (103) questionnaires were randomly distributed and returned with the information recorded. These captured detailed data on the household demographic formations, transformation propensities as well as sketched transformations details. The UDF level investigations in 310 units represented 6.2% of the population. Estate-wide survey (100%) was base on satellite, aerial and Google[©] earth photography. Architects' archival blueprints from Mutiso Menezes International (MMI), the planning and architectural consultants for most of the phases, constituted part of empirical data used in the study. Table 3-5 summarises this information.

3.2.3.3 Transformation Categories used in the study

Four main transformation categories were categorised as 'A', 'B', 'C', and 'D'. It should noted that they relate to Brand's (1994) Shearing Schemata and Oxman, *et.al.* (1985)'s models earlier discussed (Table 3-6).

a) Type 'A' - Edge-defining transformation

In Brand's (1994) terminology, this are the 'site'-based transformations, and type does not engage the provided unit, but its compound. The boundary and /or gate addition were looked at and if modified recorded as a Type 'A' transformation. Similarly horizontal surface treatments, foul water drainage and paving were considered here.

b) Type 'B' - The 'skin'-based transformations

These are habitation and personalization of the unit that included decorative and maintenance actions on the original DU. Also captured here were the security enhancement aspects like burglar-proofing grills to openings. In Brand's (1994) shearing schemata, this would include the actions on the 'skin' of the building.

c) Type 'C' Transformations – Internal modifications

In Oxman, *et.al*, (1985) these transformation types include 'subdivision' of the provided unit/spaces. These modifications reflected changes in the 'space plan' in the Brand (1994, p.13) schemata. These were subtractive DITs and operated within the envelope of the provided dwelling. These would match within the 'sub-division and sequential completion' and 'combination' categories in the Oxman, *et.al* (1985) categorization

d) Type 'D' Transformations - Extensions

These are the extensions, and are the most overt manifestation of DITs. These are additive DIT's and were outside the provided structures. This fits within the 'addition' category in Oxman, *et al* (1985)'s terminology.

3.2.4 The analysis-qualitative and quantitative dimensions

The surrogates within the economic, social, and physical variables under appropriate architectural strategy groupings from the empirical data were inputs to an SPSS programme. Outputs were quantitative, and informed the discussions. This type of data, of a quantitative nature, was necessary to add a magnitude to the phenomenon and supplement the logical argumentation in the descriptions and qualitative analysis. Some raw data and responses are included in the Appendices (9, 10, 12, 13, 14, 15, & 16) as SPSS outputs. SPSS 11 was the statistical software used for the analysis aimed at establishing any relationships between the nature and frequency of transformations.

[illegible]

	ELEMENTS	BRIEF DESCRIPTION
Type A	[illegible] boundary Surface water drainage Landscaping [illegible]	This did not include work on the actual unit but included [illegible]
Type B	Finishes – external and internal Openings – modification / replacement Openings – burglar proofing [illegible]	This was largely 'skin'-based work on the provided unit
Type C	[illegible] Conjunction – reduction Intercalary space Subdivision Add-on	These included internal spatial modifications or within the area of the provided unit, in line with the 'combination' and 'subdivision' architectural strategies framed by Oxman et al (1985) integral categories of transformation
Type D	Clip-on Vertical addition Bridging Add levels	This refers to 'extensions'

Source: author, 2010

To illustrate the presence of the phenomena, *descriptive statistics* were used which generated frequency tables and charts. Mugenda (2008) avers that these

kinds of research designs aim to illustrate the extent of the issues at stake, in this case the prevalence of dweller-initiated transformations. It was about the distributions of values for particular variables using frequency tables, histograms and other statistical formats.

The next (second) level was a *cross-tabulation* was to establish any relationship between variables, a *bi-variate analysis*. This involved preparing contingency tables of compared variables to seek any underlying tendencies in frequencies and percentages.

The Third level of analysis was to establish statistical *strengths* in addition to pure significance as above. The measure for strengths and significance in these correlations investigations used *Spearman's rho* as Correlation coefficients, as preferred by several authors (Bryman, 2005, p. 244; Mugenda, 2008, p. 69) as the data was keyed in using mainly ordinal measurements.

At the fourth level, multivariate regression analysis, measure the contributions of the various variables to rank the order of significance amongst the variables and their surrogates. This procedure was used in a similar format when analysing other relationships amongst the economic and physical determinants of transformations in both Kaloleni and later in Buru-Buru estates. The quantitative analysis is based on methodology literature by several authors (Bryman & Cramer, 2005) (Mugenda, 2008) (Mugenda & Mugenda, 1999) (Wonnacott & Wonnacot, 1977) (Mo, 1981,2002 & 2004). As will be shown, the second, Third and fourth level results however yielded no

significant results and did not form the basis of most the key findings. Appendix 5 tabulates the variables, their surrogates, codes and their measures.

3.3 Background to the Case Estates

The two case estates contrast in scale, historical background, and age, and well as the underlying strategies. They however shared the Eastlands location, and evolved from formal public sector intervention. The housing provision paradigm adopted in either case was the 'providers' approach (Hamdi, 1991). Thus the estates were developed based on the notion that the state could 'produce houses'[50], instead of just supporting the individuals' initiatives fronted by 'populist' alternative (Tzonis, 1976) (Turner, 1972 & 1977) (Habraken, 1972) and (Alexander, 1985).

Table 3-7 summarises the characteristics between the schemes. Figure 3.3 shows the location of the cases within the city of Nairobi. The Eastlands' zone in which the two schemes fall has a history of social housing developments. As part of the inclusive housing strategies, mooted after the 2nd World War, the colonial government identified the residential zone, as 'the African location', to the east of the current CBD (Hake, 1977) (Nevanlinna, 1995). The post-colonial Kenyan governments have further situated a large number of housing estates here.

[50] This was in line with modern architecture proponents. See CIAM philosophy and especially the declarations in the 1928 summit (Frampton, 1992).

Table 7-2: Parameters of the Case Estates (source: author, 2010)

	Kaloleni	Buru Buru
Development Year	1945	1973-83
No. of Units	884	4,315
Current population	3,000	[illegible]
Funding	Colonial Development Corporation, UK Government	Commonwealth Development Corporation (CDC), UK Government
Tenure & Housing Access System	Rental	[illegible] / Mortgage
Typology	Bungaloid / walk-up flats	Bungaloid / maisonettes
Target Income Group	Low income	Middle income

Source: survey, 2010

The physical environment is characterised by a flattish terrain, dry grasslands and black cotton soils as a base for all building substructure. Further, it is drier and has large depths of unstable soils that render poor for affordable construction[51] . This environmental depravity is present early in the city's evolution and indeed, these poor soils, structurally weak for building, and thus costly for construction activity appears in the 1948 Master Plan (Thornton-White, *et al*, 1948, p.27).

Kaloleni falls within the rental strategy which was favoured by the colonial government when it was no longer sustainable to stave the migration of the native African population in from the hinterland. Between 1926 and 1961 up to 14,157 rental housing were erected. The vast majority of these were for low income housing and further, these were almost exclusively sited in Eastlands zone. The typologies were often largely bungaloid single or double rooms dwellings.

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[51] Thus it has lower mean rainfall of 762mm at JKIA compared to 1049mm at Dagoretti station (Ng'ang'a, 1992, p. 11) and higher temperatures (28°C at JKIA compared to 25° in February at Dagoretti station) (Ng'ang'a, 1992, p. 17&18) that typify savanna landscapes

The post-colonial government built rental housing that targetted more of the higher-income groups, with the most of the recorded 4,974 units benefitting the higher income groups. According to Shihembetsa (1995, p. 126), of these only 1,647 housed the lower income citizens. The rental housing policy was abondoned in 1981 when Buru-Buru rental flats were erected, in favour of home ownership, through tenant purchase and mortgage programmes.

In Buru-Buru Estate, the dwellers own the units through mortgage loans. The estate came to be in the 1970s not only when ownership model was in vogue, but also with a morphological disposition towards singular but terraced, semi-detached or detached unit. Commencing in 1973, the five phases took ten years implement, up to 1983 when the dwellers moved into the last few units. Commonwealth Development Corporation (CDC) funded it in collaboration with the Government and NCC. The developers completed the first phase of the estate, comprising some 920 units, in July 1974 from its commencement in September 1973. The initiators of Buru-Buru estate envisaged an estimated target population[12] of 25,000. Whereas Buru-Buru targeted the middle-income city residents, and has remained so, Kaloleni was a social housing scheme and housed, the lower-income. The study had two added dimension of comparing the transformation propensity between the two social strata, as well as, a publicly owned scheme of Kaloleni compared with individually owned in Buru-Buru.

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[12] Based on computation of 5 persons in household, a figure sourced from Architect Sirma of MMH during a lecture at UON in 2003

In the analyses, the concepts of dwellers perceiving an urban settlement, a city, as developed by Kevin Lynch (1975) was used in the expression and spatial conception. In this thinking, adopted and adapted in this work, the 'image of a city' is defined by its physical contents of five elements of paths, edges, nodes, districts and landmarks (Lynch, 1975, p. 46)[11].

In the restricted scope of the estates, are found mainly the 'paths', 'edges', and 'nodes'; terms invariably used in discussions. The 'landmarks' and 'districts' are used broadly and do not feature prominently in the study. Indeed, Nairobi has these elements, but the current study was restricted to a particular district, here referred as a zone, the Eastlands residential district. The landmark features were not crucial to the understanding of transformations at the small-scale level of the estate in the present. Within this text, 'paths' are related variously as circulation arteries, roads, streets, footpaths and often a reference to their scales, usage and material detailing. 'Edges' are also described variously as boundaries, extents, and borders. 'Nodes' remain focal activity points within the estates, and were often defined by circulation paths and the emergence of an intensity of activities of mostly a commercial nature.

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[11] The 'paths are the channels along which the observer customarily, occasionally, or potentially moves'. The 'edges are the linear elements not used or considered as paths by the observer. The 'districts are the medium-to-large sections of the city, conceived of as two-dimensional extent, which the observer mentally enters "inside of", and which are recognizable as having some common identifying character'. The 'nodes are points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he is travelling.' 'Landmarks are another type of point-reference, but in this case the observer does not enter within them, they are external.' (Lynch, 1975, pp. 47-48) (Hensley et al., 2005, pp 43-46)

Figure 3-5: Aerial photo of part of Eastlands showing location of case estates
SOURCE: adapted from RCMRD/SoK, 2010

4 THE CASE OF KALOLENI ESTATE

4.1 Background

Kaloleni is located on the eastern part of Nairobi about two kilometres from the Central Business District (CBD) (Figs.3-3 & 4-1). Now an inner city residential neighbourhood because of rapid expansion, it was, originally on the city's periphery. Constructed at between 1945 and 1948 (Hake, 1977, p.56) (Nevanlinna, 1995, p.171) (Anderson, 2002) (Ogilvie, 1946) through colonial grants, it is now an NCC rental housing scheme[54]. Bordering the estate to the West is the City Stadium, to the east, Makongeni[55] estate, to the north, Jogoo Highway and to the south is the Industrial Area, a manufacturing district (Fig.4-1).

Kaloleni has been described as a 'model neighbourhood unit' (Hake, 1977, p. 56) and developed to house the native Kenyans following the recommendations by the C.E. Mortimer who chaired the African Housing Committee (Mortimer, 1946) (Ogilvie, 1946) that was tasked to address African urban housing needs. In a manual by Ogilvie (1946, p. 16), the Nairobi municipal engineer, the estate is referred to only as located in 'the Makongeni area near the [then] existing African stadium'.

The architect was a Mr. Sutton. The layout and unit plans used in the book refer to the current Kaloleni estate; while the Makongeni estate is a Kenya Railways estate bordering Kaloleni and whose layout and locations differ form

[54] The NCC owns 27 residential estates in Nairobi (Olende, 2001).

[55] Used as housing for railway corporation workers. In the 1940s, Kenya witnessed dramatic economic growth, and many African housing were implemented (Hake, 1977, p. 56) (Anderson, 2002).

the descriptions in Ogilvie's work (1946, pp. 16-26). Jogoo Road, a 30-metre dual carriageway, is the estate's main vehicular and pedestrian access. The public transport lay-byes located on the highway also serve as nodes for informal trade. The main vehicular estate entrance is Njia Kuu, a 20-metre dual road, which serves to access the estate's Central Open Space, where public (commercial, social, and administrative buildings) spaces are located. The estate is otherwise without any boundary elements, and is porous with multiple pedestrian access paths. In addition to the peripheral highway, a railway line fronts the estate, separates it from the Industrial Area, and acts as another edge. This rail line however, does not serve the estate as a commuter urban transport system[38]. The line has informal pedestrian on the sides and walkways. This frontage to the railway is derelict and is characterised by informal economy, urban agriculture, and temporary built-forms.

Figure 4-1 is satellite photograph of the estate showing the location of neighbouring districts and land-uses, as well as case study UDEs. Figure 4-2 is the original architectural layout of the estate archived from O.C.W. Ogilvie, the then Municipal Engineers' manual (Ogilvie, 1946). Appendix 7 is the layout of the estate from NCC archival records. The implemented scheme respected the target population was 3,000.

[38] The city lacks such a system although there is an infrequent overland service from parts of Eastlands

aerial photograph
2010

4.1.1 The Layout of Kaloleni estate

In character with the description as 'model neighbourhood unit' (Hake, 1977) (Nevanlinna, 1995), the abundance of green space and organic layout of the dwelling units, are the best descriptive attributes of Kaloleni. Indeed, it borrows heavily from the Neighbourhood Unit Concept (NUC) proposed in the 1948 Nairobi Master Plan (Thornton-White *etal.*, 1948),[1] one of the key planning concepts that guide Nairobi's growth over her century-span history.

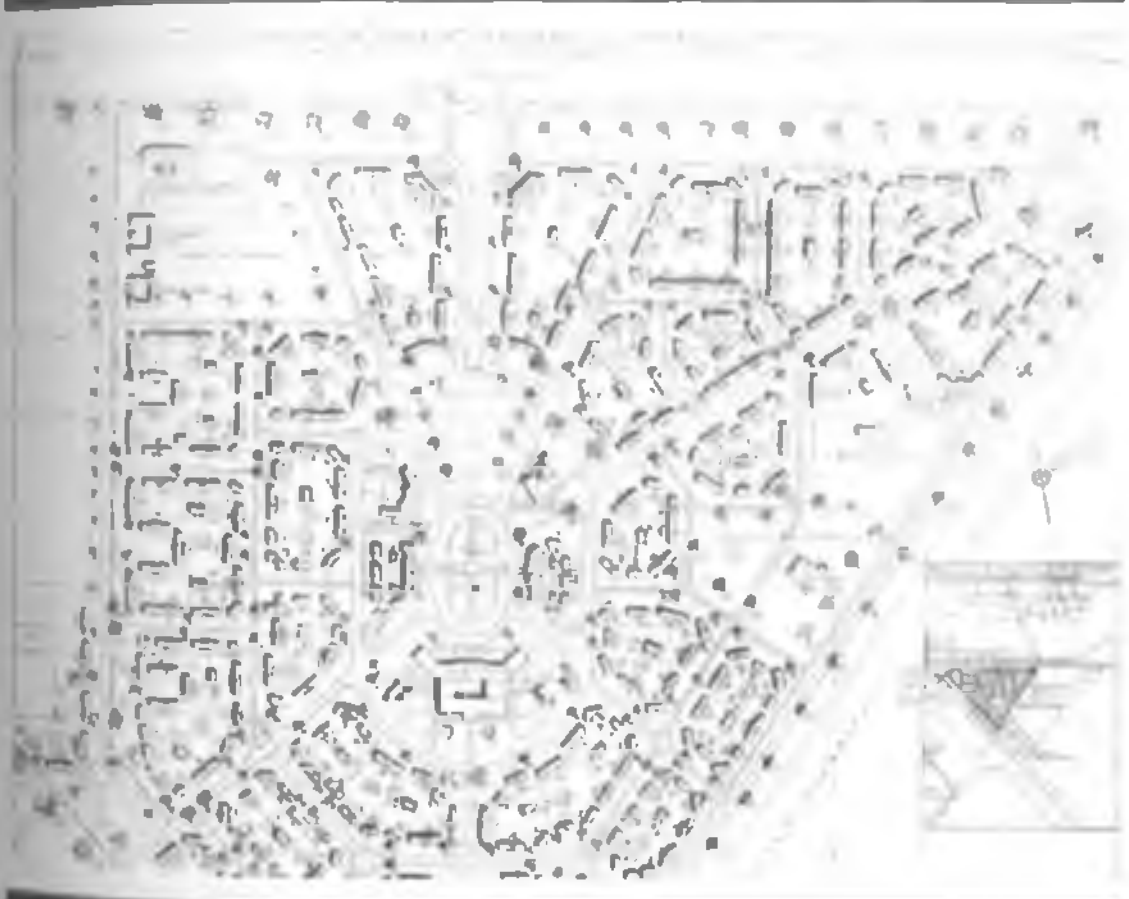
However, unlike the linear, street-based clusters that feature in the then proposed 1948 NUC Model (App. 6), clusters based on vast courtyards, apartment blocks linearly aligned within other open spaces as well as a radial street network dominate the Kaloleni estate layout and satellite image (Fig.4-1). At the global scale, the estate possessed two levels in the hierarchy of open spaces with a Central Open Space serving the entire estate and the smaller court for the clusters. The circulation paths of two types: the concentric rings with an origination from the Central Court up to the edges, and radial linkages between them also focussed on the centre. This was in line with the Ogilvie's (1946) description of the planning strategies of the estate.

A Central Open Space, referred to as the 'village green' (Ogilvie, 1946, p. 18), was surrounded by communal nature and common-function buildings that housed social, commercial and administrative functions, was the central visual and functional focus in the physical layout of the estate. The commercial

[1] It is however not a direct result of the TW NUC since it was implemented earlier and was instead a result of the Mayanei Committee (1946) (Ogilvie, 1946) whose recommendations were earlier than the Master Plan

facilities (referred to as 'African shops' in the early discussions) include a Shopping Centre that housed formal commercial activities including grocery shops, bars, butcheries, carpentry shops, salons, and barber shops.

Recreational facilities accommodated include a Social Hall, an open ground used as a handball pitch and the nearby City Stadium, which hosts citywide events. Administrative functions included the chief's office and an administrative police post and camp. Initially there was a superintendent's



office. In these early proposals the social functions included the 'a small welfare clinic and a social centre, in which provision is made for reading, writing, recreation and games, feeding, and facilities for occasional cinema shows.'

Others included in the early layout and designs included children's playgrounds and shelters, schools, playing fields, allotment gardens, and a bus shelter.' (Ogilvie, 1946, pp. 18-19)The elliptical open space at the centre of the zone is green is a recreational space, although large parts of it were now used as a dumping ground for solid waste. Part of the green space is now a Chief's Camp, used by the administration.

From the estate layout in Figure 4-2, these buildings faced the 'village green' and an oval vehicular road separated them from the dwelling units. The houses had entrances from the radial roads and paths[58]. The central traffic roads were initially from tarmac while the secondary roads and paths were from murram.

In the projections, the streets (and communal buildings) had street lighting provided. The dwelling units were later to have individual unit connections. Street and path borders, as well s as courtyards had landscaping with trees, shrubs and manicured grass and a 'Housing Authority' was to maintain these features. The estate was nearly thirty-seven hectares[59], and was composed of twenty-six (26) courtyard clusters with sixteen (16) to thirty-four (34)

[58] The main radiating roads located at surrounding natural features. Thus each surrounding natural landmarks Ngong Hills, Ol Donyo Sabuk, the Kimangop, etc., and the mountains of Kilimanjaro and Kenya may be observed from the centre of the village green' (Ogilvie, 1946, p. 19).

[59] The land the estate is located is a 99year leasehold from 1940

bungaloid, semi-detached units totalling six hundred and eighteen (618) shown in Appendix 7. In Ogilvie's (1946) early reports, he referred unit groupings as 'Plots that vary in size from those housing 65 persons to those housing 120 persons'

Other than the bungalow clusters, there was the Apartment blocks composed of two hundred and twenty-four (224) DUs that were arranged in two linear clusters, all located on the edge fronting the railway and the City Stadium (Figs. 4-1 & 4-2). The courtyards in clusters were largely organic, with no pure geometry and porous on the edges. Nevertheless, they defined a central focussed nucleic organization; oriented towards the ablution block (s). The maximum lengths of the provided courts were one hundred and fifteen (115) metres, while the width varied from about twenty (20) to fifty (50) metres, and these distances could vary within one cluster. This physical formation hardly promoted neighbourly and territorial control; a factor that contributed to the nature of the DITs that resulted.

Inside the estate, interlinked estate roads and footpaths defined circulation. Concrete footbridges over the wide, one and half to two metres wide (1.5-2), open storm water drains, linked the clusters to these circulation network. These wide gulleys for drains were also useful as edge defining elements[65] to the clusters in some parts of the estate. Intra-estate circulation was mainly

[65] Echoing some traditional settlement patterns in some Kenyan communities like the Luyia of western Kenya who used trenches to surround their villages as a defence feature (Sanya-Wandibba, 1972) (Otiego, 1986)

pedestrian, but many dwellers used other modes of transport for other[91] goods and water.

4.1.2 Genesis of transformations in Kaloleni

Physical transformations in Kaloleni have occurred in more than one phase. Further, they have not always been initiated by the individual dwellers. They have also have been officially instigated by the authorities. Though the sanctioned transformations had objectives of improving the estates physical state, to the dwellership, they have in reality had mixed impacts. They have been both positive and punitive as the negative results lay bare. The same can be said of the dweller-initiated transformations (DITs) that form the subject in the present work.

Thus outside the present dweller-focused scope, the first transformation was aimed at the introduction of in-house piped water and water-borne sanitation. Benign, in its objectives and the results, this official transformation action enhanced the estate's sanitary conditions. Indeed the archival layout plans (App. 7 & Fig. 4-2) of the unit and cluster level show the ablution blocks centrally located within cluster courtyards. A few of these ablution blocks still exist but in a dilapidated state, remain largely disused and are often havens of social and physical abuse. A layout and details of the block are shown in Appendix 10. The centrally located block was meant to provide: '...communal sanitary, bathing, clothes-and pot-washing facilities...' (Ogilvie, 1946, p. 18)

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[91] Handcarts (*mikokoteni*) or cycles were modes of goods/water transport.

The second physical transformation was dweller-driven and seemingly by the need for more space. In the early stages, this was hardly noticeable and was internal or 'skin'-based transformations only. Understandably, this aimed at bridging the gap created by the NCC's failure to fulfill their role as landlords, responsible for keeping the houses in acceptable maintenance state. Later dweller-driven transformations are however notable for their expanse through additive transformations, and constitutes large parts of this work.

These transformation activities coincided with several local, national and global policy orthodoxies. Equally significantly, it coincided with the laxity of the NCC administration in discharging curbing illegal developments and enforcement of development controls and regulations. Though national, but imposed by global bilateral donor conditionalities, the economic and political liberalization[92] (Bohman, 2006) (Hewitt, 1992) led to the informal economy (Hansen & Vaa, 2004) and self-employment that was often physically accommodated within the dwelling units and neighbourhood.

The third estate-wide construction activity was the official demolitions of these dweller-initiated extensions. In a brief period in 2003 and 2004 (Barasa, 2004), after a democratic change of government[93], there was a euphoric mood across Kenya by which some felt a proper system of managing urban resources and systems was in the offing. In fact, the Ministry of Local Government (MOLG) moved to delete the additions from most NCC estates through these

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[92] In Kenya, this was through the policy paper 'Economic Management for Renewed Growth (RoK, 1990)

[93] A transfer of political party power from KANU (Kenya African National Union), an independence struggle party to a reformist NARC (National Rainbow Coalition) which pledged a changed stance in managing state affairs

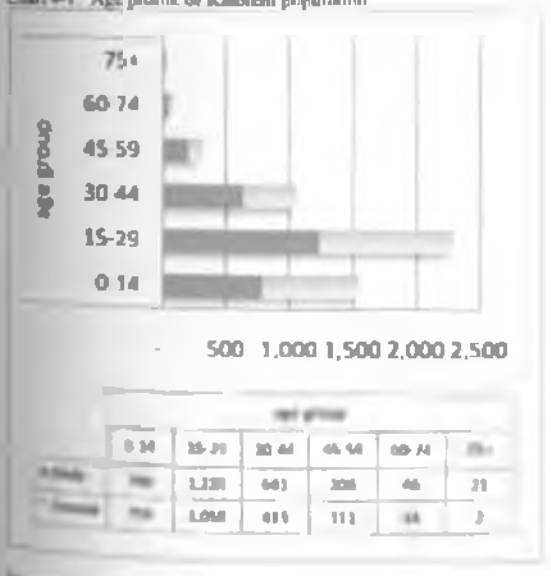
demolitions. These efforts have become a cropper as presently, a process of reconstruction prevails and dominates the estate as the study confirmed.

4.1.3 Socio-economic characteristics

According to this 2001 Central Bureau Statistics (CBS) data, the total population for Kalolcni was five thousand, three hundred and nineteen (5,319) and predominantly young with ninety-two percent (92%) aged below fourty-five (45) years. Thus, out of this, the age group of fifteen to twenty-nine (15-29) year-olds was the largest, and followed those below fourteen (0-14) age group. This is as shown in Chart 4-1 that is based on the CBS data.

The samples had more than 80% respondents below 45 years and these were born in the estate. This showed that the majority of the dwellers had helped form the urban space now witnessed and under study. In fact, only 8% had stayed for less than ten (10) years in the estate. The majority had been resident here from birth and had stayed in excess of thirty years.

Chart 4-1: Age profile of Kalolcni population



Source: Survey, 2010

The gender distribution of 50% of either sex also somewhat reflected in the sampled household heads, albeit slightly skewed in favour of the males (58%). Households in the sample were mainly medium-sized

Table 4-1 [illegible]

		Frequency	Percentage
[illegible]	[illegible]	29	42%
	Female	21	58%
[illegible]	Below 35	9	18%
	35-45	22	50%
	45-55	8	16%
	Above 55	8	16%
[illegible]	1 to 3	19	38%
	4 to 5	9	18%
	6 to 10	13	26%
	Above 10	9	18%
[illegible]	Casual worker	12	24%
	Informal trader	24	48%
	Formal business	14	28
[illegible]	Below 10	4	8%
	20 to 30	13	26%
	Above 30	33	66%

Source: survey, 2010

families of three to eight (64%) that sometimes had extended family relatives domiciled within. This extended family links accounted for the number of large families of five to above ten members of a typical household size. Table 4-1 shows some socio-economic profile from the sample.

The household heads had ages ranging from thirty-five to fifty-five (35-55) years. The largest (44%) single group was aged between thirty-five to fourty-five (35-45) years old, while the smallest representation was those above fifty-five (55) years who composed only sixteen percent (16%). The sex of the household head was mainly male representing sixty percent (60%). The small household size of below three (<3) was the common with fourty-two percent (42%) of the units, while the other three groupings were more evenly represented with sizes of three to five (3-5) years, 20%, five to ten, 18% and above 10 household members being 18%. The respondents in the sample earned income from low skilled occupations, including informal trade, business, and casual work.

4.2 Transformation at estate level

The main feature of estate-wide DIIs was accommodation of commercial and social functions, and not the residential. Further, they were located along the edge-based circulation arteries, and rarely within the intra-estate streets. The most obvious transformations observed in the estate were informal use activity that were erected from 'temporary' technology. Other features included transient activities like hawking commonly housed within temporary stands and locations, scattered spontaneously estate-wide. This type of kiosks dotted circulation nodes and the estate's edges. Figure 4-3 illustrates typical temporary kiosks.

Figure 4-3: Temporary kiosks in Kaloleni
Source: survey, 2010

In line with the NUC (Thornton-White *etal.*, 1948) master planning, formal commercial and social activities were still transacted at the centre, in the provided buildings fronting the Central Open Space. Informal transformations were scarce in this designated space and buildings. Indeed the most conspicuous transformation in the space was a huge permanent multi-storey Mixed Urban Development (MUD)[44] erected from masonry. It

[44] Named the Kimani Block, the developer, once prominent city political and business personality, and was largely a speculative venture by this ex-resident developer.

housed shops, offices and flats. It was developed fronting the Central Open Space in conformity with the planned common-use buildings.

As already related from Ogilvie's (1946) writings, provision for social and communal space was a prerequisite, and thus designated built forms were observable. The oval open space at the centre fronted the Shopping Centre and several entertainment places, and this had remained so and thus preserved the envisaged social culture. This 'village green' had recreational and administrative functions carved out, including a handball pitch and an administration camp.

The Social Hall was a large multipurpose space that housed various social activities including community meetings, dances, concerts, celebrations, as well as congregations for Christian groups. The sports function was equally elaborate accommodating: a gymnasium[^4], indoor sports like *ajua*, pool, karate, badminton, table tennis games and darts. Outside the hall was a children's recreational space abutting a nursery school. In addition, there was a community library. Indeed, the estate seemed well provided with such social spaces that were accepted and well received by the dwellership. As a result, few DIYs aimed exclusively to accommodate the common social function at the estate level.

The assertion (of acceptance of the provided) did hold true for the economic motive transformations. The proliferation of informal activities on the edges

[4] For professional and amateur world-class boxing that boasted several Olympians including a gold medalist and a contemporary female boxing icon.

and (occasionally) along the intra-estate paths, embodied a negation of the central-focus master planning. The edges, including Jogoo, Stadium, Young Roads and the railway, tended provide avenues for transformations.

The intensity of activity along the edges was calibrated by their expanse and scale. For instance, the vast scale and city-wide usage of Jogoo Highway and the Railway isolated any functional links to the adjacent districts of the Industrial Area and the City Council (NCC) market: Burma Market. They thus acted as effective edges, and indeed in line with the TW Neighbourhood Model (App. 6). This NUC Model showed that linkages to other neighbourhoods and rest of the city were via such peripherally positioned circulation paths. Largely leftover voids because of the infrastructure setback and buffer requirements, these spaces were now spaces for informal commercial activities in the transformations.

Jogoo Road had commercial developments concentrated at an emergent node in close proximity to the stadium. However, away from this stadium node open greenery remained which served the buffer function originally intended. The scale of Jogoo Highway therefore minimised the dweller-initiated propensity to transform along this major transport path. Further, the road seemed the main 'front' of the estate and conformed to the master planning ideals. However, where transformations occurred, it was due to the obvious proximity of the stadium.

On the other hand, the railway, located on the southern edge was the 'rear', and it was largely a place for informal trade in illicit brews and as well as more

legal 'soft' transformations of urban agriculture of food crop cultivation. The reason for this posture was attributable to the fact that, unlike Jogoo, the railway did not serve the estate and immediate neighbourhoods as public transport.

The other edge, Stadium Road[46], that separated Kaloleni and the City Stadium, was relatively unkempt and housed a few informal kiosks. It is noteworthy that this edge-defining road attracted fewer transformations than the similarly scaled[47] Young Road separating Kaloleni from Makongeni estate. Its location, at the 'front' and the adjacency to a sanctioned social and recreational space was the reason. Indeed, although neglected, this stadium edge remained for legitimate trade, and as such, it constituted part of the public sphere of estate.

Young Road on the eastern edge had temporary extensions that housed the illegal commercial activities. These included illegal alcohol production and its consumption within the extensions. The road was unsuited for vehicles due to poor maintenance was and because of the encroachment by the temporary sheds. The activities housed in the kiosks were also culinary and indeed, the kiosks were affordable cooked food eateries for the public.

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[46] The City Stadium, to the North-West, a recreational facility, also lacked a direct functional impact to the estate presumably because it hosted city- and nation-wide sporting events and was not exclusive to Kaloleni and other neighbourhoods within the vicinity. Indeed other smaller recreational spaces (like 'Wembley stadium', the handball pitch, and the activities in the Social Hall) within the estate were well suited for dwellership. The massive physical presence of the City Stadium dwarfed the bungalow dwellings common in the estate.

[47] They are both nine (9) metre wide

It was evident that if Stadium and Jogoo roads constituted the estate's 'front' and public sphere, then Young Road and the railway, were the 'rear' perspectives of Kaloleni.

From the foregoing, it is noteworthy that the key physical planning and urban design elements within the estate did not form magnets for the tranformations. Thus, the Central Open Space, radial and concetric street morphology attracted insignificant transformations initiated directly by the dwellership. The results were the edge-based transformations.

4.2.1 Transformation trends in the sample

The analysis in this section relies on the observations and responses from the surveyed sample. The statistical measures are mainly descriptive but some quantitative measures were used to illustrate the gravity of the phenomena discussed. Surrogates of the three basic variables of the Physical, Social, and Economic were used in the findings and their interpretations.

4.2.1.1 The physical dimensions of DITs

The house type was only physical variable that was operationalized and used in assessing the influence of the physical strategy on the transformations. The variation was however only in the number of living rooms available to the dweller's use. It was thus not about the typology and hence the spatial organizational principles. A further point useful in the discussion was about the 'site': the 'plot less' formation[a] where no plot definitions were associated to

[a] They may seem to contradict Ogilvie's (1946) continued reference to plots in his descriptions, but what he calls plots were the clusters that were jointly utilized by the dwellers.

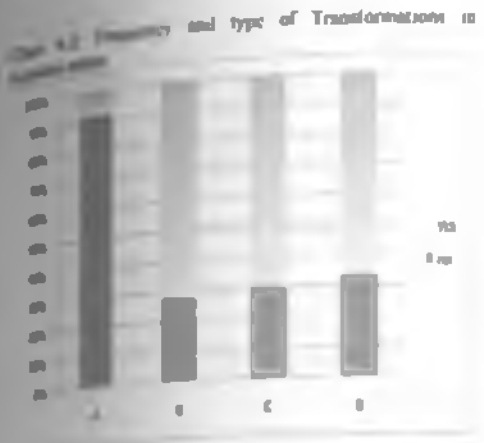
the individual DU. This strategic stance meant any space outside the unit was common space and outside the dweller's individual domain.

The statistical frequencies of the physical variables of the transformations in the sample are in Appendix 14, used in the discussion. Chart 4-2 shows the frequency of transformations types recorded in the sample, while Chart 4-3 shows the activities within the extensions (type' D') transformations. Type 'B', 'C', & 'D' were on average about 65% frequency, while type 'A' DITs were in only in about 10% of the cases.

The infrequency of type 'A' DITs was a reflection of the 'plotless' formation. The 'skin'-based transformations (type 'B'), included burglar-proofing using metal bars to openings and decoration. The decorative manifestations were the painted units and other finishes like internal ceilings.

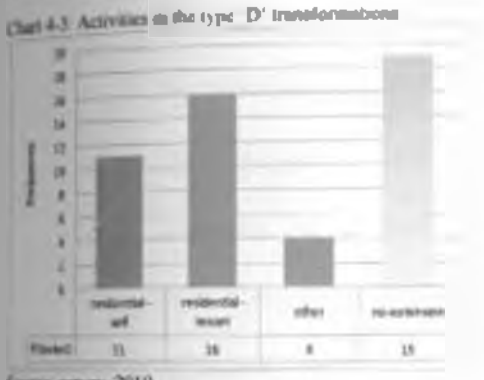
The commonest type 'C' transformation was the incorporation of the kitchen porch into an internal space used variously as kitchen, storage, and as laundry space. Other type 'C' details included the incorporation of a verandah or court access arcade. These two transformations are as in Oxman *etal* (1985)'s terminology 'spare space' and 'intercalary' incorporation.

The technology for all type 'C" internal spatial appropriation were from mostly durable technology using masonry or metal grills and plates. Thus, for instance, masonry and burglar-proofed opening mostly defined the incorporation of the kitchen porch as well as the entrance verandah spaces. Roofing for such space was sometimes in corrugated translucent synthetic sheeting.



Source: survey, 2010

Chart 4-3: Activities in the type 'D' transformations



Source: survey, 2010

A significant percentage (35%) of units in Kalolenі had not undertaken type 'D' transformations and the function remained residential for the household. Here extensions were evident as remnants of the earlier demolitions (Barasa, 2004). This was evident in the form of 'physical traces' of a screeded plinth showing the extent of the initial extensions, since demolished.

The respondents often avoided answers to such a retrospective query about the use the added units had been. Nevertheless, some confirmed it was for both household residential use and subletting. Indeed, the functions in the extended units substantially reflected this supposition with 22% used for household residential use and 32% for sub-tenancies (Chart 4-3). 'Other' uses included a commercial purpose (like fish frying kiosk and a tailor's station). Indeed, the use of the extension was to address the deficit in the domestic spatial situation.

Another dimension was technological, the materials used for the added spaces. The extensions were invariably 'temporary' with *mabati* sheeting for all walls and roof, all anchored on a timber frame. The openings in extensions were from similar 'temporary' construction, i.e. *mabati* nailed on timber Z-

bracing frames as door and window shutters. For 'wet' services, most units had added an external toilet and shower space where the extensions were for sub-tenant use. Extensions had illegal electric power connections, sourced from KPLC overhead lines.

The other technological dimension was the process of erecting the extensions. The DU owners engaged informal processes for adding these spaces, and *fundis* were the main actors who built the extensions. The appropriateness in the technology also included the materials' sourcing. Thus, the materials used were from the vicinity, and were often re-cycled or re-used. These included *debes*, i.e. metal plates from used oil tin cans. Other that in its negation, the original permanent DU technology was not reflected in the extensions. Indeed, most extensions (type 'D') were detached as 'add-beside' or 'lean-to' forms.

This trend was little to do with the dwellers verdict of the permanent original DU but instead, it was more to do with the rental tenure and socio-economic status of the dwellers. The choice of 'temporary' and 'permanent' technology was also manifest in the legitimacy and legality of the dwellers' perceptions. The overt extensions were thus recognition of the illegality of extensions in this rental estate. Its frequency showed the legitimate need for physical space for the dwellers.

In contrast to the overt 'temporary' extensions, internal transformations (type 'C' DITs), were on other hand often 'permanent' or acceptable materials. This also signified the perception of more security for these covert DITs. It was

also a process of legitimisation as most of the internal actions fell within the domain of maintenance meant to be a responsibility of the NCC.

4.2.1.2 Social aspects of transformations

The variables that address this social dimension included the time-based aspects like duration of stay of the household head and the age of the household head, their occupation and age, as well as household size. Appendix 15 shows the SPSS correlation matrix of these social variables and the transformations types. Table 4-1 showed the social characteristic profile of the sample.

Time was as a social variable as time factors related to the social bonding or otherwise amongst the dwellers. For instance, the duration of stay in Kaloleni by the household head inferred his social roots to the scheme. The majority 66% of the respondents had stayed for more than thirty years within the scheme. Even more important was the fact that these long-stay tenants were in fact born in the scheme, which meant their parents were the original NCC tenants. In the sample, nearly all[69] had a parent recorded as the official NCC tenant.

As shown in the correlation matrix in Appendix 15, this long duration of stay was however not positively correlated with propensity for extensions, the activity, and use of the transformed space. This confirmed that the parentage was more influential that the duration of the sitting tenant. Thus, in the long run

[69] Only one case representing 2% of the sample was not the official NCC tenant, having officially transferred tenancy from the original NCC tenant.

regardless of the sample findings, the history of an original being a parent was more informative with regard to the propensity to transform the unit. The effect was that no variation existed due to the duration of stay of the respondents in the sample, the current tenants in the sample.

The use of the extended units however correlated to the age of the household head. Understandably, the younger householders, aged below thirty-five (<35) leased their units presumably for the income. The smaller household sizes, common in this group, may also have meant availability of such added space for other households and for the renting. Those household heads aged between thirty-five and fifty-five (35-55 used the transformed units for their families. Again, this group had bigger families and/or probably more stable incomes. Those above fifty-five (55<) either used the units for rental income or other uses that mainly were for income generation. The older ones would have these priorities given that their offsprings had matured and possibly domiciled elsewhere.

Regarding Type 'A' transformations, there seemed to be no relationship with age of the household head. This was understandable given that there was a 'shadow' process of NCC tenancy inheritance from an older to the younger generation. This meant the age distinctions shielded the real tenancy characteristics of the dwellers. As such, actions on the edge-defining aspects enshrined in type 'A' transformations were not reliant on the age of the household head. Because of the 'inheritance', the dwellers felt they 'owned' the units, and therefore had the nudging to define their so perceived territory.

The same time variable of HHH-age related to types 'B', 'C', and 'D' transformations however yielded rather surprisingly strong correlation coefficients. They showed a higher percentage of older dwellers with a higher propensity to undertake these transformation types. Thus, space enhancing but 'skin'-based transformations as the burglar proofing and finishes enshrined in type 'B' transformations were emphasised by the oldest dwellers[70]. The same applied for internal physical transformations and extensions enshrined in types 'C' and 'D' DIT types respectively. This may be explained as a confirmation that social connections prevailed over the age of the householders.

The other social variable, the household size, was also informative as shown in Appendix 15[71] . The smallest households (1 to 3 members) used the DITs purely for income from subletting. The largest households (above 10 members) also sublet their parts of their extended units. The former did not add the space for their own consumption, the motive was clearly economic and thus to use the units for extra income. The later finding with larger households was also economic as the large family size demanded more expenditure and hence income from the unit.

Here, clearly a compromise was necessary between the need for economic income and social accommodation for the household. The intermediate family

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[70] The output shows an acceptable level of significance of .000 (most writers accept 0.05 in social science research (Bryman, 2004, p. 269) (Ma, 2004). However, symbolic measures of strength show a weak relationship of 0.391

[71] This is an SPSS cross-tabulation table and it compares the activity in the extension with the members of the household. Some co-ordinate language can be discerned as it compares 1) percentages 'within' different HH sizes of each activity (columns 1 and 2) percentage of activity type within each HH size (rows). Identical usage prevails in SPSS cross-tabulations.

sizes of between three and ten members ('3 to 5' & '5 to 10' household size categories) were seemingly indifferent as half used the units for economic purpose while the other used them for household consumption.

Of the types of transformations, only type 'D' seemed to be influenced by the household size, thus, the higher the size of the household the more the chances of type 'D' transformations. A small family of three or less (<3) were 62% less likely to add extra rooms. On the other hand a household of more than ten (10+) was definitely (100%) expected to add extra rooms.

On overall, the social dimension findings were predominantly weak, and largely camouflage the distortion occasioned by the virtual inheritance of the units through inter-generational transfers. This was necessary for obvious economic advantage for these low-income families to retain the social housing units that charged only economic rents.

The need to retain the units in the family was economic rather than social since physically the units accorded little amenity with their small sizes and poor spatial gradients in terms of privacy and comfort. Further, a weak tenure security system that the rental arrangement implied meant feeble linkages to formal market instruments that accord finance for physical enhancement of the unit. Thus, the poverty of the dwellers meant low bargaining power in the capital market; a fact compounded by the lack of tenure security.

Thus, the social variables of household head age, duration of stay and size of the household did not offer any demonstrable linkages to the DITs

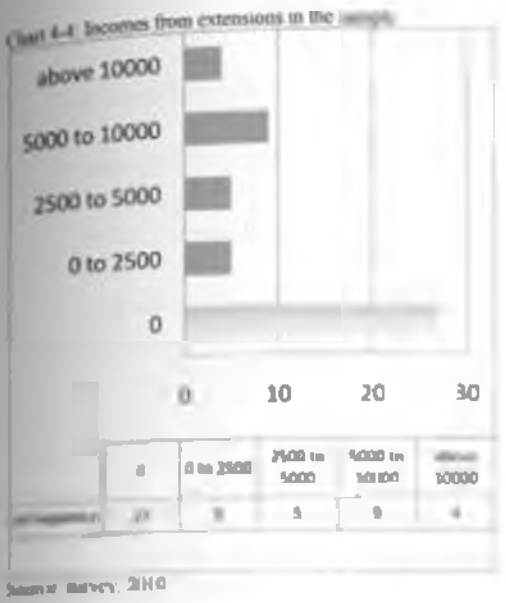
phenomena. This was largely because the sample parameters hardly reflected the intrinsic factors of 'inheritance' and the resulting demographic mechanics.

Another equally strong dimension that nullified the social factors was the physical condition of the provided dwellings. Largely small of between one and three living spaces (rooms), the variations was insignificant to cause any ripple effect to the dweller-households, which were mostly large and unsuited for even the largest DU type. Given the paucity of physical space within the provided DUs, the only avenue for spatial satisfaction was outside, into the immediate vicinity that was often the expansive courtyards and common spaces.

4.2.1.3 Economic characteristics and transformation trends

In the surveyed sample, the dwellers earned income from informal trade (41%), small-scale business (31%), or casual work (28%) in the estate or vicinity. The formal employment areas included the nearby Industrial Area and Burma Market, an NCC formal market. Income from the extension rooms supplemented their incomes and was a motivator for extensions. This was a consequence of the large disparity between the rents to NCC, which remained low and varied depending on unit sizes. Appendix 9 illustrates SPSS correlations between economic and transformation types, narrated in this section.

These economic variables include rental payments to NCC and sub-tenant rents. In the sample, the fifty percent (50%) were single-roomed and paid between five and seven hundred shillings (500-700 KES), fourty-two percent



(42%) paid between seven hundred and one thousand (700-1,000 KES), while the remaining (8%) paid between one thousand and fifteen hundred shillings (1,000-1,500 KES). These figures sharply contrast the returns from the sub-tenant rents where a single *mabati* room would attract rents of between two thousand and two thousand five hundred shillings (2,000-2,500 KES). The justification for the added space obviously related to the high returns from the extensions.

Although the majority (51%) realised no income from the units due to usage of the additional rooms by the own or had not extended, the motivator for the rest was the realised sub-tenant rental returns. As shown in Chart 4-4, these cumulative rental returns ranged from 2,500 KES (10%); between 2,500 to 5,000KES (10%); 5,000 to 10,000 KES (20%) and above 10,000 KES (9%), which relegated the NCC payments to insignificance. This implied a number of the official tenants used the sub-tenant rents to offset the NCC charges. It also meant that the sub-tenants subsidised the official NCC tenants and effectively sustained their tenancies. This lent a premium to the NCC tenancy as was reflected in reluctance to cede tenancies without a monetary consideration; a form of 'sale'.

Another realisation was that the reasons for not extending were more in line with adherence to administrative requirements and the fear for demolitions. It was not economic, as returns from extensions far outweighed any investments in the 'temporary' unit (s).

Indeed, the extensions which were the ones that attracted rents were mainly (70%) were used for sub-letting, instead of the household social uses. The tabulation shows a high propensity for extensions for the higher rent-paying tenants

The position here is that the rents payable to NCC were far below market rates and this may have guided the dwellers' perception that the social housing estate was free and now was theirs (and amenable to physical transformation for their economic benefit). The rental returns from the added units however had a direct bearing to the propensity to transform. The correlations' matrix (App. 9) for the economic variables confirms the above findings [1].

Types 'A', 'B' and 'C' transformations mainly involved the appropriation of the provided space through territorial control ('A'), personalization ('B') and domestic spatial demands in internal modifications ('C'), as such the sample correctly shows no direct linkage with income from sub-tenants. This confirmed that these types of transformations aimed to realize more utility from the space within the DUs (and UDUs) provided.

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[1] The amounts paid from rents in the sub-let directly related to the propensity for type 'D' transformations with a (+) 0.555 Correlation Coefficient and a significance level of 0.000. The same applies for the other transformations, recording close zero or negative Correlation Coefficients

4.3 UDE level transformations in the Kaloleni

The UDEs in Kaloleni were of two types: the ground-based clusters, consisting of the bungaloid units, related in the horizontal plan by a central court and secondly the apartments vertically stacked on two concrete floor levels. In addition to this vertical-horizontal distinction, the two UDEs were different in the articulation and access to of the immediate open green space. The apartment blocks were surrounded by open lawns with no obvious directly relationship and thus poorly defined territorially. On the hand, the clusters had

Table 4-2 Summary of 5 cluster physical characteristics in Kaloleni estate

	Court Length (M)	Court Width (M)	Court Area (M²)	Number of Units in Cluster	Gross Usable Area per Open Space Per Unit (M²)
Mean	65	48	3080	24	130
Maximum	115	70	5400	34	159
Minimum	35	35	1225	16	77
Mode	38	40	1400	28	50
Median	65	44	2813	24	117
Total				618	

Source: survey, 2010

a more physically direct relationship to the open grass court[7].

The three case UDEs investigated were; two of the cluster type ('A' and 'O') and one of the apartment blocks (*Gurofani*) (Fig. 4-1 and App. 7). Table 4-2 lists the physical characteristics of the estate cluster formations. The cluster courts varied in dimension from a minimum thirty-five (35) metres up to one hundred and fifteen (115) metres. The areas of the courts had a maximum exceeding an acre (five thousand four hundred (5,400) square metres). Each

[7] It is informative to note the Ogilvie (1946), the municipal engineer, viewed these clusters as communal plots. That meant in a sense he envisaged a common stake by the dwellership, unlike the present-day gated clusters.

DU had a *per capita* lawn of a maximum of one hundred and fifty-nine (159) square metres of the open courtyard. On average twenty-four (24) DUs were in each cluster.

4.3.1 Case 1 UDE: Cluster Court 'A'

This case cluster, was organically defined grouping of twenty-two semi detached DUs (blocks[71]). They were of varied sizes with: one-roomed (2), two-roomed (6) and three-roomed (14) units. Its maximum dimension was one hundred and fifteen (115) metres, and with an area of four thousand (4100) square metres, was among the largest in the estate. This nearly one acre of open space in the cluster was in line with the neighbourhood unit concept (NUC) of large green spaces in the city's Master Plan (Thornton-White *etal*.,1948).

The impression was that this was no longer conducive to the high-density urban living requirements that the Eastlands zone and the city have become. Indeed, this was evident in the densification of the cluster through the dweller-appropriation of the open court.

The original layout from NCC archives in Figure 4-4 indicates two ablution units located within the courtyard. The later layout plans and aerial photographs show the two ablution blocks deleted, in the exactly the same layout.

Cluster 'A' bordered the Jogoo Highway and was along the main estate vehicular entrance, Njia Kuu Road that led directly to the estate Central Open Space, the Social Hall and Shopping Centre.

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[71] Each block, comprised of two [illegible] and semi-detached units, had undefined land boundaries.

Figure 4-4: Original Court 'A' layout
Source: survey, 2010

Figure 4-5: Aerial image of court 'A' – without existing court blocks and DITs
Source: author, 2010

Access to the court and the courtyard was unclear, and instead gaps between the blocks formed entry paths into the courtyard. Some of these gaps were defined with masonry walls with a stone arched opening that formed an arcaded entry into the court. Access was therefore only to individual DUs. This access was sometimes via a small pre-cast RC slab-footbridges spanning across the open storm water drain.

Averaged to each unit, the amount of open space was one hundred and eighty-six (186) square metres for each DU. Figure 4-5 is a graphical reconstruction of this expansive open green space, while figure 4-7 shows what is left of it after the extensions. The remnant of the green space was replete with spontaneous footpaths linking the various DUs. Otherwise, the green space was now for the dweller's individual use (Fig. 4-6) expressed in the 'shadow' plot definitions.

Although the NCC had recently demolished DITs, some dwellers had rebuilt some of them along the lines of the original plinth. Others bore physical traces of the original plinth by the exposed cement-based floor base and

Figure 4-5: Transformed Cluster Court 'A'
Source: SoK & RCMRD, 2003

Figure 4-7: Shadow plots in Cluster 'A' and remaining common court
Source: survey, 2010

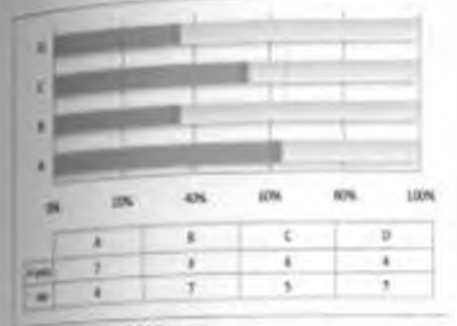
finishing. As a result, the majority DITs were not Type 'B' (36%), but boundary defining elements – Type 'A' (64%). Internal modifications accounted for 55% of the DITs.

Infamous for their lack of maintenance and neglect by the NCC, most of the units in the cluster were without notable 'skin'-based transformations with Type 'B' changes observable in only 36% of the units. Some cultivation was also observed in the cluster court. These cultivated open spaces defined the extent of appropriated territory by the DU. Charts 4-6 and 4-7, are the frequency relations on the types of DITs and activities within the extensions. Figure 4-6 is aerial photographic impression of the extensions.

4.3.1.1 Physical aspects

The most common DIT, frequent in sixty-four percent (64%) of the cases, was the Type 'A' transformations. These were mainly defined through hedges, barbed wire

Chart 4-6: Frequency of transformation types in Cluster 'A'



Source: survey, 2010

Chart 4-7: Activities within extensions in cluster 'A'

Source: survey, 2010

fencing, *and mabati* on a timber frame. These were all low cost material types. The 'temporary' technology was self-managed through self-help models (Erkelens, 1991).

Another observation was the use of extensions to demarcate the individual dweller-territory. The extensions were therefore used for edge-definitions. The result was that green court was thus appropriated by the dwellers, for individual usage. This left only about fourty (40%) percent for common use as mainly circulation. The individual dweller-appropriation of the court defined 'shadow' plots, reconstructed in Figure 4-7.

The key motivator for the extensions, in the cluster was to establish territorial control portions hived off the ill-defined common green space. As can be observed it was far from equitable. None of the respondents explained the basis of the extent of the 'boundary'. Indeed some dwellers expressed displeasure at the 'selfish' neighbours for 'grabbing' larger junks than reasonable. Similarly, the transformations aimed to secure the territory to lend themselves against other dwellers' aspirations.

Within the provided space, materials that are more durable were used in the Type 'C' transformations, the internal sub-divisions. This showed more

confidence by the dwellers in these less obvious DITs. The inaction by NCC on this type of DITs showed they promoted them and viewed them as enhancing their spatial qualities.

In reality, the transformations only served to fill the gap occasioned by the ineptitude of the NCC in fulfilling their responsibility of maintaining the rental units. For the tenant, the internal modifications served to personalize the space to their individual use, to improve occupants' personal privacy and the security. These Type 'C' transformations included the use of metal panels / bars and stone blocks to internalize semi-external spaces like the verandah or kitchen porches[5].

The lesson from physical aspects of the emergent DITs in the case was the dwellers' effort to re-define territory. It also aimed to personalize the space, improve individual security and privacy. This was in line with Habraken's (1998) 'order' of control through 'form'. It further confirmed Newman's (1972) 'defensible spaces' concept. These trends were functional deficits now physically bridged by the DITs' actions.

4.3.1.2 Social aspects

In its original state, the original cluster hardly functioned as social grouping. This led to individual dwellers to independently coalesce socially around each unit that translated into an enclave guided by the extensions. The social aspects were through sharing space and utilities, like water and sewerage and the *de facto* 'plot' formation in the enclave.

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[5] In Carmona & Gavinch (1987) [illegible] this was the 'inter-cohort' or 'spare space' combination type

A small court (or unroofed corridor), common to the added units, linked the extensions to the original unit. The social drive was thus to create social control over the territorial space with a locus on the original 'core' unit. Although the motive for the boundaries' was known, their extent was not. Indeed, this ambiguity often led to social tensions and conflict.

The dwellers were however united in keeping away outsiders from misusing the court. Some cited this as the reason for 'grabbing' the open space and/or blocking the arcaded court accesses. This was the only illustration and occasion of communal social sense translated into physical transformation.

The social dimension can also be understood in terms of the activities and uses of the extensions. Chart 4-7 shows the frequencies of the activities recorded in the added units. That residential use by the tenant household was common, occurring in nearly two-thirds (65%) of the cases, signaled that the motive was largely for social use. The commercial uses were few ('commercial', 18%) as were the sub-tenancies ('residential use-rented', 18%).

This was also interpreted as a direct consequence of the demolitions which displaced mainly the sub-tenant lodgers. It was also physical, and can be related to the forefront location of the cluster, at the main entrance and fronting Jogoo Highway.

A summary observation of the social dimension from the cluster study is the lack of a communal sense and common action towards the common space. Thus transformations were individualized leaving what was common unkempt and often desolate. This finding was disconcerting given that the dwellers had

long lived together. The long co-residence in the court would promote more social and communal bonding. This bonding was desirable for high density urban neighbourhoods and congeniality that the estate was evolving into.

4.3.1.3 Economic aspects

Little could be isolated as exclusive economic activity within the cluster environs, and hence the economic motives were not high on the transformation agenda. Similar exclusively commercial function, household income-enhancing activity through sub-tenancy in the cluster was low (18%). Viewed as an economic use of space, urban agriculture through cultivation of food and decorative crops was understandably high, observable in 82% of the case units. Thus parts of the court, was so utilized, often to define the extent of their territory, but justified by the dwellers as to supplement their food budget; an economic motive.

Although a few isolated cases of commercial activity were located in extensions, the respondents did not find the need for economic space was a major motivator for the acts. Further, the location of the activities also did not allude to the DUs and the clusters. For instance, a telephone booth was located close to one of the blocks, but even this hardly focused on the cluster use and was outwardly oriented, to catch pedestrians along the estate street than the exclusive use by the cluster.

Another indicator of the economic determinant of DITs was in the technological materials used in defining the physical form of the extensions. Thus, the use of 'temporary' materials was an indicator of low purchasing

power of the low-income dwellers, as much as the fear of economic loss it would entail in the event of demolitions. Indeed, the rental tenure system that was used bestowed more rights to the NCC in their capacity as the landlords, at the expense of the consumers (the tenant dwellers).

4.3.1.4 Court 'A' Transformations -a summary

In Court 'A', the UDE shows ample evidence of DITs as driven by the physical, social and economic motive. The physical motive overrode the other two, largely because the provided 'plotless' formation did not accord sufficient dweller control over the physical and social territory. Thus the first motive was to ensure territorial control that ultimately formed the latitude for the social and economic actions that ensued.

Thus even with demolitions, the dwellers preferred to demonstrate their 'territory' using physical elements and space use. It was within the physical extent that they felt compelled to address other survivalist activities like commerce and socialization. Thus, the basic verdict is that in opting for space that was not physically well defined; the architectural strategy invited the transformations, that emerged in Court 'A'.

The rental tenure played another qualifying role in the transformations nature and type, by promoting the 'temporary' technological materials used in the additions. Thus the insecure tenure was manifest physically generating the *mabati* structures. A further corollary was that such technology demanded the use of local artisans and direct participation by the dwellers in the process of transformations. The dweller thus became the driver and agent of change. The

qualifying characteristic tag can also be placed on the dwellers' low-income economic status, as the low investment was reflected in the 'temporary' technology.

4.3.2 Case UDE 2: Cluster Court 'O'

Court 'O' had sixteen (16) semi-detached units in eight (8) blocks. The DU types here were eight 1-roomed, two 2-roomed and six 3-roomed unit types. There was evidence of demolitions as was in Court 'A', but here the reconstruction was more widespread. Located away from the more 'visible' front of the estate, the dwellers seemed more confident in transforming their units as supported by higher frequency (88%) of type 'D' transformations.

The court was smaller with an area of one thousand, two hundred and twenty-five (1,225) square metres and average width of thirty-five (35) metres shown in Table 4-8. Figure 4-8 is the archival drawing illustrating the original layout of the cluster. A reconstructed aerial image showing the un-transformed green court is in Figure 4-9. The 'shadow' territorial edges defined through extensions for each plot and the remnants of the green courtyard are in Figure 4-10.

4.3.2.1 Physical aspects

Chart 4-8 shows the frequency of transformation types in Cluster 'O'. Territorial definition was high on the dwellers' transformation agenda. This was despite the fact that this type 'A' DITs *per se* were in only 50% of the units. Indeed, as was in Cluster 'A', this statistic however did not report the

Figure 4-8: Archive drawing of cluster 'O'
Source: NCC, 2010

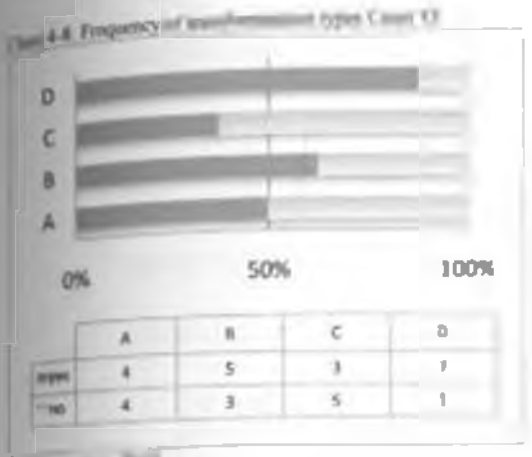
Figure 4-9: Aerial image of court 'O'
Source: author, 2010

Figure 4-10: 'shadow' plots and remaining open space in cluster 'O'
Source: author, 2010

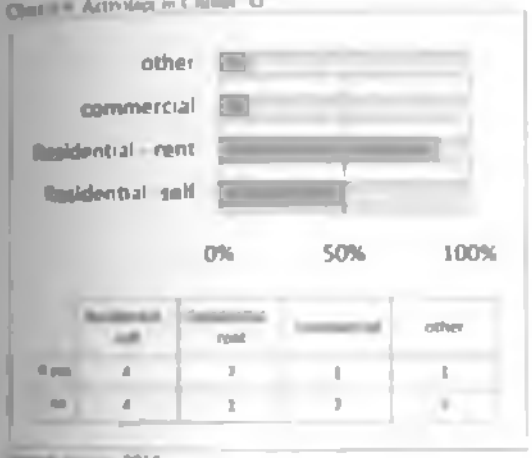
edges defined by complete DITs, and hence the phenomenon of edge defining was higher. Further, the presence of physical traces shown by floor plinth remains represented the individual territorial extent. Thirteen percent (13%) of the units had no extensions but had territorial boundaries using urban agricultural activities, hedges, and/or barbed wire/*mabati* fencing.

Types 'B', the 'skin'-based and internal, transformations were evident in 63% of the cluster units. This meant neglect and poor maintenance probably due to the economic status of the dwellers, this was small but significant and was observed in 37% of the units. It was also surprising to note that only a few security-based modifications to the openings were present. In fact, most doors and windows used the original timber shutters, a light wire fabric for burglar proofing and retained the antique low-cost ironmongery. Asked why, the dwellers blamed their low income, while others felt they had nothing to protect any way!

Type 'C', the internal modifications, were neither frequent nor overt, compared to the other DITs' types, and were in 38% of the cases. This finding included the units



	A	B	C	D
yes	4	5	3	7
no	4	3	5	1



				other
yes	4	7	1	1
no	4	1	7	7

that had converted an arcade space into a domestic use room as part of his type 'C' DITs. This 'spare space' transformation type and as in Cluster 'A', served to control access to the courtyard for common cluster security reasons. It also created extra household-use space.

As already reported, Type 'D' transformations were the most frequent and were in 88% of the units. Chart 4-9 reports the frequency of uses of the extensions. The use of added space was mainly residential, but largely for rental income (88%) as opposed to 50% used by the household to accommodate the enlarged size. Purely 'commercial' use spaces were rare and were in only three units (13%), which had kiosks for informal trade. The 'other' use of the DITs was for domestic animal rearing, mainly chicken and/or pets, which was in 13% of the cluster units.

In summary, the provided expansive courtyard did not articulate the cluster in the form of physical or other bonding. Instead, the physical reality explained showed the unilateral attempts by individual DIT owners to claim the extent of

their territory using edge definitions and type 'D' extensions. The result was enclaves with some 'no-man's' land, the remnants of the original court, used as footpaths and greenery, representing about 35% of the original open space (Fig. 4-10). Thus, the transformations seemed to redefine an independent spatial entity hived off the expansive courtyard, creating 'mini-clusters' gravitating towards the DU.

The materials and technology for extensions was always of *mabati* on a timber frame for walls and roofs, all on a screeded firm concrete and rubble hardcore-based floor. According to conversations with the dwellers, the 'temporary' technology anticipated the fluidity of the action in the face of a constant threat of demolitions. This was a consequence of the illegality of building on rented space. They further affirmed that it was also, what was within their economic means.

A typical room measured in area about ten-metre (10) squared rectangle. The heights of the units were based on the length of the sheet, which was often two and half (2.5) and three (3) metres, all common modules of *mabati* sheeting. Apart from the singular room, there were massive transformations of up to eight rooms in at least one case within the cluster.

4.3.2.2 Economic aspects

The transformations in cluster 'C' reflected the economic dimension in several ways including the low-cost technology employed and the income-generating uses accommodated. Indeed, the 'temporary' technology used in the extensions reflected the affordability. Affordability was about the easy

availability of the predominant of timber and *mabati* as low-cost building materials. Similarly, it was about the abundant local *fundi* skills used for the construction technology. Most dwellers also stated they assisted the builders in the construction task to reduce expenses, an affirmation of a direct participatory approach.

A notable dimension of the technology used in the DIT's was that it was not about indigenously available materials and skills. This is unlike some proponents of indigenous technology and local resource use (Schumacher, 1973). In reality, the urban context has made it harder for one to harp on Appropriate Building Technology (ABT) as indigenous, homemade, manual, and local. This invited pragmatism, and for instance, the preferred *mabati*, is a manufactured product with minimal local contribution. The market availability of the building components was the major determinant of cost-saving strategies in the Kaloleni environment. this stance determined appropriateness of the technology for building houses.

It was also notable that the sub-tenants housed in the added rooms, were of the low-income bracket, and therefore affordability of the dwelling was premised in this type of consumer. In fact, all the tenants encountered in the sample were engaged in the informal trade within the vicinity. Another notable observation was that the sub-tenant rents witnessed were between two thousand and two thousand-five hundred shillings (2000-2500 KES), and thus were identical to those prevalent in informal settlements within the city.

Another notable dimension of the economic use of the additions was their use predominantly for sub-tenant residential purpose. This was attributable to the location of the cluster in relation to the catchment populations in the estate and its vicinity. The low prevalence of purely commercial additions (13%) was thus largely due to a lack of an obvious market occasioned by the inner location of the cluster. The pure commercial use was often small-scale and was for use in the immediate vicinity. It is however accurate to state that the only economic motivator for transformations was the rental unit that was commonly added to the existing structure.

4.3.2.3 Social dimension

The transformations adhered to a social logic; that of creating social control in the physically defined 'mini-courts'. This was within the territorially defined 'shadow' or 'virtual' plots, that surrounded the original DUs. This 'mini-court' served as a locus for tenant controlled space where they could perform several tasks including managing their sub-tenants as well as proximity with other family members.

Another social motivator was the expanded household. For instance, adult children meant more privacy and the need to separate private accommodation that was realised through the DITs. This reality not possible in linearly aligned provided DUs. These were wanting in transitional space- provision needed between the main spaces for more privacy and control.

4.3.2.4 Cluster 'O' transformations – a summary

The case UDE, cluster 'O', confirmed the higher priority accorded to the physical formation, presented by the openness available in the ill-demarcated original court. The social and economic drivers only served to re-affirm the physical control over the defined territory. Another finding was predominance of the dweller as the main agent for change in the cluster. Indeed, there was no noted cluster based organisation like a cluster committee, to initiate, monitor, or control individual tendencies to unilaterally added space. The absence of such a communal formation however contributed to the poor outcome and vulnerability of the transformation actions.

4.3.3 Case UDE 3: Gorofani Apartment Block

Two cluster zones of the Gorofani UDE were present in the estate. Figure 4-11 and Appendix 7 show their location from the NCC archive drawing. The case UDE grouping was composed of linear one-storeyed blocks, and the acute angular relation to the street (and the railway line) implied a deliberate design strategy to orient the main facades northwards, necessary for optimal solar shading and penetration. This location has ten blocks, spaced about twenty (20) metres apart. The location is at the corner of the estate and fronts the railway line and partly the Nairobi City Stadium grounds.

This 'Gorofani' zone used only one unit typology, a single room arranged linearly along a gangway. Vertical access was through a symmetrically aligned staircase (Figs. 4-12, 4-13 and 4-14). There was no attempt in boundary definition to define group territory around an apartment cluster court, and

indeed this open space remained un-appropriated by the dwellers. The blocks of flats were accessed using footpaths that branched off the outer ring roads. These footpaths however, were unkempt and often had ponds of standing water, as was the rest of the unkempt green space.

Externally the blocks (Fig. 4-12) were in fair decorative condition for most parts of the external walling surface, which had been well finished. It had coarse un-keyed render and manual dressing used on the ground floor walling. The upper floor external wall finish was on the other hand was brightly plastered and painted; an outlook retained as observed in the fair decorative condition of these blocks.

Only 'temporary' *clip-on* additions, *lean-toes* and *add-besides* were the physical expressions of DITs and were not well articulated and were commonly observed in the open spaces. The ownership of these additions was interesting as all of the dwellers (respondents) in the flats denied their ownership or use. Indeed, these added units were exclusively on the 'no-man's land' available on the open grounds. These were at the ground level and often abutted the blocks.

Squatting was thus common in these ill-defined open spaces, and the DITs were such products. These were thus transformations by others, external to the dwellership of Kalolenі. The possible explanation was the lack of communal ownership of space in the blocks and the communally used expansive openness. The lack of any linkage between the flat dwellers and the emergent DIT units on the ground made it impossible to draw any logical motivation for the random extensions.

Reminiscent and mimicking of informal settlements, the DITs were invariably from temporary materials that included *mabati* and timber framing for walls and roofs and other such temporal materials, as recycled *debes* once used as oil containers.

The low-level extension of units, directly initiated by the UDE dwellers, implied that the typology was not suited for the phenomenon. It meant that an implied 'ownership' and direct access of the ground was a pre-requisite to the DITs' propensity. The absence of a physical avenue for DITs' formation made it impossible for any social motive for DITs in Gorofani zone.

Similarly, the economic motive was hampered by the costs of adding a space within the existing apartment frame. The expansive open spaces were for occasional garbage dumping-use. Otherwise, the accessible open spaces were often pools of standing water during the rainy seasons, or became dust bowls during drier occasions. These poor physical states re-affirmed the un-owned 'no man's land' that the apartment zone had become.

Figure 4-12: Exterior view of block of flats in Kaloleni
Source: survey, 2010

Figure 4-13: Exterior view of block of flats in Kaloleni – CAD projection
Source: survey, 2010

4.3.3.1 Gorofani UDE- a summary

The basic lesson from the Gorofani UDE was that the physical strategy of vertical unit grouping minimized the chances of DITs. This may be seen as positive if the objective was to retain the original typology and aesthetic. However, if the strategy was to use the provided DU to catalyze generation of more housing, then it is undesirable for the lack of this regenerative potential.

Figure 4-14: Typical floor plan of typical floor plan of apartment block in Kaloleni
Source: survey, 2010

4.3.4 Lessons from UDE Level Transformations in Kaloleni estate

In this summary of transformations at UDE level, the cluster formation was predominant and thus guided the main direction. This was because the lessons from the apartment grouping type only confirmed the long-held notion of its unsuitability low-income dwellership, here due to the low propensity for DITs. The lessons isolated various aspects of the economic, social, and physical motives summarised in this section.

4.3.4.1 Economic aspects of UDE level transformations

Though minimal, the economic dimension within the UDEs was manifest in several ways including the use of low-cost 'temporary' materials for the extensions. The technology also signified the ease of erection, with the option of the dweller directly participating in the erection of the additional space. The use of the added spaces served an economic purpose through sub-letting and for commercial ends. Commercial DITs, manifest sometimes as kiosks, were minimal, but occurred on the common space and on road/railway reserves. The economic motive for DITs was minimal and driven by the individual and never common nor communal at the grouping level.

4.3.4.2 Social aspects of UDE level transformations

Similar to the economic motive, little could be distinctly associated with the social dimension of DITs, directly linked to the group formation of the UDE. The one evidence of socially driven common action was the blocking of arcaded entrances to deter criminal elements from misusing the common court. Interviews with the respondents pointed to need to enclose the yard as an

inevitable DITs' action meant to eliminate the misuse of the court by the criminal types. However, based on the evidence, it is true that the social dimension was a vestigial motive for UDE level DITs.

4.3.4 3 Physical aspects of UDE level transformations

The major lesson in the UDE study was the eminence of the physical strategy in predetermining the nature, use, and scale of the DITs. The nature, manifest physically as technology and materials, of the DITs was a direct result of the rental tenure in the estate. At cluster level, the most obvious physical and functional observation was the additional units that defined a mini-cluster, a sub-set curved form the open courtyard, with a locus around the provided individual units. This ignored the provided cluster that seemed over scaled for communal social and even economic networks among the dwellers.

Their porous nature invited unilateral enclosure measures by unit dwellers, and reflected the need for clearly defined edges. These physical sub-sets were to reinforce the individual's territorial defensible space. It was for creating individual independence and autonomy, which in turn negated the common cluster strategy. The function of the DITs was also significant as the added space was exclusively for residential use. This was in line wit the physical proximity to the original entity.

4.4 The Dwelling Units in Kaloleni Estate

The next section investigates the above findings and phenomena as manifest at the smaller scale of the Dwelling Units within Kaloleni estate. According to Ogilvie (1946), the strategy of building durable and permanent dwellings was

the core of the conception of the estate. The target population of three thousand (3,000) was housed in dwellings. The DUs varied in size and meant to house between three (3) persons and seven (7) persons, and 'erected as single units, in blocks of two, three or four units, but not exceeding four units'. The survey revealed that the two-roomed block reflecting the semi-detached block was common. Where more than two DU was used the semi-detached block was separated using an arched arcade leading to the courtyard.

In the strategy, each unit was to have: 'a kitchen, food store, bicycle or pram shelter and small front or back verandah, if possible, and that, in addition, sleeping accommodation should be provided at the rate of 40ft² per adult' (Ogilvie, 1946, pp. 17-18). From the fieldwork, these spatial principles were still evident, however the 'bicycle or pram shelter' (referred to in the study as 'other' space) was also used a general store or incorporated into the adjacent living room for accommodation. Figure 4-15, Appendices 10 and 12 are archival drawings showing some of the used DU typologies.

4.4.1 General description of provided DUs

Six types (coded T1 to T6), based on archival drawings and field measured drawings and were the basis for the bungaloid clusters and apartment blocks. According Ogilvie (1946):

> 'The accommodation varies from dwelling designed for three persons to those for seven persons, and the dwellings are planned to be erected as single units, in blocks of two, three or four units, but not exceeding four units. The houses are grouped in plots and each plot provides communal sanitary, bathing, clothes-and pot-washing facilities in a central sanitary

> block. Plots vary in size from those housing 65 persons to those housing 120 persons. Twenty different design-units for houses have been adopted by varying the numbers and sizes of rooms served by the same kitchen unit.' (Ogilvie, 1946, p. 18).

Thus, a conscious effort was made to vary the sizes of the DUs depending on the desired occupancy. The evidence for the survey showed a simple linear typology that only varied in scale, and this confirmed the physical design strategy broached by Ogilvie (1946). As already mentioned, the units were grouped in the clusters, referred to as 'plots' by Ogilvie (1946), with target populations of between 65 to 120 persons. The units were mainly semi-detached (two attached units), but blocks of three to four units were also observed, with twin blocks separated by an arcaded court entrance.

Their physical characteristics, including areas and space types, are as in Chart 4-10 and in Table 4-3. The NCC archival drawings and Ogilvie's (1946) drawings available were only three types, here referred as T1, T2 (one-roomed), and T3 (two-roomed). These are in Figure 4-12, Appendices 10, and 12, and illustrate semi-detached bungaloid unit blocks. These confirm that the DUs were derivatives of a single linear organisation typology. They differed only in, (1) location in the cluster, which was at either at a corner or aligned (2) the number of main rooms, and (3) the numbers in each block. The apartment type (T4) was not in the early scheme, as Ogilvie (1946) never referred to it in the Manual (Ogilvie, 1946).

	T1	T2	T3	T4	T5	T6
R1	15.30	14.80	12.00	12.00	12.00	12.00
R2	0.00	0.00	12.00	0.00	12.00	9.00
R3	0.00	0.00	0.00	0.00	12.00	0.00
Kitchen	2.00	4.60	4.00	0.00	4.00	4.00
toilet	0.00	0.00	1.80	2.00	1.80	1.80
shower	0.00	0.00	1.00	2.00	1.00	1.00
store	2.00	2.00	1.50	0.00	3.00	3.00
Verandah	2.30	3.30	5.80	4.50	3.00	3.00
porch	0.00	0.00	6.00	0.00	5.00	5.00
Other	2.80	3.30	1.50	0.00	1.00	1.50

Source: survey, 2010

	T1	T2	T3	T4	T5	T6
Total(M²)	34.40	28.00	45.60	30.50	50.80	40.30

Source: survey, 2010

Common to all surveyed DUs was the entrance verandah, which measured between 2 and 6 square metres. At the back, a kitchen porch was provided only in the surveyed units, but was not shown in T1 drawings which contradicted Ogilvie's narration (Ogilvie, 1946, p.18). In addition, a storage space,

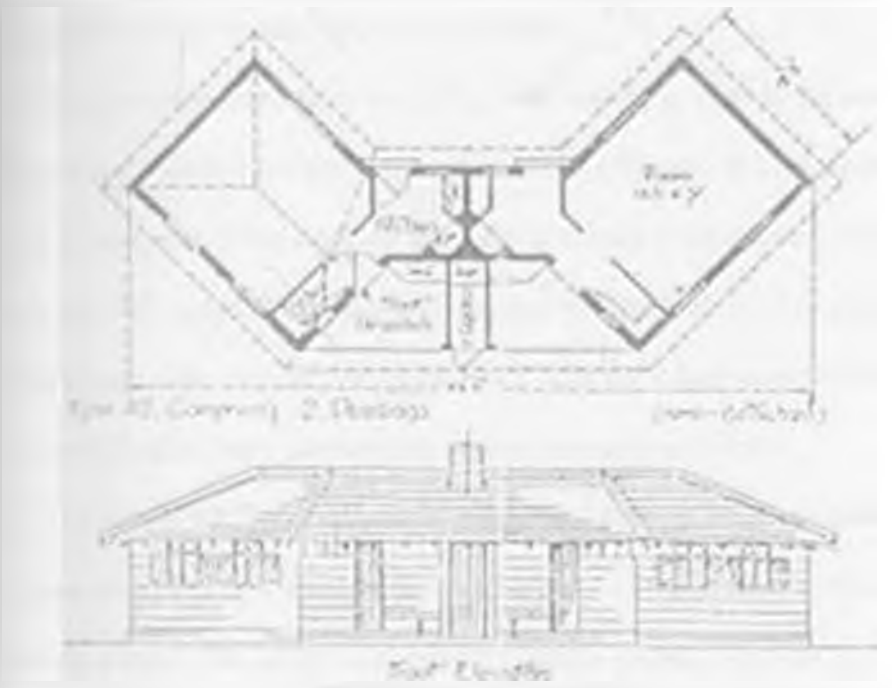


Figure 4.15 Plan and elevation Type T1 architectural drawing
Source: NCC

measuring between one to two (1-2) square metres was provided. There was the later addition of a shower and WC room in bungalows.

The apartment type , coded T4, were single rooms that used a common ablution and storage services. A chimney space was located inside the single rooms. This implied that all activities, other than the 'wet' services, were meant to be housed in one room.

These original types (T1, T2 and T3) lacked 'wet' services like toilets and bathrooms but have a space for cooking with a indoor chimney. There was a seemingly innocuos outward opening space ('other') at the front whose

function from early writings was for a 'bicycle or pram shelter'(Ogilvie, 1946, p.18). It measured about one-and-a-half to two (1.5 to 2.0m^2) square metre in area and was the smallest space type provided.

The measured types from the survey were varied in sizes in the number of rooms that reflected the multi-roomed units described above. They however all had a toilet and shower addition and a porch linking to the kitchen. Unilike the original DU, the addition was distinguished by virtue of the flat concrete slab roof cover. The flat slab was meant as a base for a roof water storage tank, however this had been converted to storage or dumping of debris.

The rooms for living ranged in area from about nine (9) to fifteen (15) square metres. The 1-roomed unit which has a largest area of fifteen (15) square metres. The utility and ancillary spaces (toilets, showers and stores) were basic and economically designed, with an average area of one and half (1.5) square metres. Kitchens had a chimney and wall shelving for some indoor kitchen storage. The total unit areas are equally small, ranging from twenty (20-55) fifty-five square metres.

The provided spaces served to anchor physically the DUs that emerged through a common; 1) access point, 2) 'wet' service core or physically as 3) 'lean-toes' for extensions. Further, the paucity of the provided space meant growing households were made to generate space socially suiting these bigger family.

Table 4-4 summrises the construction details in the DU type According to Ogilvie (1946, p.19) key decision on the construction of the DUs was to use

'permanent form of construction'. This was based on 'the then plentiful supply of stone in Nairobi District'. Further, 'the fact that the loan repayment was expected over 40 years, and the prospect of ultimate economy in capital expenditure and long-term maintenance.'(Ogilvie, 1946, p. 21)

The openings were from timber; using timber shutters for both windows and doors. The materials used for construction of the houses were as follows; rendered stone for external walling and plastered and painted kitchen interiors. The main rooms had plain stone surface finishing. Cement screed was the finish on concrete floor slab flooring. Clay roofing tiles, timber for truss members, beams, windows, and doors were from timber.

The investigation showed technologies and details that negated or contrasted the provided types. Thus the use of 'temporary' technology served to confront the 'permanence' of the provided DU. This reflected the affordability levels of the dwellership. Thus the low income led to the low disposable incomes and the minimal investment that ensued. The rental tenure status also implied lack of unit 'ownership' in law and prohibitions of durable extensions for fear of demolitions.

Of the fifty units, only 4% were three-roomed (T2) with 44% one-roomed (T2) and 52%, two-roomed (T5). There was no clear correlation between house type and dweller satisfaction. Thus from the survey 83% were unhappy with the provided house type, but no clear relation could be discerned from the house size (type) with this dissatisfaction. It is however accurate to state that

the dwellers found the units unsatisfactory for their physical needs leading to the prevalence of transformations.

Appendix 9, the outcome of the SPSS Cross-Tabulation, however yielded low significance levels and was not the basis of the analysis. Cross-tabulation between the transformation type and the original type equally yielded no

Table 4 - Construction of Kololani Dwelling Units

Element	Basic Material	External Finish	Internal Finish	Comment
Foundation	Mass concrete			• Based on excavation and removal of existing black cotton soil up to the hard rock. A layer of concrete blinding preceded the mass concrete footing. A 150mm Foundation walling was then erected. • Hardcore fill used in excavation
Floor	Mass concrete	Cement screed		• Damp Proof Course (DPC) on all walls
Wall	Stone	Chisel-dressed stone with recessed mortar joints left with natural colour	Plastered and finished with a coat of lime wash	• 450mm Thick in courses 225mm High • Internal wall were 100mm thick • flats are plastered /painted on the first floor external wall and internally
Windows	Timber shutter	paint	paint	• not glazed because of shortage of glass • wood grilles used fixed with ledged and braced shutters • use of black cabin hooks in shutters
Doors	timber	paint	paint	• use of softwood (pado) for roof structure • treated hardwood frames used • external doors framed, ledged and braced (FLB) • internal doors ordinary laminated type • use of iron hinges, black iron bolts and padlocks
Roof	Timber structure	Mangalore clay tiles	No ceiling	• tiles imported form India • sheet iron used for aprons, flashings and gutters
Fittings	Timber shelves			• shelves provided in the kitchen • stone charcoal bins provided near the fireplace • mild steel coat and hat hooks formed in walls

Source: author, 2010

significant statistic, as did a correlation table relating the house type to the type of transformation. To use the unit as a physical variable was desirable since they formed the architectural strategy in the estate, yet the results showed it did not matter. This is correct mainly because the units were uniformly morphologically disposed, small and had no significant variation in spatial quality and magnitude. This contradicted the finding from the UDE discussion earlier, where the grouping strategy (the cluster or apartment block) contributed immensely to the transformations. The DU studies will shed more light.

Figure 4-16: T3 plan showing furniture Lyout in a typical unit
Source: survey, 2010

Figure 4-17: Typical T2-single room unit – 3-d CAD projection
Source: survey, 2010

4.4.2 One-roomed Bungalow Unit

The available archive plan (Fig. 4-15) shows a semi-detached block composed of two units of one room each. Figures 4- 16 and 4-17 show measured drawings of single-room unit but was not located at a cluster corner. Economically designed, each unit has a main room, a store, a kitchen, a verandah space and the 'other' space shared

between the two semi-detached rooms. The main space is a rectangular single room of about fifteen (15) square metres. This was as a multiple use space, used variously for sleeping, visitors and eating food. Doors to the stores opened into a common entrance space that also served as a transition and porch to the kitchen, and the main room. The main room had a door to the outside through a verandah.

4.4.2.1 Case Unit 1 – No. L22

Located in cluster 'L' was a one-roomed unit based on type T2. The dweller was named Eric[26]. Born in 1973, he worked at a local telecommunications corporation from 1993, until he was 'retrenched'[27] in 2005. He trained at a local polytechnic and possessed a diploma as a telegraphist. His father was original tenant who retired from the postal corporation in 1993. The father now lived in the rural home, having bequeathed the offsprings the dwellership and official tenancy of the Kaloleni DU. Eric's mother lived in their rural home.

Eric was single and lived in unit with a brother and his child. The extension was thus purely for use of the household. He had converted a store into a bedroom for himself, while the brother who lived with his child used the extension.

Self-employed, Eric was now small-scale trader and dealt in commodities procurement and sale. He received no rent for the extension. He paid the NCC rent of 575 KES plus 150 KES as water charge. He had three more added

[26] All names modified for privacy reasons

[27] Colloquialism for being declared redundant from employment that accompanied the structural adjustments in the public sector

Figure 4-18: External view of L22
Source: survey, 2010

Figure 4-19: View into kitchen area L22
Source: survey, 2010

Figure 4-20: Plan showing internal arrangements in L22
Source: survey, 2010

rooms, which were used exclusively for rental income but since demolished in the 2003.

The main emphasis in the transformations in the DU was internal and the dweller had elaborately modified the interior to suit his use. He confessed that the extension was an appendage purely meant to accommodate his un-employed sibling in the short term. Figures 4-18 to 4-20 are images and drawings based on the observations from the case.

Internal modifications (types 'B' and 'C') included burglar proofing of the external doors to the main unit that defined and retained the verandah space. He had converted the kitchen and store into a bedroom by demolishing a wall. The space (bedroom) however still served as a transitional link to the porch, which was now to a kitchen (Fig. 4-20). Thus, the porch had been internalised and this space that fronted ablution unit space was now the kitchen. In defining the new kitchen, *mabati* roofing was evident as well as rusted flattened *debe)* in the gable edges

above the entrance.

The extension, was a *mabati* unit with the material used on virtually all building elements of the walls, roof, window, and door. It measured 3 by 3 metres and accommodated mainly the bed, a few seats, and clothes storage.

The original DU had are 200 millimetres thick natural stone external walling which allow for sufficient time lag keeping the house reasonably comfortable; cool during the day and warm at night. The extension was however not comfortable as it became hot during the day and very cold at night, a consequence of the *mabati* technology.

As for the openings, the house had added metal burglar-proof doors for security in the original DU. Windows had remained of glass casement in the ablution block and timber shutters in the main DU, but the extension's window was made of *mabati*, which exacerbated the physical comfort condition of the dwellers in extension unit.

Natural lighting in original DU was adequate despite the additional metal burglar proofing. However, the porch, which was now the kitchen, was totally enclosed, remained dark, and had cut off any natural lighting to the toilet. Initially open to the sky, the covering using the *mabati* roof, of this porch and erection of a door had made the space very dark and in the process compromised natural ventilation. Ventilation in the main DU was initially reasonable because of the cross-location of the openings, but the extensions had compromised this initial condition by blocking openings. The added unit

had very poor ventilation as the door and the window were on the same wall eliminating any chance for cross-ventilation.

In L22, the transformations created adequate space for the dweller by introducing the modified bedroom space from the original kitchen, and converting the porch into a cooking space. The added room was in line with his extended family status, to accommodate his sibling in interim period. These seemingly reasonable judgements were however tampered by the emergent physical quality due to the material specifications and articulation of the physical added spaces.

4.4.2.2 Case unit 2-Unit No. G3

Peris, the respondent was a female, in her mid-thirties and was a mother of two boys aged about three and nine (3 and 9) years. Located in cluster G, the unit layout was the original corner unit (T1). The unit had a history of at least one transfer through a shadow market arrangement[78]. Peris[79] was the sitting tenant, who 'bought'[80] it from a Recho, son of the original tenant 'owner' Festo. Upon retirement to the countryside in the late 1980s, Festo (now deceased) transferred tenancy to Recho. Peris had been the *de facto* tenant since 2001.

This 'selling' arrangement facilitated records at NCC to reflect the current dweller. The alternative was to 'inherit' the unit from the true tenant without

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[78] ... ownership in NCC rental estates (Otieya, 2009)

[79] No real names are used in the narrations for individuals' privacy and to respect the respondents' requests

[80] The respondent for reasons of confidentiality could not reveal the particular 'purchase' price for the unit. Elsewhere, the figures revealed during informal discussions were wide-ranging from KES 80,000 to 250,000

changing records at NCC, and this was the case with Recho. Indeed, according to Peris, the later was mainly possible if one had a cordial relationship, often blood, with the NCC tenant like the case of Festo's transfer to Recho, his son. This 'transfer' through 'selling' gave some authority to Peris to undertake transformations.

Located at the corner of Court 'G', G3 (figures 4-21, 4-22 and 4-23) had a small lawn and a hedge. The front yard had a grass lawn, but was also for cultivation, with vegetables (*Sukuma wiki*, onions, and tomatoes) and maize, as food crops. A few broken, yet well-ordered and neat concrete slabs defined the front yard, and these were for the pedestrian user immediately after a lockable *mabati* compound gate. This front yard was also for laundry work, and had a single tree. The hedge laced with some barbed wire defined the area around front of the unit and formed an edge to the DU territory.

All openings were burglar-prooled with metal plates and bars. The verandah space was now an internal space with a huge metal wall/door. This defined an extra 'room' that served as the sleeping quarter for her two young children. It also contained the main access and front entrance door to the house. This somewhat disoriented the visitor with public and private space conflicting in this location. It was obvious the young age of the children put a lower premium to their privacy than the adult tenants.

The main room that mainly for visitors, but was (using curtains) divided into a separate sleeping zone. An open porch at the kitchen to the ablution area had

Figure 4-21: External view of DU G3
Source: survey, 2010

Figure 4-22: Kitchen view in G3
Source: survey, 2010

Figure 4-23: CAD projection of G3
Source: survey, 2010

a *mabati* roof. Outside of the original unit was added built and un-built space used for sub-tenants.

She had added two rooms exclusively for use by the tenants. Further, she had added water borne sanitation unit that accommodated a toilet and shower for the sub-tenants. Small yard separated her unit with the sub-tenant rooms, which was used for relaxation and laundry work. The linear sub-tenant units were from *mabati* sheets on a timber frame. The independently accessed quarters for the tenants further illustrated the need for spatial segregation and separation between the 'owner' householder and the tenants for more privacy.

The respondent had irregular incomes from casual work from the nearby CBD and Industrial area, and as an informal trader. However, additional income came from her two added rooms. Rents attracted were two thousand shillings (2,000 KES) for a single room. This charge included some services like water. No connection of electric power existed to the added rooms. The two tenants, paid four thousand (4,000 KES), a healthy sum compared to the rent she paid

the NCC of KES 580.

The cost of erecting the structures was definitely significant given her low income. This cost had been minimised given the local *fundis* she had hired and used *mabati* and timber skeletal structure. The *fundis* charged labour charges only while she procured the materials.

Though clearly an economic motive was a predominant basis for the transformations in G3, the physical avenue accorded in original space catalysed the nature of the transformations. Thus, the abundance of open space within the court was the basis for the quality and the magnitude of these DITs.

The social motive seemed not strong for her given the young family where privacy was not a premium. However, the separation from the tenants' illustrated the need for some privacy. The case supports the position that functional concerns of economy and social fulfilment remain central to her housing satisfaction, but the physical architectural strategy was the medium to their realisation.

4.4.3 Two-roomed Unit

All the variants of two-roomed DUs (e.g. T6 in Figs. 4-24- and 4-25) had two adequately dimensioned rooms with areas of 11 and 15m^2. They were not directly accessible as a 1.5-metre corridor and a small verandah and lobby precede them after the slightly arched entrance verandah. The corridor serves as transition space also for accessing the kitchen and small store. The kitchen and 'other' space (now used as a store) opened to the backyard. Roofing was a double-pitched hip-ended clay tiled type. The porch space, with an area of six

Figure 4-24: 2-roomed plan of T6
Source: survey, 2010

Figure 4-25: CAD projection of T6
Source: survey, 2010

metres squared, was now a living space, and was now washing space. It had retained the store and the 'other' space for storage.

4.4.3.1 Case Unit 3- K13

The case unit differed slightly from T6 with access to one living function room only possible through the other. This accorded the dweller to restrict the use one of the rooms for sleeping while the other was for the public. The respondent, Felix, lived in the two-roomed unit with his mother, two siblings (a brother and sister), and niece. The mother, a Legio Maria church elder worked from home in the verandah as a tailor. The DU had piped water connected and operational, a water-borne sewage disposal and had electricity power supply. Felix was in his late twenties and completed school in 1997. He was a casual worker. His father was deceased.

The unit had mainly type 'D' transformations, which served to define edge and were the overt boundary definition elements. The six rooms added because of transformation defined a common courtyard. The compound was however in poor physical state and was strewn with solid waste portions and also had a blocked sewer spewing foul water and odour.

Figure 4-26: K13-plan of extended unit
Source: survey, 2010

Figure 4-27: K13-3-d projection of the extended DU
Source: survey, 2010

Figure 4-28: View into mini-court in K13
Source: survey, 2010

Internally the kitchen porch was roofed and formed part of the household's kitchen. The mother lived in the original house with the granddaughter. The siblings inhabited the added rooms, while three of them were for to sub-tenants.

The extensions therefore served both economic and social value to the household. With a rent of two thousand five hundred shillings (2,500 KES), these leased three rooms erected from *mabati* attracted a total sum of seven thousand five hundred shillings (7,500KES) only (Table 4-5). The other three added rooms created needed privacy among the members of family by availing sleeping

Table 4-4: Space Types and Transformations in DU K13

description	NCC Rent	subtenant rent
Verandah, used as business, tailoring space for mum...	1200 KES	-
Visitors room, dining		
Bedroom, used by mum		
Kitchen		
Ancillary space: WC, shower		
DIT room, used by Felix		
DIT room for sister		
DIT space for brother		
DIT space for tenant 1		2,500
DIT room used by tenant 2		2,500
DIT space for tenant 3		2,500

2010

spaces for the adult siblings. The family shared the kitchen and visitors' room that served also for dining in the original DU.

NCC payment totalled one thousand two hundred shillings (1,200 KES). Figures 4-26 and 4-27 are CAD projections of the current state of the case of the two-roomed DU of K13. Figure 4-28 is view of activities within the 'mini-court'. Table 4-5 lists the spaces, their uses, and figures of NCC repayments and rental returns from the extensions from the case Dwelling Unit No. K13.

Spatially, the DU seemed well articulated because of the transformations. The extensions defined the territorial edge that also created a decent courtyard space. The access to the extensions was independent, and clearly distinguished form the main DU. The transformations combined the social and economic space within the DU clearly. The same also applied with clear privacy and public domains defined in the emerging physical formation.

Figure 4-29: Unit V1-floor plan
Source: survey, 2010

Figure 4-30: Unit V1-3-d projection
Source: survey, 2010

Figure 4-31: V1 – main unit/extension interface and access toDITs' units
Source: survey, 2010

4.4.3.2 Case Unit 4- V1

The respondent in the case unit, V1, was named Tata, a twenty-one year old woman who was a student in tertiary training college in the CBD. She lived in the house with her mother, her aunt, an elder brother's six-year-old son. The original NCC tenant was her grandfather, who had died in 1993. The NCC records reflected the same and the rent to NCC was through the deceased's name. The grandfather had moved in the house in the 1960s, and Tata' mother (and the aunt who lived with her), were born in the house. The mother was mostly in the countryside tending to the rural farm, and was not part of the dweller-household.

Table 4-6 shows the space types used in Unit V1, while Figures 4-29 and 4-30 show the layout and a three-dimensional projection of the case DU. Figure 4-31 is a photograph of the unit. The main unit had no evidence of any transformations, and it remained in poor maintenance state. The original unit remained in the largely in the original state with minimal changes structurally and

	Name	Description	NCC Rent	Sub-tenants' rent
Room 1	Main room	Visitors' room, dining room, shower for kids	770	-
Room 2	Bedroom	Sleeping for adult members of the house		-
Room 3	Kitchen	Cooking for main households		-
Room 4	WC, shower, store	Ancillary spaces		
Room 5	DIT room	multi use by sub-tenant	-	2,500.00 KES
Room 6	DIT room	multi use by sub-tenant	-	2,500.00 KES
Room 7	DIT room	multi use by sub-tenant	-	2,500.00 KES
TOTAL			770	7,500.00 KES

Source: survey, 2010

decoratively. The porch to the kitchen was enclosed (type 'C' DIT) using a *mabati* roof and timber door to the mini-court fronting the tenants' quarters (type D). The main room was a multi-use space that served mainly for children sleeping at night, and had not undergone any physical modifications. In the day, it hosted visitors and was also for dining.

The sub-tenants quarters, were *mabati* extensions anchored on to a timber frame. These three rooms were in a row, with a one-metre wide screed finished floor plinth at the entrances. They shared the ablution spaces with the original unit. They had screed-finished floors, based on hardcore base. Accessed independently from a space defined between main house and the added rooms, the extensions had some privacy and exclusivity. The DITs' households, for laundry washing and drying, used the 'mini- court', largely a gangway fronting a barbed wire boundary.

Table 4-6 also shows a computation of the payments to NCC and rental returns from the added spaces. The rent paid to NCC was seven hundred and seventy shillings (770 KES) for the two-roomed unit.

The total of seven thousand five hundred (7,500 KES) sub-rent paid by the lodgers was nearly ten times the NCC charges, and was profitable given the minimal investment made towards the erection of the *mabati* structure. This money served as income and it seemed the clear motivator for transformations. Indeed, the household members, that were of at least two generations, were crowded in the two main rooms and whatever spare space they could find, and yet they spared the added spaces for the sub-tenants.

The main unit had electricity connection, and this was subject to independent payments to the utility company, the KPLC. Based on the observable and confessed uses, of only lighting and occasional ironing, the monthly power bill was from 500 to 700 KES. The respondent however felt these charges were high and said they were perpetually harassed. Further, it was common practice for dwellers to connect illegally.[81]

The low economic status of the dwellers seemed to lead to social compromises in social privacy and expense of needed income from the dwelling. Adults used one room as a shared bedroom. The other room was used for visitors and sleeping for children. The three sub-tenants shared a common toilet and shower room in the main unit. Further, they had a common outdoor space that they shared for recreation, cleaning and laundry activities, as well as some cooking. It was clear that the motivation for the additional space was financial and not social since the dwellers seemed content with the compromises within the two original rooms.

[81] In fact, they wrongly thought the interviewer was from KPLC out to apprehend such culprits!

Figure 4-32: Three-roomed unit(T5) plan
Source: survey, 2010

Figure 4-33: T5 3-d projection of a semi-detached block
Source: survey, 2010

4.4.4 Three roomed unit

Type T5 in Figures 4-32 and 4-33, the 3-roomed unit recorded had almost equally sized main living spaces of each approximated 12 square metres. The linear typology had a centrally placed entrance. A narrow entrance lobby/verandah preceded the main spaces. Apart from the last room located at the end, the other two rooms had no privacy since access was only possible through intervening doors. This was a strange arrangement that denied privacy to all spaces in the unit.

4.4.4.1 Case Unit 5-Y13

Six adult siblings occupied House number Y13, a 3-roomed DU located in cluster 'Y' that faced City Stadium. Dika, the household head (the respondent) was dissatisfied with the space, as it was inadequate for household's social and physical spatial needs. As such, he had added a semi-autonomous unit for his use since he was married with three children. The main house used by five of his siblings, leaving, Dika, the eldest, to inhabit the extension, with his family. In his thirties, he worked as a driver downtown and had fourth-form education.

Though born in the house, he and his siblings went to in boarding schools upcountry. The reasons for the extension were purely for his accommodation, and was thus to create social space between him and the younger siblings.

The DU had been 'inherited' from the now deceased parents. He lived under the perpetual threat of demolition by NCC, a fate that had befallen them earlier in 2003. He lived in the four-roomed extension with a wife, two school going children, a baby and a house assistant.

Physically, Dika's mainly 'clip-on' and 'add-beside' unit, used to house his young family, was however mainly encroachments in the acquired open space and built from temporary material. In addition to the fear of demolitions, the other concern was that the immediate neighbour had usurped more than her fair share of the open space. This was space 'available' for transformations.

In the extension, the added spaces were: a bedroom for his son, the 15-year-old boy's room, a visitors' lounge, a bedroom, cooking space, and small court (Figs. 4-34, 4-35 and 4-36). He still used the main house for services including the 'wet' utilities like toilets, showering, and water supply. Part of the transformations involved taking over court entrance space (Figs. 4-34 & 4-35) that he had converted to a bedroom. Further, he had incorporated the verandah space, and converted it to bedroom using permanent materials (a 'spare space' transformation).

The transformations commenced with internal 'skin'-based, Type 'B', and then incorporation intercalary space spaces like verandahs and porches. The two transformations using permanent materials were type 'C'; where a

Figure 4.34: Case DU Y13- layout
Source: survey, 2010

Figure 4.35: Case Unit Y13-3d CAD projection
Source: survey, 2010

Figure 4.36: Unit Y13-view into corridor 'court'
Source: survey, 2010

verandah had been converted to a bedroom and incorporation of an arcade used to access into a living space. The evidence from the investigation in this unit illustrated that the structure and the size of the households in Kaloleni demanded more space than was ever provided. Seemingly, the strategy to provide varied type plans was not equal to the task at hand of housing the low-income dwellers here.

The process of transformation in the case DU involved usurping 'free' internal space like the verandahs and in porches. This was following by the move to the open external space within the courtyards. The first was as legal given that it did not infringe on the unit's perimeter. This was firmed by the dwellers' propensity to use durable materials, here. The second, was 'less legal', and was manifest as impermanent transformations. None of these transformation efforts was in line with development regulations. It was only a perceived notion of security the dwellers'

adopted and translated in the technology they adopted. The other physical informants of the transformation were the location of the utility services. Water, for instance, was available in a 'wet core' area close to the original unit. This proximity meant that the added space could only be near the main unit to optimise the sharing of the 'wet' utility services.

4.4.5 One-roomed flats

The one-roomed flat, T4, was a multi-use space used for all household activities (like sleeping, eating, cooking, visitors, and entertainment) except the bathroom functions of the toilet, shower, and laundry washing. The room measured three (3) by four (4) metres, giving an area of twelve (12) square metres. This a small space for these combined functions for a typical Kaloleni household of two parents up to five offsprings (who were often of children advanced age).

The location of chimney in the rooms meant that cooking was in line with the designated use of the spaces. The interiors were un-finished leaving coarsely textured wall surface. Plaster and paint was the finish to the first floor exterior surfaces (Figs. 4-12, 4-13 and 4-14).

Linearly organised along a 2-metre access, each of the rooms had a door that opened into this common corridor. This space, averaged per each unit gave a per capita space of 4.5 square metres, a seemingly useful space in magnitude, that was however hardly available to individual flats DUs given its use to access other units on the floors. The passage often also served for drying wet laundry. A two-flight staircase linked the two floors in the one-storey

apartment block used identically in the eight blocks in Kaloleni. A small store was located on the ground floor close to the stair. The 'wet' functions were in a core that had a shower, Water Closet (WC), and wash hand basin (WHB). These comprised two shower and WC spaces, which were common to the eight rooms on each floor.

The window openings were exclusively from timber, using timber shutters with a Z-section bracing and with old ironmongery details of a simple latch and window stay, hinged on timber frame. Each of these windows had light wire grills additional to these shutters. The doors were composed of vertical ledges nailed on the Z-section bracing and with padlocked latches.

4.4.5.1 Case unit & The Apartment room

Transformations in the apartment unit were limited to category 'B', largely due to the grouping morphology. Thus, only 'skin'-based internal modifications were possible. Often the main room was subdivided using curtain clothing to separate common space from bedroom of the adult and main tenant. No single permanent subdivision was in the ones visited. Other 'skin'-based transformations included finishes from a plain wall to painting on the un-plastered wall. A few fitting items like shelving had also been introduced internally.

The ablution space, toilet, and shower, which were common for use by four units, remained mainly un-maintained decoratively and functionally. This was due to the frequent water shortage and the common use of the spaces. Although, the propensity for subletting was hard due to the typology, it was

Figure 4-37: view inside case DU flat
Source: survey, 2010

Figure 4-38: Plan space-use in flat DU
Source: survey, 2010

Figure 4-39: Flat DU- view into staircase
Source: survey, 2010

reported by the respondents that a concept of rent sharing was possible in some cases. None of the five units visited had such an arrangement, however.

That all the rooms were invariably subdivided with the cloth curtains demonstrated the multi-use nature of the occupancy, and the separation of public and private space in the estate. A 'skin'-based physical transformation that was incidentally missing was that of security – burglar proofing of the openings. Further, the openings had retained the original materials: timber shutters for windows and 'Z' braced timber doors. Ordinarily these would have been replaced with metal casement types, and which would be burglar-proofed. This was justified, if at all, only by the low-income levels of the dwellers. Figure 4-37 is an interior view in the case DU, while Figure 4-38 shows the furniture layout of the same generated through a CAD drawing. Figure 4-39 is view into the staircase circulation.

4.5 Summary of Transformation trends in Kaloleni

The transformations in Kaloleni illustrate that housing realised through the initiative of the dweller is both enriching to the neighbourhoods as much as it was self-defeating. These was a mirror of the underlying strategies of morphology and functional relationships. Similarly, this responded to the housing delivery system, in this case the rental consumption of the housing. The architectural strategy aimed to create neighbourhood unit through appropriate grouping in bungaloid housing units in clusters and the few apartment blocks studied.

Unique to Kaloleni (and typical to Kenyan public-sector rental housing), transformations are a now a mainstream dimension confirmed in the empirical findings. The morphological strategy ingrained in the environmental stance of the neighbourhood unit, the economic strategy of self-sufficient communities and the ownership strategy combined to shape emergent transformations. This was manifest at the three hierarchical scale levels (of the estate, UDE and the DUs), which encapsulated the architectural strategy. In this conclusion, the physical, social, and economic justifications and manifestations of transformations are summarised.

4.5.1 Social Dimension to Transformations in Kaloleni

The choice of hierarchically assessing the DIYs' phenomenon through physical categories of estate, UDE and DU, had the effect of highlighting the physical motivation of transforming estates at those varying scales. It was useful in a descriptive manner, but the human agency was equally crucial in

informing the architectural strategy on the nature of DITs. Motivated by the economic gain and encapsulated in physical form, transformations were a choice by the dweller not necessarily reflecting the inter-personal and social relations that guided them but through passive peer influences.

Thus, the apparent unity of purpose at the estate was not because of any communal action, but as result of their common challenges of poverty and the deficiencies of the house provided. Indeed, the fragmented transformations seemingly un-coordinated were however responsive in a similar fashion to the lack of security of tenure and the low-income profile of the dwellers.

The other social trend here seems to have been to create a new socio-physical entity within, but also contradicting, the provided frame by creating the new 'mini-clusters'. Thus, the findings show a breakdown of cluster level community action and the emergence of a newer physical socio-economic entity around the unit. In essence, the social dimension was due to the physical limitations and opportunities of the provided physical space.

4.5.2 Economic Perspective in Kaloleni Estate

The economic aspect of the rental dwelling is rooted in the fact that there was a highly subsidised rent charged to the NCC tenant, which made the units attractive mainly for the low-income. Further, the prime location of the estate, in close proximity to the Industrial Area and the CBD further enhanced the economic value of the dwellings for the low-income dwellers. This was why the tenants were reluctant to surrender their tenancies.

Other macro-economic factors like inflation, whereby any low-income earnings would not sustain them any longer, leading to demand for income from the dwelling and from the extensions. Despite the dire economic reality, the physical opportunity accorded by the expansive space, was strong.

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 lack of tenure security in the tenancy arrangement meant the added units were of low technological value. However, as an investment model these low cost transformations were supported by the high rents.

4.5.3 Physical Perspectives of Transformations in Kaloleni

Estate-wide, the three physical parameters were significant: 1) the centrally located common commercial, social, community, and recreational spaces, 2) the radial estate street organisation with the ring roads, and 3) the unit grouping and clustering morphology. The first two elements did not seem to catalyse transformations overtly. However, the latter, the clustering of the units clusters was at the core of all transformations observed.

Some transformations occurred in direct contradiction to these physical formations. For instance, transformations promoted informal trade located away from the centrally located NUC shopping centre. This fact nullified any possible gravitation to the centre, and instead decentralised trade. Trade activity was thus informally dotted across the scheme that emerged along the

circulation arteries and spontaneous nodes. The non-hierarchical radial street formation seemed to promote the locational spontaneity of these commercial activities. These concentrations were thus a negation of the strategy of focussing trade at the centre in NUC frame[82]. The central formal market in the estate therefore remained dormant and with low activity as opposed to the thriving spontaneous informality in the streets and the edges on the periphery.

The clusters were however, the main focus of dweller-initiated transformations, albeit again in direct contradiction to the provided types. The formation of 'mini-clusters' using the provided unit as the locus created appropriately scaled clusters that also established individual territorial control. They thus established a 'plot' formation that was otherwise absent in the initial concept. This however was dampened by the illegality of the act in the rental ownership strategy, which forced the dwellers to define these spaces using temporal technology and materials. These lowered quality was the main result of the lack of tenure security, but the phenomenon confirmed that the need and urge to extent the units was inevitable.

The availability of physical space occasioned by the open cluster planning in the 'plot-less' formation, was seen as the catalyst to the dwellers for transformations. Repeated throughout the estate clusters, the literal replication of the type and nature of the DIT's was a re-affirmation of the hypothetical position that physical space determined the DITs' type. Thus, the thesis here is

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[82] However, these commercial activities were insignificant compared to the dense informal markets that emerged at the edges close to the Stadium/Jogoo and Young Roads, these concentrations served the larger population outside the estate

that availability of ground space (a 'site') adjacent to the provided DU or UDI was the impetus for DIIs' formation.

This physical stance position was reiterated in the opposite theoretical replication in the apartment typology where minimal transformation activity was because of the vertically grouped UDE typology. The vertical grouping denied access to the 'site', which denied the dwellers an opportunity for transformations. Thus, physical space promoted or deterred DIIs, and less of the social and economic dimensions.

At the DU scale, the lack of significant variety in the unit characteristics meant that transformations occurred regardless of the unit types. Thus although the physical nature of the units did not seem to promote or deter transformations, it was precisely because the variety was limited compared to the household requirements, a further re-affirmation of the proposition. The conclusion was that regardless of any social or economic inclination of the strategy the physical strategy was the most important factor of transformations.

5 THE CASE OF BURU-BURU ESTATE

5.1 General Background

A few authors (Anyamba, 2006; Nevanlinna, 1995 and Hirst & Lamba 1994) trace the origins of Buru-Buru to the 1962 Regional Boundaries Commission that advocated the eastward expansion of the Nairobi for housing development. The action incorporated the former Donholm Sisal Farm into the city as a residential zone. It is now a major residential district[81] . In addition, the Nairobi Urban Study Group in the 1973 Metropolitan Growth Strategy, MGS (NUSG, 1973) averred and further advocated eastward expansion of the city's boundaries for the same (Emig & Ismail, 1980). Figure 5-1 is the aerial photograph and shows the location of the Phases and adjacent districts to Buru-Buru estate.

Earmarked for the then emerging middle-income, Buru-Buru adopted the mortgage housing financing delivery strategy. This marked a departure from the Rental and the Tenant Purchase housing finance models, hitherto popular in urban housing delivery. These earlier approaches, heavily laced with state subsidies, over time had proved economically unsustainable and less amenable to the liberal market development orthodoxy[82] since preferred.

In this then new direction, the government only offered guarantees for offshore funding (Anyamba, 2006, p. 168), and left the bulk of housing development to the private sector through mortgage loans that were to be paid

[81] Other schemes in the zone include Tena, Donholm, Umoja and many more public and private estates.

[82] This market approach was largely a middle-income strategy. However, according to Syagga (2003), with the onset of the full cost recovery principle in the 1980s', it sometimes applied in low cost schemes.

over 15 to 25 years. This was unlike the rental model, used in Kaloleni estate (Ogilvie, 1946), where repayment was up to fourty years.

In Buru-Buru, the joint main institutional actors were the Nairobi City Council (NCC) (implementers), the central Government (GoK, for financial guarantees) and the British Commonwealth Development Corporation (CDC, for offshore finance). The design and planning consultants were private firms. In the early phases (I and II) it was the firm Colin Buchanan and Partners, a UK-based firm. Mutiso Menezes International (MMI), a locally incorporated planning and architectural consultancy was charged with the bulk of the later phases (III[84], IV and part of V). Paviz Agepour, another Nairobi firm worked on a final part of the last phase, Phase V Extension (Sector SG).

The two key planning and design[85] morphology determinants that defined Buru-Buru estate are the physical and the timing defined in the phases of the scheme. The physical dimension used the plots' clustering system, the plot – based planning that accommodated the units and the circulation networks. Unlike Kaloleni, Buru-Buru layout was on individually demarcated plots[86]. The sequential planning was through the phases from Phase I to V (Fig.5-1 and Table 5-1).

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[84] Jerry Standley was the project architect for Phase III (Menezes, 1978)

[85] A distinction between the term disciplines of Urban Planning and Design, both with the same origin in architecture, which study the city artefact. They are here distinguished by the different emphases of the former on land use, infrastructure and social issues; while the latter focuses on the morphology (Middleton, 1982) (Steinø, 2004).

[86] The approach can be traced back to the colonial urban spatial project of replacing African spatial formations of 'orders without frameworks' with creation of distinctions between 'inside' and 'outside' at various spatial scales, manifest in the estate and plot morphologies(Anyumba 2006, p.171) (Myers, 2003, p.68) (Mitchell, 1988).

The plots vary from six to 10.5 metres wide and 20 to 24 metres in length. This ratio of 1:3.3 to 1:-4 falls within the recommendations in the *Urbanization Primer* (Caminos & Goethert, 1969), for efficient services utilization in plot sub-divisions. However, organically planned around unit clusters that surround courtyards, the estate is on the overall devoid of any rigid geometrical planning.[88] The courtyards vary in dimension, areas and as well as the number of constituent unit. The cluster was the main Urban Design Element (UDE) used for physical and social grouping in the estate.

The time-based grouping element, also employed was through the phasing of the implementation in the five phases. Table 5-1 shows the defining physical parameters of the phases. Each phase houses an average of nie hundred and forty-three (943) Dwelling Units that vary in scale from two to four bedroomed.

They also vary in form from the detached, bungaloid, semi-detached, maisonette and terraced articulation. There was a design evolution over the five phases, though vestigial, with increased sizing of the units from 2-3 bedroomed up to 4-bedroomed units. In addition, a new typology of a 'corner shop[89]' was an option. The former evolution, increased space and reflected a revision of the targeted household size. It reflected added spatial needs as well as increased affordability by the newer dwellers.

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[88] Kiganda (1989) has drawn parallels to the garden city movement pioneered by Ebenezer Howard (Howard, 1898) and as implemented in Welwyn, Runcorn and Letchworth (Panerai, Castex, & Depaule, 2004)

[89] From MMI drawings and a 2003 lecture: Architect Sirma of MMI at UoN

Figure 5.1: Aerial photograph of Buru Buru estate
source: RCMRD/SoK, 2010

The later, was a functional change, and illustrated the need for a functional mix: a precursor to some of the emergent typologies witnessed in the DITs. The development control conditions that guided the planning design aimed for a density of 32 (or 260 persons) plots per hectare, a plot ratio of 0.75 and plot coverage of 35%[90]. Car parking requirements allowed a car per plot and a single car provision for two plots outside the plots, meant to accommodate visitors and extra cars. Another restriction was vertical whereby no more than two-storeyed (ground-plus-one) dwellings were developed.

The major circulation paths that define the edges and separate it from neighbouring districts include: the Railway line to the South and Eastern direction and Jogoo Highway to the West. These two defined wide expanse of open space to the south that ultimately fronted the Industrial Area. Rabai Road forms a loop on the Easterly and Northerly sides.

A low-income estate, Umoja Phase 1, was located to the East of Buru-Buru. The two estates were separated by Railway line and Outer Ring Road that ran parallel to each other. A natural edge, the Nairobi River, defines part of the extreme Northern edge. A Spine road, Mumias South Road that traversed the scheme and connected the various phases (Fig.5-1) was used mainly for vehicular transport, and accommodated common commercial and social amenities[91]. It was a 30M wide road reserve, with a tarmac carriageway.

[90] A recent revision allows plot cover of 50% (Anyamba , 2006) (NCC sources))

[91] This echoed the TW Neighbourhood Unit Concept (App.8) and to the Garden City Concept (Kigondu, 1989) (Parsons, Carter, & Depende, 2004)

	PHASE 1		PHASE 2		PHASE 3		PHASE 4		PHASE 5	
Time of Implementation	1973-74		1975-76		1977-78		1979-81		1981-84	
Total Units / %	941	20%	977	21%	887	19%	857	18%	1051	22%
Target Population	4 700		4 885		4,435		4 285		5,255	
Sample	23		20		10		9		41	
Average Number Of Units For Each Phase										941
Average Population For Each Phase										4,719
Total Number Of Units										4,719
Total Population Targeted										23,595

Source: Author, 2010

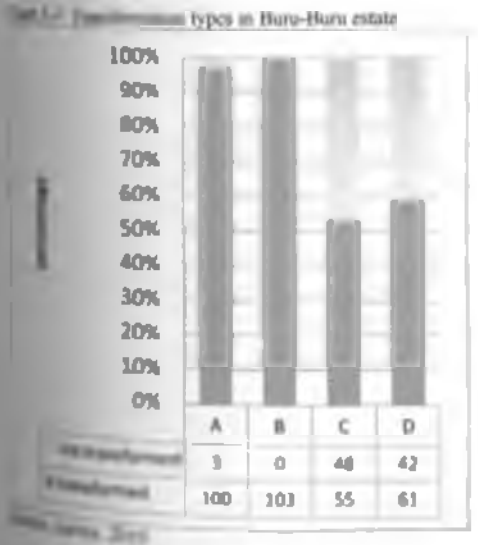
The key planning similarities with Kaloleni included the further development of the Garden city principle that originated the Neighbourhood Unit Concept in the *Nairobi- Master Plan For A Colonial Capital* (Thornton-White *etal.*, 1948). However, Buru-Buru borrowed heavily from early English Garden Cities like Welwyn, Runcorn and Letchworth, amongst others. With plots of 0.5 acres and hence projected densities of 19 Persons per Hectare, this matched Howard's densities and a population of about 30,000 people. This was further reflected in the use of individual fenced plots and cul-de-sacs that culminated in the cluster courts (Kigondu, 1989) (Howard, 1898) (Burke, 1975) (Barnett, 1986) (Panerai, Castex, & Depaule, 2004)

These courts were meant for landscaped greenery, parking, and children's play area. These were hallmarks for a middle-class urban housing. The similarity with the NUC used in Kaloleni was the centralisation of social and commercial amenities. However, in this case the central space was linked directly by a spine road, Mumias Road, absent in Kaloleni and the NUC. In those two concepts, the linkages were located on the periphery (like the Jogoo

Rd. and the railway line), defining edges, rather than paths within the scheme. However, they also shared the sense of landscaped openness and self-containment with necessary social and commercial amenities.

5.2 Sample DIT characteristics

Chart 5-1 shows the recorded DIT types from the sample survey. It showed that the most frequent transformation type was Type 'B', with all (100%) the sample units having been internally modified. This was understandable and explained by respondents as inevitable given the need to define, secure and personalize the dwelling. This was also within the common expectations of the ownership model on which the scheme was based. Thus, all the units surveyed had undergone decorative changes and had reinforced their openings using metal burglar-proofing bars and plates for added security. Furthermore, given their middle-class status they had the disposable income to support such transformations.



The next most frequent transformation, in 97% of the cases, was for the plot definition and compound modifications; the type 'A' transformations. Open space pavement using stone or pre-cast concrete slabs and well-kept grass lawns were common, and the respondents explained this as a further

assertion of the desired physical quality in estate[92].

These frequencies are also about the timing and prioritisation of the transformation types. Thus, the highest priority was the type 'B', then 'A' and finally 'C' and 'D', which reported similar percentages (42% & 44%). From these one can also see the increasing costs of these DITs' types: an economic choice. In the next sections, the social, physical and economic aspects of DITs are discussed.

5.2.1 Social Aspects of Transformations in Buru-Buru

The variables included are the types of transformations (A, B, C & D) and social variables of gender of the household head (HHH), their marital status, household size, ages, and time-based parameters of the household head age, of the children and duration of stay in the unit. Appendix 16 shows the sample SPSS[93] correlation matrix for social factors and DITs' type.

At its inception, the socio-economic profile of Buru-Buru was for the middle-income, and this remained so during the study, albeit with the advent of lower income groups through their accommodation as sub-tenants within the extensions. In post-occupancy studies of the social profile (Menezes, 1978) of scheme, it was reported that it was designed to house 'well educated couples just starting their families with both husband and wife in full time paid employment' performing mainly 'white collar jobs'. The report mentioned that despite this target, lower-income dwellers were present, covertly housed as part

[92] These were also included in the provided DU as 'precast paving slabs at the front and rear entrances' (Matrix Menezes International, nd, p 1)

[93] Pearson's correlation constant was used to show significance levels. Cross-tabulation matrices were also used.

of the family. From the survey, this later situation has been exacerbated in the emergence of DIIs reported in the present work.

The households were largely male headed (88%), and conventional family set-ups, with a father head, wife and children occupied 79% of the units. Some unmarried household heads, with or without children, were a significant proportion and contributed 20% of the families. The age group of the heads was middle-aged of above forty years. Ninety-two percent of the households had three and above children.

The age profiles of the children was nearly uniformly distributed among the selected age brackets of below six (14%), 6-15 yrs (25%), 15-21years (29%) and above 21 (32%). Additional members of the household residing within the houses were domestic workers. No incidence of extended families was reported in sample. Table 5-2 shows the frequency of these social characteristics of gender, marital status and age of the Household head (HHH) from the survey.

Time-based variables were perceived as having a social dimension, and had a direct relationship to the transformation process. For instance, the duration of stay of the household head was viewed was indicative of the social networks established over time and therefore a capacity to make more socially aware

	HHH-Gender		HHH-Marital status				HHH-Age			
	female	male	married with kids	married without kids	single with kids	single	below 30	31-40 years	41-50 years	above 50
Frequency	15	88	81	3	9	11	8	29	41	11
Total	103		101				102			
%	15%	85%	80%	3%	6%	11%	8%	28%	40%	32%

Source: survey, 2010

decisions regarding the physical environment. The other time variables of the age of the household head and the children similarly served a social function given that maturity or otherwise influenced the way space was consumed to realise physical separation, social independence and associated hierarchical distance.

Two-thirds of the dwellers in the sample had stayed in the estate for more than ten years, and this reflected a propensity to engage in extensions (type 'D' transformations). Thus, more than 60% of these long-stay dwellers had added space this way. A similar (67%) statistic applied to those who stayed for between four and ten years. The significant difference was for those who had stayed for less than four years, where only 50% transformed that way. Extended length of stay did not relate to the tendency to extend the unit as the statistical significance was weak[8]. The duration of stay was thus unverified.

Type 'C' transformations were similarly not correlated to the duration of stay, with nearly all duration periods recording 50% transformation frequency. The other transformation types were even less affected by the duration of stay as nearly all had undertaken boundary-defining (type 'B') and 'skin'-based transformations (type 'A'). It was apparent that with regard to the social dimension, the type of transformation that mattered was only the extensions. Thus, socially pre-selected middle-income and thus relatively affluent grouping in Buru-Buru had fulfilment in the provided class needs of the estate. This was manifest in the fact that the dwellers uniformly addressed basic cost

[8] I-0.441, in Appendix 24

transformations reflected in the types 'A', 'B' and 'C' transformation frequencies.

Similar to the duration, the age of the household head reflected on their social standing in the estate. Thus, type 'D' transformations averaged about 50% across the age profiles of 'below 30' (63%), '31-40' (55%), '41-55' (51%) and 'above 55' (69%)[95]. Type 'C' transformations were more amongst the older ages ('above 55' had 64% against others who averaged 48%. These descriptive figures however, do not correlate transformations to the variable of the age of the household age at all with weak significance levels and low correlation coefficients (App. 16).

From the survey, female-headed households were less prone to undertake type 'D' transformations with 27% adding extra space, against the male-headed ones (65%). In Appendix 16, the strong significance (0.005 for 'C' and 0.003 for 'D') support this strong link though the coefficients 0.274 and 0.288 are not as convincing. Similarly, internal modifications (Type 'C') were rare amongst women-headed households (App. 16). This trend may be a result of the weaker economic status normally imposed by gender the world over.

Similarly, in absolute terms, the households with children were more prone to type 'D' transformations, but this faded in comparison to the proportion of transformers in the marital group. Thus, of the eighty-one 'married-with-kids' group, only 58% had added space. On the other hand, 63% of the 'single' and

[95] Statistical significance, T, (0.763) and strength, lambda (0.19) reflect the weak link between these factors and these quantitative transformation types (App.24).

100% of the 'married-without-kids' category had the same. A low transformation frequency among 'single-with-kids' of 33% was noted. These figures, however, give a seemingly false impression, as those in these categories accounted for only 20% of the sample. With regard to the presence of children, another social statistic of 58% however did not show the variable as a strong motivator for quantitative DTTs[96]. The above discussion is mirrored in the type 'C' transformations also.

Size of the household informed on whether added space was for use by the household or otherwise. This however was not supported by the findings with all groupings nearly half-likely to transform. Thus, households of 'one', 'two', '3-4' and 'above 4' recorded 50%, 45%, 64% and 57% respectively, that averaged 59% probability of type 'D' transformations. A plausible explanation was that the provided unit addressed the nuclear family unit represented in the classifications and hence transformations were for other reasons unrelated to the household size[97]. Similarly, the age profile of offsprings had no bearing to the adding of space in Buru-Buru estate.

In conclusion, the findings did support the social factors as motivators for transformations of any type in Buru-Buru. This reflected contentment of the provided dwellings for the sizes, age profile and gender variables by the sitting household hold.

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[96] Indeed, the significance of 0.413 (against the preferred 0.05) and lambda measure of strength (0.032 against a figure closer to 1) bear testimony of the weak social correlation between marital status and type 'D' transformations.

[97] The statistical significance of 0.695 and lambda of 0.025 support the position

5.2.2 Economic aspects of transformations in Buru-Buru

In Buru-Buru, variables that had an economic dimension included occupation of the household head (reflecting income), residency status (owned /rented) and mortgage/rental payments. The position was that transformations involve capital investments by the dwellers that are only possible due to a capacity to realise them through their income, savings and /or loans. Another economic dimension was the anticipated returns occasioned by the rental returns and trading within the extended premises. Appendix 17 shows an SPSS output showing a correlation matrix between DUs' type and economic variables.

The majority of the sample was in the middle-income frame[28] through the description of the occupation/profession/educational status. This was what the designers' aspired for with 76% with post-secondary education and a majority (49%) being university educated. They earned regular income as professionals from the public and private sector, the NGO world or business (Table 5-2)[29]. The owner-occupiers were a majority (76%) of the respondents, and had stayed the longest in the estate, with more than ten (10)-year duration stays.

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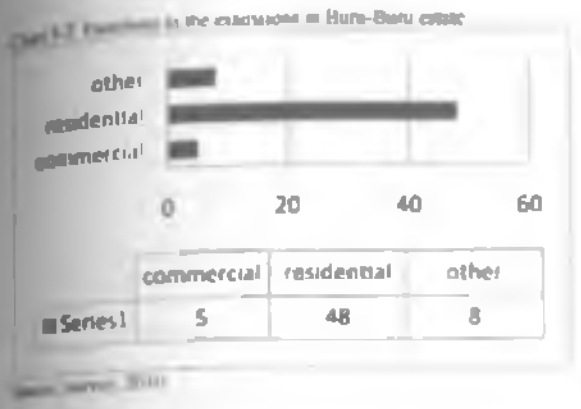
[28] A normal methodological and hence operational difficulty when conducting socio-economic studies in Kenya is the reluctance by many respondents to answer accurately and directly with regards to income levels. To circumvent this profession and occupation were used as measures of income.

[29] An early survey, 2010 of the in Phase 1 and 2 of the estate (Menezes, 1978) indicated that majority households were 'white collar' (euphemism for non-manual and professional jobs) workers. This has seems to have been retained over the last thirty years.



Using the CBS figures of August 2007, the incomes of the sampled dwellers ranged from KES 25,001 to 140,000. Using universal measure acceptable income proportion (25%) devoted to housing one should expect between about KES 8,000 and 35,000 possible spending to housing. This was within the prevailing rents in the estate, shown in Chart 5-3. These figures far supersede the early mortgage repayment schedules reported in phases 1 and 2, where in 1978 (Menezes, 1978) rents ranged from KES 350 to 1,500[10]. Coupled with inflation and the Present Value (PV) of money and the fact that the principal mortgage loans have since been offset in these early phases, it was evident that the more accurate measure of the cost of the dwelling is the prevailing rents.

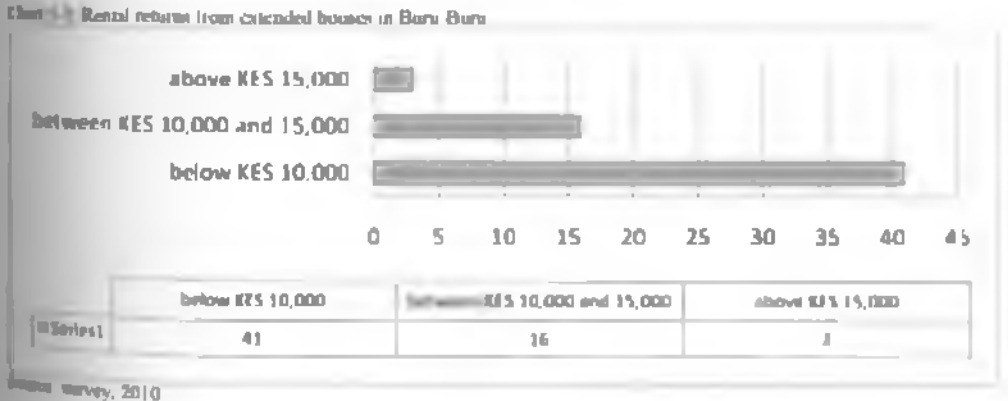
Although owned, the houses were often rented from early in the schemes' inception. A survey of phases 1 and 2 (Menezes, 1978) showed that 45% were tenants. This implied that the economic motive has always been present and that the blossoming of transformations for income only served to entrench it further. Although the sample here showed a higher owner-occupation

[10] These are inappropriate units bearing in mind the Present Value (PV) computations and hence current affordabilities (De Troves, 1990).

percentage (76%), this was additional to the rental accommodation prevalent in the extensions.

Another measure of the economic premium attached to the extensions was the activities undertaken and functions housed in them, shown in Chart 5-2. Though the function in the extensions was predominantly residential, this was to house rent payers in a tenement formation. Since none of the owners were in low-income bracket, it was only possible to correlate the propensity for transformations as driven by the income-supplementing[101] motive.

From observations and responses, residential rents (79%) and commercial uses (13%) were the noted motivators for the extensions. Another significant finding was the majority presence of the owner-occupiers with tenants co-residing on the same plot. It was an indicator that transformations were undertaken predominantly for the economic objective. This was unexpected as



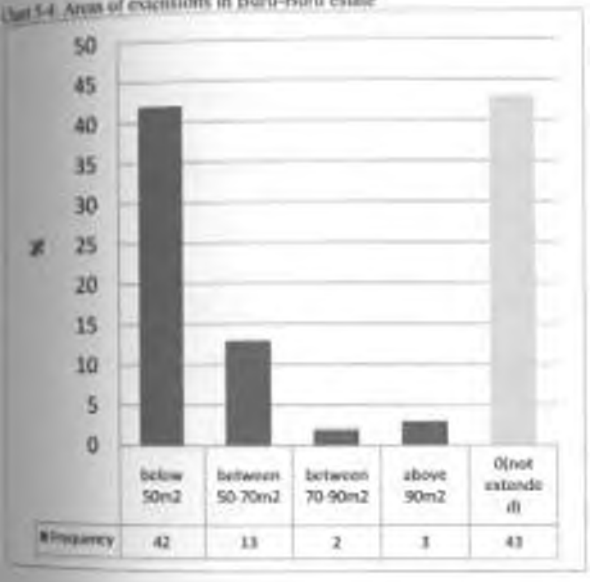
survey, 2010

[101] Other views have rubbished the CBS income classification are unrelated to reality of livelihoods in the country as inflation and other financial/economic measures have reduced the middle-income earners to a lower strata. Thus, the income brackets infer erroneous information with regard to the middle-income, and that the bracket for the low-income ought to be raised to better appreciate the reality of incomes and spending in the country

the middle-income owner-occupiers would have been expected to prioritise their social exclusion higher than the economic benefits. The position was that any social consequences were subject to physical controls and management of the resulting extended space.

In terms of rental returns (Chart 5-2)[168], most rents were below KES 10,000 since the added units were small (suited for studio apartments and bed-sitters). Higher rents of above KES 15,000 were in units above 90 square metres found only in 5% of the cases. As discussed the use of the extensions for the household use was rare[169] and units were exclusively for extra income. Chart 5-4 shows the areas of type 'D' transformations and confirms the higher frequency of the small-sized additions occurring in 40% of the sample.

Chart 5-4: Areas of extensions in Buru-Buru estate

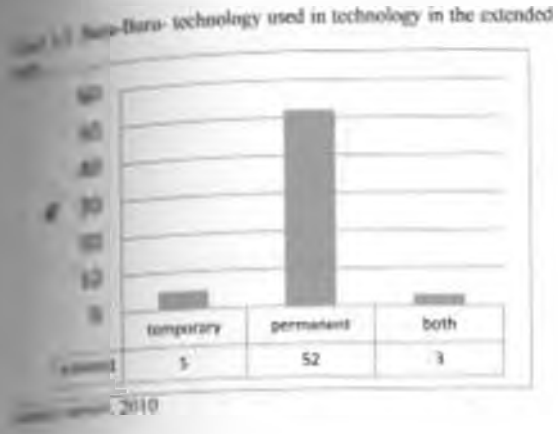


Source: survey, 2010

Another economic factor was the cost of extensions. These added units were predominantly (87%) 'permanent' which implied high capital investment. The cheaper 'temporary' technology extensions were found in 8% of the units

[168] These figures were seen by the respondents as sufficient motivators for the extensions in the estate, although this was obvious given the likely investments in the construction of the extensions

[169] In Menezes' (1978) study the opposite seemed the case, but he qualified it that at that time most respondents were reluctant to reveal the true letting and subletting propensity because it contravened the mortgage agreement. The conditions have changed since all the dwellings' loans in the early phases had been offset



while 5% used both technologies in the extensions. The respondents felt the durable technologies were in character with the established middle-income status the estate was, and that this 'permanence' in the DII would attract appropriate rents. Chart 5-5 shows the percentage distribution of the technologies used in the extensions.

A noteworthy mention here is the use of 'temporary' extensions. Unless used for ancillary function[104], the 'temporary' extensions within the plot were never for residential accommodation. Some 'temporary' extensions located outside the plot on encroached land were used for exclusively for commerce. This reflected the use value of the extensions as well as a clear social statement on DIIs' occupation. The use of this 'temporary' technology in these extensions thus also signified the recognition that these were unsanctioned activities in the spaces meant for infrastructure and in areas of the estate meant to be exclusively residential purpose.

Though no direct economic benefit accrued from households that engaged in other DIIs (A, B&C), one can argue that there was an added use value in these alternatives. For instance, the erection of a boundary wall improved household security, while internal modifications and 'skin'-based

[104] E.g. car garage, domestic animal house and external storage

transformations enhanced the usability, aesthetic and social value of unit. Indeed, the frequency of transformations of type 'A' (edge defining) and 'B' ('skin'-based) was particularly high and respondents pointed out the need to retain a 'quality' dwelling commensurate with their status as the motivator. The argument also applied to type 'C'[108] transformations.

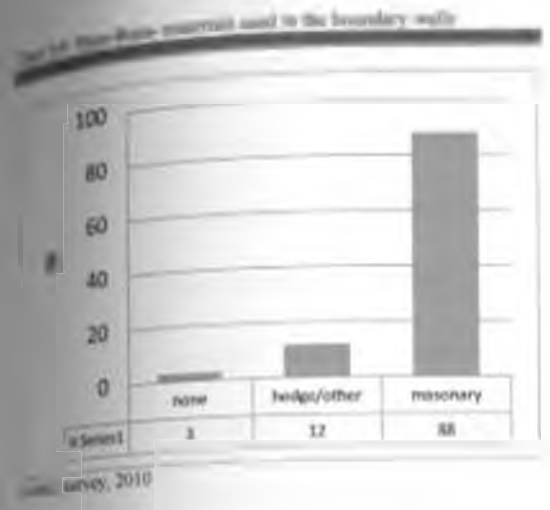
5.2.3 The Physical dimension of DITs

The physical aspects of transformations were essentially about space use manifest physically and its realisation. The four types of transformations were all physical and the investigation here was on the functional adaptations and implications. The same was gauged against the physical planning requirements that governed housing development. The physical disposition (articulation, orientation, and accessibility, in the relationship between the original and the DITs) and therefore the technology used in its composition were also informative concerning the quality of transformations.

From Chart 5-1, types 'B', 'A', 'D' and 'C' were so ordered in terms of frequency, but this was also the order of the dwellers' transformation priorities. This section explains the reasons for this order.

It was evident that all (100%) units engaged in internal 'skin'-based modifications, type 'B', and it reflected the need to personalize the use of the unit. This involved personalisation of the unit through finishing, decorating, and basic repairs and maintenance as well as, security measures like metal

[108] It is felt that this frequency was probably higher as privacy and security concerns restricted DIT access.



burglar proofing of openings. These physical measures served utilitarian roles as much as the social ones and thus, enhanced the functionality of the house.

The next priority (97%) transformation was the territory-defining type, type 'A', which engaged in the erection of boundary edge elements (boundary walling and gates). A perfunctory view of Buru-Buru from afar gave the impression that the overt transformations image in Buru-Buru was the boundary walling using masonry walls, and thereby creating an image of walled and 'gated' compounds. Indeed, of these edge definitions, 85% had erected masonry (Chart 5-6), as opposed to 'softer' versions of hedges and other materials. Noteworthy is fact that the 'soft' options (i.e. bamboo with cypress or kei-apple shrub hedge), were part of the original design. The 'none' boundary elements reflected a neglected boundary condition, and this was rare. The edge definitions were but the dwellers desire to illustrate the extent of their territorial control; largely a social connotation. The 'walled' and 'gated' compunds created an unelcome aesthetic effect to many observers.

Type 'C" transformations which involved internal modifications, was more evenly spread amongst the sample with non-transformers accounting for 47%. This was an affirmation for the provided designs. Indeed, the half who undertook such changes did so mainly as an aspect of personlisation and not as

wholesome changes[186]. Thus, the conceptual position by the architects of a middle-income nuclear family accommodation was realised through this affirmative verdict by the dwellers.

However, a few engaged in more substantive transformations; Type 'D', that involved additional space outside the provided plinth. The 59% who engaged in these additions bore evidence that all was not well, and that there was need for space whose use was outside the nulear family of the owner-occupier household.

Chart 5-4 illustrated the sizes of the extensions, and these were mainly units added beside and independent of the original house. These were however used predominantly (79%) for rental dwellings, which pointed utilisation of the unit by owner household as also important. The added area was close in magnitude to the area of the provided DU with a majority of added units being single bed roomed with area of below (50 m^2). This compared in scale to the provided DU types in magnitude, where the smallest unit (Type 3-1), a two-bed roomed bungalow unit was forty-nine (49m^2) and the largest was eighty-eight square metres (88m^2) in area. Seemingly, the transformers preferred additional space that did not physically dwarf the original DUs.

In general, the trends indicated the physical qualities in transformations entailed personalisation of the provided DU for householders' use that included their privacy, aesthetic appeal, and security. This was succeeded by

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[186] For instance in one case a kitchen porch was incorporated into the kitchen. This only affirmed the need for a bigger cooking area inside the DU rather than disapproval of an external kitchen per se.

modifications for tertiary functions like income generation from the added DIT unit. These however respected a social evaluative frame of the middle-income dwellership in the estate.

In the next sections, the nature of physical formation was possible only using the type 'D' transformations (extensions). This was so since they were the most overt and attracted attention in the discussion of DITs by professionals and policy makers alike. This choice was deliberate and was also guided by the fact that from the frequencies, extensions were the least frequent which meant discernible considerations might be at play in their emergence. The investigation was to isolate these factors and develop models for policies[87]. The investigation in these sections used the physical scales of the estate, UDE and DU.

5.3 Estate level DIT characteristics

The sample was used to assess the contribution of the estate's physical characteristics on the emerging transformations. Central to the estate considerations was the circulations paths as guided by the hierarchy of street formation from the spine road (Mumias Road) down to the smallest level of the footpaths. In the networks, the nodal points form avenues for different types of transformation that were also broached. Similarly, the edge-defining circulation paths like Jogoo Highway were surveyed for their influence to the

[87] However, the other transformation types ('A', 'B' and 'C') remained significant as they qualified as desirable and enhancements to the [illegible]. Indeed, the lessons from these transformations types were to form part of the recommendations in line with condonable violations that authorities should delete from development prohibitions, as they were inevitable and, in any case, they enhanced the utility of the dwellings. They thus promoted desirable and convivial neighbourhoods; the objective of housing development.

phenomenon. At estate level, the cluster was investigated for its contribution to the global estate DITs' propensity.

The factors that constitute the discussion at the estate level include the location in relation to the circulation paths, edges and nodal points within the estate. The physical location of the extension related to the function it housed and also the relationship (social or economic) to the owner-occupied DU. Within this physical aspects extension's physical detachment and accessibility were factors that influenced the locational choices and uses. Similarly, the orientation and proximity to the circulation arteries of the varied scales in the estate were added physical variables to DITs' nature, type, and magnitude. Another variable found useful in the investigation was the typologies and technologies of the resultants. Appendices 18, 19, 20, and 21 are SPSS outputs relating physical factors to the DITs' type and apply in this section.

5.3.1 Paths and location of extension

The main mode access to the estate was mainly vehicular, using individual or public transport. The spine road, Mumias South Road, was the main entry into the estate. On it were lay-byes used for public motorised transport. Pedestrian paths flanked the carriageway of the spine road. It also had some natural landscape features like trees, shrubs and other vegetation. In the road reserve were infrastructural services including water, sewerage, and electric power lines.

It was a two-way tarmac paved 25-metre wide road reserve. The intra-estate streets linking the clusters measured in width between 10 and 15 metres.

Pedestrian paths meant to be used to link clusters were unpaved pathways and measured between 3 and 5 metres. Other linkages occasionally used as paths were three-metre way-leaves located between plots.

The circulation artery that attracted type 'D' DUIs was the spine, where 76% were located. Figure 5-2 illustrates this emerging character. Those fronting the estate roads were 14%, and fewer fronted the cluster courts (10%). Correlation measures[104] support the position that location along the major streets was more amenable to type 'D' extensions. Another determinant to the location was the commercial-use propensity the extension was likely to attract.

This in turn influenced the activities accommodated within the extension. The functions within extensions included the purely (1) residential, (2) commercial and (3) 'other', shown in Chart 5-3. The sample had most (79%) extensions used for residential purpose. The 'other' (13%) uses were common functions mainly of a social nature. Of these, rented residential-use extensions fronted and were accessed mainly from the spine (89%) or intra-estate (50%) roads. The respondents felt this accorded the renters more privacy

5-2: View from commercial centre fronting the spine road into
ellings
survey, 2010

[104] With a significance of 0.011 a Pearson's correlation coefficient of 0.332 (App.29)

away from the owner-occupied main DU. Appendix 21 shows the relationship to the spine, court and estate streets and the activity in extension. The court oriented DUs used for residential purpose, were mainly for the householder's exclusive use.

This trend marked an emergent tradition whereby renters were kept away from the more private court that owner-occupiers preferred as their domain. This illustrates the value of the social dimension with regard to the physical articulation of the extensions used for incomes for the owners. Thus, the preliminary supposition from this finding was that the physical factor of location directed the type and use of the extension.

The spine road, planned to site the major commercial functions, also lent itself to dweller-initiated extensions serving parallel commercial and public functions. Indeed, houses fronting the spine had been extended to create more commercial space in parallel and echoing the central focus on the designated commercial nodes along the spine. These were linear chain of commercial space along the spine, included kiosks for food, petty trade, and light manufacturing of furniture and car repairs. In addition, worthy of note was that these were located both on the road reserve space and within the on-plot on building setbacks. The same trend was common along the minor circulation paths, albeit at a diminished scale. Respondents however took exception to this trend given the proximity of other similar functions within the designated commercial nodes.

With regard to the 'other', mainly social functions (e.g. kindergartens, health clinics, and dispensaries) were similarly strategically located fronting the catchment areas within the estate with majority (57%) fronting the estate roads. The diminished location along the spine (29%) seemed to show a definite priority list by the dwellers. This order implied accommodation of social-use functions in closer proximity to their dwelling spaces at exclusion of the purely trade-based usage. Further, other than the spine road, the next level of circulation the estate street roads similarly attracted extensions of a lower magnitude (24%), and with a bias towards residential use. The logic must relate to the 'middle' income bases of the estate and the desire for privacy and security of the owners of the DUs. Indeed, this seemed to imply that a genial and original aura prevailed within the core of the estate and hence the cluster spaces.

The commercial extensions fronting the spine had several dimensions regarding their physical form and orientation. Naturally, unlike the residential DITs and aiming to capture a pedestrian market for their wares and services, the orientation of these commercial ones was outward, with major openings placed street-wards. It was apparent that having established that the predominant motive for extensions was economic, the physical location served to confirm this trend. The circulation paths acted as foci for transformations supporting this economic tendency.

Unlike the DITs' focus on the major circulation paths, the minor arteries had a contradictory result. Instead of being the focus of extensions, the pedestrian

paths, meant to be cluster links and to shorten circulation lengths, were mostly closed, unused, and taken over by the plots abutting them. Such appropriated spaces were used for additional space for largely ancillary functions. These included uses like storage and garage sheds, as well as cultivation. It suffices to state that they were ill-placed with regard to the clear circulation hierarchy that had been established from the spine road down to the estate streets. With the service way leaves, footpaths did not relate to the hierarchical order of the circulation paths. Although they served to shorten distances between clusters, this compromised the hierarchical privacy and exclusivity gradient established by the paths' network, leading their irrelevance.

Appendix 21, an SPSS Cross-tabulation Matrix between the street orientation and the activity in the extension confirms the positions and descriptions made. It shows the location of the extension in relation to the spine, estate street and in relation to the court. Most (76%) extensions were oriented towards the spine road. Of these, 95% were for income-generation as rental accommodation or business premises.

Thus the physical factors of location within the circulation paths calibrated to inform the type and nature of extensions. Central to the choices was the need to balance between economic expediency and social privacy and exclusivity of the middle-income dwellers of the estate.

5.3.2 Articulation of extension

As already stated the propensity in the estate was economic, with extensions used predominantly for extra income. However, because of the genesis of the

estate as a middle-income neighbourhood, there was need to retain the social exclusivity and privacy, realised through the articulation strategies. These articulation strategies also covered aspects of orientation and location of the entrances in relation to the public streets, the semi-private inner courts, and the more private dwelling units. It was also about the independence of the extension. Appendix 20 is an SPSS cross-tabulation output between the extension's physical independence from the original unit.

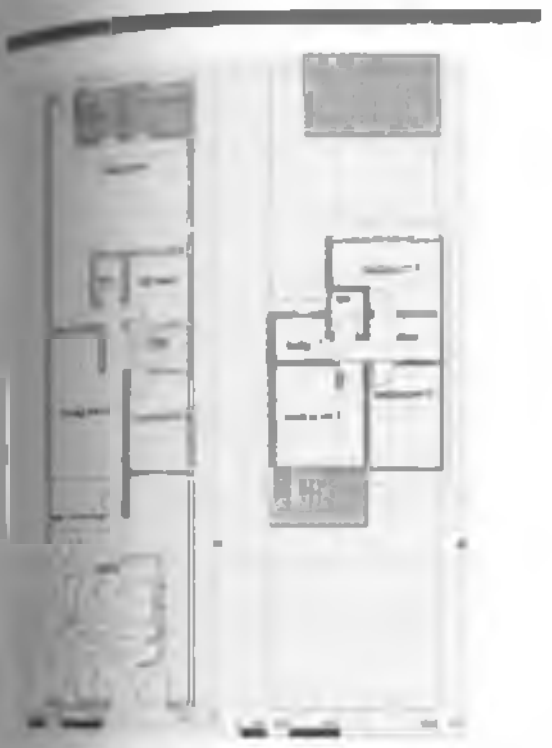

Figure 5-3: First and 2nd floor Storeyed with independent bungaloid unit Type 4.2 in Sector SG
Source: survey, 2010

Figure 5-4: 3D projection of type 4.2 in SG
Source: survey, 2010

The majority of the added units were articulated independently both physically and functionally away from the original DU. This fell within the 'addition' transformation and 'add beside' category by Oxman *etal.*, (1985). Thus, for instance access to them was often independent, either directly (14%) or but through the main gate (57%) but rarely through the main house (13%). The fact that a significant number had to pass through the

gate implied a desire by the owner-occupier to monitor the use of the added space.

Physically the added units were mainly (77%) detached demonstrating the desire for a unit that functioned autonomously (Figs. 5-3 and 5-4). Thus, the added units were to fulfil economic value to the owner-occupier without their ceding territorial control over the plot and privacy within their owner-occupied houses. The residential extensions along the spine road were accessed, not from the spine, but from inner streets. The respondents said that this was ostensibly for security and privacy reasons[98].

Of attached DIT units, 60% were used exclusively for the householder residential purposes. This contrasted with the detached additions (87%) which were used exclusively by tenants. The commercial units which were attached to the main house (40%) housed home-based enterprises (HBEs) operated by a member of the household. The 'part independent' category that was observed in 7% of the cases was simply a case of more than one unit developed with one free of the structure of the main house while the other was attached. Appendix 20 applies.

From the findings, the DITs' articulation was physically realised to fulfil deeply understood dweller functional needs of fulfilling economic objectives without compromising social ones of privacy and exclusivity of class of the

[98] Where accesses from the spine were possible, they were often locked (or even blocked!) for most times of the day.

owner-occupied dwellership. This articulation was also in the form of the emerging typologies and the technology employed in the products.

5.3.3 Typology of type 'D' DITs

The added units were mostly detached and most (59%) were singular and functioned independently. Table 5-3 shows the distribution of the types, classified as single (1) 59%, double (2) 33%, triple (3) 3% and more (+3) 5%. Another typological feature was the number of storeys, and the majority (65%) of the added units were bungaloid. The multi-storeyed were in 35% of the units, and were of multiple tenancy. This meant number of storeys was purely to add more economic independent entities rather than spatial quality enhancement. The bungaloid typology was the preferred extension type appearing in 64% of the all the overall observations. This was regardless of the original typology. The reason advanced by the respondents was the prohibitive cost implications of going above the ground floor, a purely economic decision.

However, the important finding was not the unit typology but the 'plotted' typology as the lead contributor to frequency and type of extensions described. The individuated 'plot' concept was the singular physical strategy that promoted the nature and magnitude of the extensions. This was ostensibly because it accorded territorial control and autonomy to the individual dweller. This also promoted investment in the quality of the additional space in Buru-Buru. Indeed,

Table 5-3: Frequency of independent units in the extensions

	One	two	three	More than three
Frequency	36	20	2	3
Percentage	59%	33%	3%	5%

Source: Author, 2010

Figure 5-5: Extensions along Mumias South Rd showing temporary encroachments and permanent surveyed types
Source: survey, 2010

Table 5-4: technology in the categories

	permanent	temporary	both
Frequency	52	9	3
Percentage	84%	15%	1%

Source: survey, 2010

the additions were plot accentuated and not based on the provided DU typology. This was related to the provisions of ownership and territorial extent of the 'plotted' typology.

The plot therefore was an avenue to undertake transformations that were independent physically and functionally in order to address the social and economic ambivalence prevailing in Buru-Buru. The ambivalence prevailed because the middle-income objective implied social exclusivity that was however meant to be moderated by the propensity for commercial and rental user extensions, which invited intrusion, by others. The plot formation came in handy in addressing this obvious conflict. Figure 5-5 is a photograph along Mumias South Road and shows the emerging streetscape of the extensions.

5.3.4 Technology in DITs

The key variable in articulating DITs' technology was the durability of the materials used, that approximated to the concepts of 'permanent' or

'temporary' technology[18]. It was a position about the confidence the dweller had in the investment in the extensions. The position for the distinction in the present study was that 'temporary' technologies largely demountable types that can easily be moved or demolished with minimized losses. This choice of technology was however telling with regard to the legality or legitimacy of the dwellers' actions. In Buru-Buru, this stance guided the location and function accommodated in the extensions. Table 5-4 shows the frequency of the alternative technologies in the sample. Figure 5-5 illustrates distinction between the 'temporary' and 'permanent' technologies as used along Mumias South Road.

Across the estate 'permanent' technology prevailed in the 'extensions', with 84% erected purely from masonry. This was a statement of the preferred aesthetic of middle-income social grouping in Buru-Buru. This was about the preferred image already discussed, as well as the dwellers' economic status and hence affordability of the more costly 'permanent' constructions.

A key indicator was the location of the 'temporary' extensions. In this connection it was noted that extensions located within the plot were largely from durable materials, particularly if they did not serve for an ancillary function. On the other hand those that encroached on the road reserve were makeshift and always of a 'temporary' nature. They included canvas awnings that formed the canopies, exclusively used for trade. Walling for such would be

[18] Appendix 25 details the features of these technologies. The distinction is however arbitrary and even subjective, especially for a domestic building whose layout may only last a maximum of a generation. According to Hamal (1994, p. 13), only 'exceptionally quiet homes might wait 30years' for change to occur, meaning transformation is more frequent space layouts.

from timber off-cuts and/or mabati sheeting. Though rare (8%), this marked a stance by the dweller of their legitimacy role despite their illegal genesis. It was thus felt by the unilateral dweller-developers that there was need for distinction of 'temporary' technology for the illegal extension in the commercial kiosk built on encroached road reserve.

This finding contrasts somewhat with the 'permanent' DITs within the plots. Even though they were on owned land, they still contravened the building line (BL) setback reserved for dwellings fronting circulation paths. This use of durable technology signified the secure tenure, the mortgage ownership system entailed. Yet despite the ownership, the setting within the urban area implied adherence to development control stipulations of building setback (BL), Plot Coverage (PC) and Plot Ratio (PR), that hardly guaranteed absolute rights. Though erroneous, to the dwellers, the ownership deed signified exclusive rights to manage the on-plot space.

The technology used in the DITs was therefore largely a statement of the dwellers' perception of levels of legitimacy and legality of their acts. Developments on encroached land were thus always 'temporary' and thus reflected the illegality of the act and thus anticipation of demolitions by the authorities at short notice.

This use of cheaper technology implied caution to minimise economic loses in the demolition eventuality. Another dimension was the activities within the illegal 'temporary' additions, which was invariably commercial. It also implied an unsanctioned activity in the residential estate.

Thus, the choice of technology signified differing standpoints. Technology as 'temporary' meant illegal pending legitimatisation, while 'permanent' technology meant legitimate pending legalisation. Findings from the estate and sample already reported form the basis for further discussion at the UDE and DU scales in remainder of the chapter.

5.4 The UDE level DIT characteristics

The physical layout in Buru-Buru used hierarchical DU groupings as an organising strategy. Thus, it commenced with the global Estate level, the Phases (I to V), the Sectors (SG, SF, SB and SC) and down to the smallest the UDE clusters. The phases were time-based, as well as spatial and conceptual improvements in the DU typology.

The 'sector' categorization was not obvious, but the main characteristic was the slicing by the spine through the affected phases. For instance, Sectors SG and SF emerged from the two wings in Phase V separated by Mumias South Rd. the same applied to Phase II in the case of Sectors SB and SC. Figure 5-6 shows the grouping strategy in Buru-Buru.

Otherwise, the most significant UDE in Buru-Buru was the clusters defined by various Dwelling Units located on plots, surrounding a *cu-de-sac*[11] and a landscaped courtyard. The physically introverted nucleic organisation created a housing community at a manageable scale for consensus on common issues desirable and needed in urban settlements.

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[11] Similar to Unwin's (1902) 'close' in the designs of Welwyn Garden City

Indeed, the enclosed courts served for common car parking[112], occasional cluster meetings, recreation, and children's play. The clusters also accorded the dwellers an opportunity for common security and social control. The investigation was on the cases of Mchwa, Thura, and Lesitima Cluster Courts, preceded by Phase IV and Sector SG descriptions.

5.4.1 Phase IV Characteristics

The case of Phase IV is typical of the phases in the estate. It was composed of twenty clusters. The number of units in each cluster range from about 22 to more than 65 plots. The average number of cluster units is 40. The mean dimension was 50 metres. The court ranged in area from 450 to about 5000 square metres. The most frequent magnitude of the clusters courts was 1250 square metres.

The description tabulated in Appendix 26 relies on the Working Drawings from the architects, and shows cluster named alphabetically. On the ground, the dwellers have adopted Kenyan and other names[113] to identify the same. Though the areas of the courts are similar in dimensions and area to Kaloleni, a few significant conceptual differences defined their utilization and ultimately their propensity for DITs different from Kaloleni.

The most significant was the hierarchical structure in relation to the circulation paths and other useable space in and outside the DUs. These

[112] In addition, each DU had an on-plot space for a single car. Elsewhere in the estate, parking was available in the commercial and social spaces, like the Shopping Centre, recreational space, worship, administrative, health and educational buildings.

[113] Those in the sample were: Mugumo, Mpera, Mogllia, Mnazi, Mchwa, Makuruu, Korokoro, Khanga, [illegible] Bamboo, Lesitima, Thura, and Avocado.

defined the private and public domains more concretely with a view of making the estate more conducive to the middle-income target dwellership.

With the DUs defined as private, the front-and back-yards on each aimed for semi-private spaces. These were used various for car garages, gardening and landscaping features and domestic animals; all uses and realms of the household's privacy. Figure 5-6 is a graphical illustration of the hierarchy within the cluster.

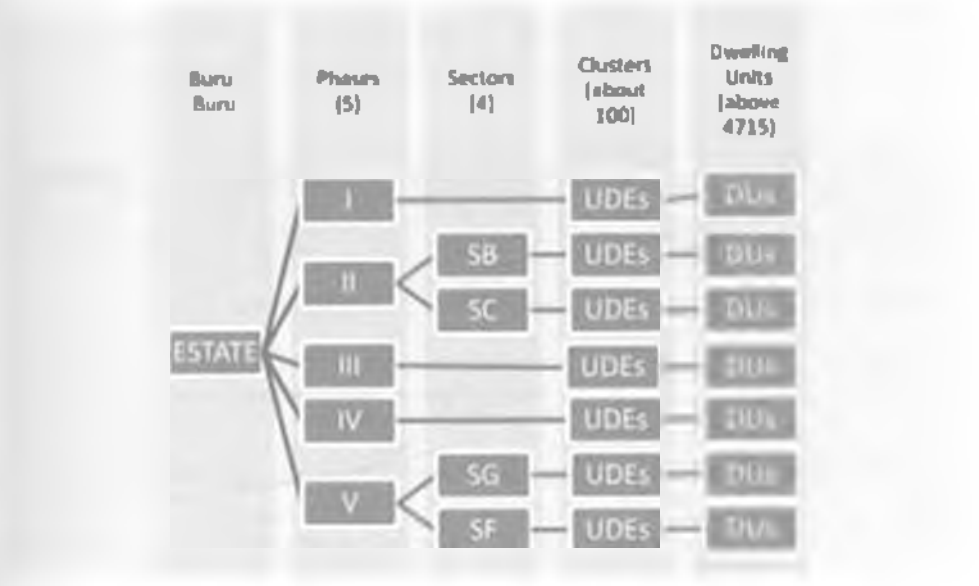


Figure 5-6 Hierarchy of the DU groupings in Buru Buru
Source: survey, 2010

Other transitional space elements included front entrance verandah and rear kitchen porch that transited to the yards. The next level was the semi-public cluster court; used for common cluster activities. All houses fronted the landscaped courtyards that also served and was accessible for communal car parking as well as other social activities; all clearly defined uses. This was

unlike Kaloleni where the open spaces were inaccessible save for the pedestrian commuters.

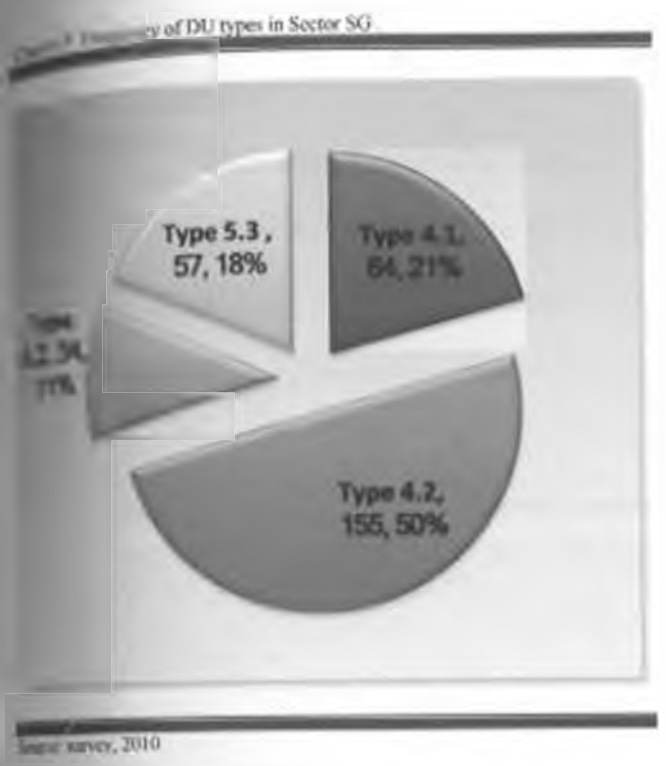
Beyond the cluster was the controlled public domain of the inter-cluster circulation paths. Similar to Kaloleni, the inter-cluster roads mainly assumed curvilinear forms that served to slow down vehicles and conducive for pedestrians. The most public space in the estate was the spine road which accommodated the most accessible land uses including the commercial and public social spaces. These descriptions are graphically illustrated in Figure 5-7 below.

Figure 5-7 Hierarchies of public/private space in Ihuru Ihuru
Source: survey, 2010

Like Kaloleni however, the pedestrian paths broke away from this clear hierarchy and interspersed the clusters as short-cut accesses. The other conceptual difference was the definition of private territory in the plotted formation as will be further elaborated at the DU level. The DUs were also bigger and better designed, with prerequisite privacy gradients, to suit families.

5.4.2 Sector SG Characteristics

Sector SG in Phase 5 (V) was composed of three hundred and ten (310) units it represented a mixture of the unit typologies represented as maisonettes and bungalows distributed as shown in Appendix 28, the working drawing



layout. The layout shows the hierarchic spatial organisation and meandering street networks. It had seven cluster groupings.

The number of units/plots in the clusters ranged from twenty-nine (29) to eighty (80). The logic for the disparity was not obvious, but as this formation was socially constructed i.e. after the design in the occupation period, it likely that was through mutual consent and agreements amongst the dwellers.

Each court had between four (4) and nineteen (19) bungaloid DUs, but the largest typologies were the maisonettes that varied from 21 to 75 per cluster, in numbers. The four DU types in the sector, were Types 5-3, 5-2, 4-1, and 4-2, shown in Chart 5-7. The courtyards also varied in dimensions and areas. The minimum widths were 20 metres, while the maximum was 91 metre. The areas averaged about 2,500 square metres the maximum was 3,500 m^2. The minimum court area was about 1000m2. The mean per capita access to the court was about fifty square metres ($50m^2$). This choice to accord this small

courtyard space recognised the private open space on each plot as a front and back yards.

Typical of the entire Buru-Buru, a conscious strategy in the design of the courts was the location of the DU access roads around the green courts. This shielded this common space from an ambiguous relationship to the units, rendering unilateral appropriation impossible.

[illegible] Aerial photo of transformed [illegible] Court
[illegible] 2010

5.4.3 Case UDF 1- Mchwa Court

Mchwa Court[14] (Fig. 5-8) had two courtyards and accommodated sixty-eight (68) units. These units varied in type, size, and the plot sizes they sited had differing physical characteristics. Of the Dwelling Units in the cluster, nineteen (19) of the units were bungaloid of Type 4.1 that were sited on the wider plots dimensioned nine (9) by twenty-one (21) metres. The rest of plots were narrower, of five (5) or six (6) metre widths and longer of up to twenty-four (24) metres. Table 5-7 shows the distribution of the types within the cluster, as well as the frequency distribution of extensions.

Of the two courts, the smaller courtyard was nearly one thousand-five hundred (1,500) square metres in area, and had twenty-four (24) units directly fronting it. The rest of the units (44) fronted the larger yard that was nearly two thousand (2,000) square metres. Thirty common parking lots were located outside of the plots in the courts. Three (3) to five (5) metre-wide tarmac roads separated a green space within the courtyards from the dwelling units.

A steel gate and timber guardhouse, managed by the cluster Residents' Association (RA) was the first physical evidence of transformation in Mchwa court. Nearly half (47%) of the units within the cluster had Type 'D' transformations. These were used either for pure commercial or rental purpose, but never for the household social use (Chart 5-8). The lesson was that the unit types provided by the architects' matched the dweller-household functional needs.

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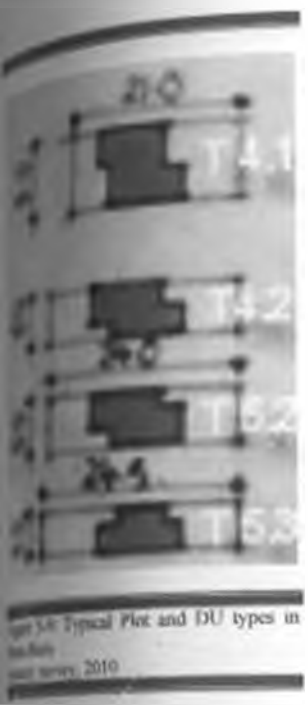
[14] Appendix 33 is a study sketch based on the working drawings of Mchwa Court, highlighted in Appendix 36.

It affirmed the allusion that extensions were largely for economic ends, i.e. added incomes for the dwellers. This had the result of prioritisation of the spatial needs of the dwellers in terms of the frequency and cost of implementation. Thus, the dwellers first attended to 'personalisation' transformation types, captured mainly in Types A, B and C to realise and re-affirm their middle-income social status. Of course, another factor was the investment outlay that these types entailed, which made them easier to undertake than the extensions.

Chart 5-8 shows the distribution of the extensions based on the house types and the uses within the extensions. Locationally, the bungalow units (Type 4.1) were all located away from the edges of cluster and directly fronted the courts, and of these 37%, had added an extra unit. The largest DU was four dwelling units, two bedrooms each, located on a wide (18 by 24 metres) corner plot. It was on two levels and was accessed directly from the main compound. The smallest added space was the singular kiosk (about 10 square metres) located at the front of the inner plots. Location was the major determinants of nature, scale, and use of extensions. Figure 5-9, illustrates the layout of the DUs on the plot types, while Table 5-5 shows the plot sizes on which the DUs were placed.



Typical Plot and DU types in
survey, 2010

Indeed, in the cluster, the propensity for transformation and its functional type were influenced by the location in relation to the streets and the court rather than the unit types or plot sizes. For instance although Types 4.2, 5.2 and 5.3 were all maisonettes and were sited on narrower plots, none of these seems to have deterred the propensity for transformations. Although, Type 4-2 attracted most (68%) transformations, this was because of the location along the estate streets, and not because the unit type and plot size.

On the other hand, Types 5.2 and 5.3 were located at the estate edge, Jogoo Highway, and thus attracted fewer extensions. This was because the highway was edge-defining feature, the extent of the estate, and therefore the need for shielding from the adjacent districts. Where some extensions were possible, they had an inward orientation away from the exterior of the estate (Fig. 5-11).

Indeed, the few that had windows on these walls or the extensions that occurred on the edge were permanently locked or altogether barricaded Additionally, all units on this edge used the plot for on-plot planting of trees

DU types and transformation types in Mchwa Court

Unit Type	Frequency	Plot size	Description	No. of bedrooms	Extensions	% extended
4.1	19	9 by 21m.	Bungalow	3	7	37%
4.2	28	6 by 24m.	Maisonette	3	19	68%
5.2	8	6 by 24.5m.	Maisonette	4	3	38%
5.3	13	5 by 24.5m.	Maisonette	4	3	23%
TOTAL	68				32	47%

survey, 2010

cultivation and of food crops like bananas and maize. Vertical transformation, multi-storeyed units, occurred on the outer edges- the estate roads, and edge circulation paths (Figs. 5-10 and 5-12).

The function accommodated in this court, deep in relation to Mumias South road, was mostly residential, ostensibly because of the limited pedestrian and vehicular traffic. However, some kiosks within courts were defined using 'permanent' technology (Fig.5-11). This further confirmed that the physical dimension that guided DFI's in the estate was the location and street frontage. It was also about social value attached to the building form within the middle-income neighbourhood. DFI's responded to this through functional type, technology, and orientation, which ultimately influenced the DFI's type within Mchwa UDE.

The green courts and interior common open space remained unaffected by encroachment and disuse (Fig.5-12) as result of a strong communal spirit through the cluster Residents' Association (RA). Car parking for mainly visitors and children's play were the uses

found in the courtyard. Evidence of greenery within the plots was through trees and other cultivated vegetation and food crops.

The two pedestrian pathways, one to a neighbouring cluster and another to Jogoo Road, had all been closed and long been taken over by the immediate house owners, creating a secluded 'gated' cluster

Dwellers within the cluster confronted transformations with a tacit appreciation of this condition of security, privacy, and social exclusivity of the dwellership. Indeed, all these units had added a 2-metre boundary wall with broken bottle coping, ostensibly to keep off intruders. Another social dimension to the transformations was through the largely residential activities within the cluster courts.

The economic dimension in the cluster, as indeed in the rest of the estate was based on the cost of the extension as all the other transformation types were classified as basic to the Buru-Buru dwellership of middle-income dwellers. Thus Type 'A' modifications that were used to define the territory of the dweller was in line with the plot formation and therefore an effort secure and retain it in the plot defining elements, observed in all the cluster units. . This was also the case with internal 'skin'-based and decorative modifications (type 'B') as this was necessary to retain the class and quality of the unit for a relatively affluent household.

Type 'C' modifications often remained unrecorded but were covertly undertaken. These involved personalized[115] actions within the unit and even if the actions contravened any building regulations were nearly impossible to enforce by any authority[116]. From an economic perspective, one can assert that these were within the middle-income affordability and hardly swayed budgetary priorities at the household budget level. One can however add that the drive to investment in non-extension type of transformations had a much a social dimension as was the physical conditions and economic benefits they accrued.

All DITs witnessed in the cluster thus primarily aimed at keeping up with the class expectations, within the profit drive and occasioned by the physical locational factors. The few court additions were one storeyed and only two (2) of them were used as commercial kiosks erected from durable materials. A delicate balance between costs and returns must have been realised through the choice between permanent and bungaloid developments as opposed to multistoreyed alternatives. The additions amounted to small tenement[117] additions suited for a small household dwellership.

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[115] In *Responsive Environments – A Manual for Designers*, Bentley etal. (2005, p. 99), believe users will personalise their existing environments to achieve spaces that bear a stamp of their 'tastes and values' They do this to improve practical use of facilities ('remedial') and to change the image of the place ('affirmative')

[116] This compounded by the reluctance by most respondents to allow questions leading such details as this (mainly on household safety and security)

[117] Defined as 'portion of a house tenanted as a separate dwelling' (Award Publications Ltd., 1975), however, tenement homes are mainly associated with poorer neighbourhoods in Western cities (Hackenmeyer, 2006) In Nairobi other lower income dwelling forms exist (Hackenmeyer, 2006) in the informal settlements.

From the survey, rents for these single-room, studio (bed-sitter),single and two-bedroomed extensions ranged from 4,500 to 15,000 (KES). This supplemantary income to the middle-income dwellers in the cluster and Buru-Buru estate as a whole, was sufficient incentive for the extensions. The cost of the permanent extensions was however high, and these rental returns did seem justified in the short term. Table 5-6 shows the surveyed mean average rents from differently sized extensions and the computed costs[18] of their construction within the estate.

5.4.4 Case UDE 2: Thura Court

The cluster was located in Phase 4 (IV) and partially fronted the spine road. The access was from a feeder immediately joining Mumias road. It had 39 plots distributed between maisonette (types 4.2 and 5.2) and bungalow (type 4.1) types. The yard measured forty-five (45) by fifty-five (55) metres- seemed

Table 5-6 [illegible]

	single room	bed-sitter	1-bedroom	2-bedroom
[illegible]	15	20	35	45
Cost of extension (KES)	900,000	[illegible]	700,000	900,000
Mean rent (KES)	4,750	[illegible]	11,000	15,286

Source: survey 2010

well scaled for the number of units abutting it. Circulation paths included the spine road formed the edge to the court and the feeder road.

The feeder road reserve was between fifteen (15) and twenty-to and a half (22.5) metre at widest. Because of the non-rigid and rather organic layout

[18] This used an average cost per square metre of KES 20,000 for the period prior to the survey when the units were implemented.

design, common within the entire Buru-Buru scheme, the circulation road reserves never assumed uniform dimension. Within Thura Court, the paved road was four (4) metres but the reserve for the same varied from seven (7) to fourteen (14) metres. Appendix 23 shows a field sketches and notes of Thura Court used in the investigation.

A metal gate to the court had been introduced and signboard had been erected signalling the entrance to the court. This was the first transformation at court level that one encountered on entering the court form the only remaining entrance, the vehicular access road. All pedestrian accesses were all blocked from public use, and this was ostensibly for security and social reasons.

Indeed, no internally oriented (to the courtyard) extensions was observed, and retaining the residential character to the court space. Extensions were located on the feeder road fronting the cluster and the spine road. This was due to the pedestrian nature of the feeder road, and aimed to capture trade potential of along these roads and the spine road. Off-plot extensions observed at the junction between the feeder road and Mumias South road (Fig. 5-13), were exclusively used for commercial purpose. This junction had become a commercial node by evidence of these kiosks. They were as kiosks for petty trade including food and grocery. These off-plot developments encroached on road reserves and were from 'temporary' materials.

On the other hand the courtyard had remained intact, unaffected by extensions and had retained the original greenery including shrubs, grass and

trees. Indeed, other than the cluster signpost one could discern no intrusions into the original green open space.

Extensions were evident in 38% of the units. The bungalows (type 4-1) had more extensions, and this was attributed to the fact that they were located along the streets and also had wider plots. Another observation was that these extensions all occurred on the exterior of the cluster and fronted the circulation paths. They also outward-oriented qualified by the access directly from these paths.

The use of the extensions also brought more light to the phenomenon of extensions further. Exclusively on the spine road, the typology developed combined residential and commercial uses through the storeyed mixed-urban typology that emerged. Erected on two levels, the ground floor served commercial purposes, while the upper levels were residential in this typology.

As in Mchwa Court, the attitude towards DITs reflected the social, economic, and physical objectives of the dwellers in several ways. The social dimension was manifest in the exclusivity and of cluster introverted dwellings. This was as reflected in their access through exclusively the courtyard roads. The presence of a human guard and the gate at the entrance were physical barriers to offer security to the court residents, but also reinforced the social

exclusivity of Thura Court. This stance excluded non-owners, the sub-tenants resident in the extensions, from being part of the cluster.

On the other hand, all extensions were extroverted and thus were accessed from the streets and as opposed to the court-ward inclined owner-occupied DUs. Their use always had a commercial and public element, which furthered the physical extroversion and external orientation.

5.4.5 Case UDE 3: Lesitima Court

Located in Phase 2, Lesitima court was composed by two courtyards that were symmetrically positioned. The court was composed of 35 dwelling units. The access road on which the security gate was located formed the axis that dissected the two bi-polar courts. Modestly dimensioned, the two courts were on average of thirty (30) metres width and forty-five (45) metres lengthwise. They were largely grass islands that also accommodated public car parking space for up four cars each. The plots were five (5) to seven (7) metres in width while the lengths were up to twenty-four and half (24.5) metres.

Of the 35 units, 17% had type D transformations, with both residential use (50%) and commercial use (50%) additions. These were developed independent of the main units, as 'add-beside' units. Mainly (83%) from masonry walling and tiled roofing, these additions were located at the front and back of the units. The commercial ones were in front in this inner court and were based on the ground floor only, while the other were storeyed and at the back.

The frontal additions fronted the cluster roads for ease of access by pedestrians for basic commercial services like grocery. One of these commercial use additions was a hair salon frequented by estate dwellers. The rear transformations were residential and used by tenants. Their access was through a way leave, now for exclusive tenant access. Appendix 22 illustrates the field sketch court layout and location of the extensions based on the field study sketch. Some field sketches in the appendix (App. 22) also supplement the description of the transformation options in the cluster.

5.4.6 Summary observations of UDE level transformations

The investigation of the attitudes towards DITs at the UDE level confirms the role of design strategy in guiding DITs within Buru-Buru estate. The physical strategy of grouping the units in a cluster united by a courtyard had a both a physical and social effect which ultimately influenced the economic aspects of DITs.

The architect's approach to housing grouping was physical creation of clusters as evidenced in Buru-Buru estate. The evidence in the cases supported the strategy as suited for creation of convivial neighbourhood. The role of transformation at this scale was to reinforce the choice but qualified it through physical choices that 'gated' the community in cluster. The sealing of foot pathways to neighbouring for instance takes the position that the communication between different spheres of influence ought to be hierarchical, systematised, and controlled. This decision to seal footpaths was thus meant to

reinforce a security and hence social order suited for the cluster scale transformations.

The exclusivity was also functional through the peripheral location of the commercial function. Extensions for commercial use were accessed predominantly from outside of the cluster court. The choice of 'permanent' technology was also telling as far as it confirmed the middle-class dwellership. It also confirmed the confidence and security of tenure that the dwellers bestowed their mortgage ownership of the units. The 'temporary' technology used in the kiosks that were built on the encroached road reserves was also telling as it illustrated the insecurity of the illegal action and the alien function so added. An added physical signifier was the lower (vertical scale) scaled physical definition of court-oriented extensions.

The social dimension to clustering remained the fundamental objective of the grouping, and the fact was supported by the social actions taken in transformations at the cluster scale. The acts were largely to reassert territoriality. The social outfit that was used to realise the social and communal objectives was the cluster court Residents' Associations (RAs) evident in the clusters. The association supported the neighbourly linkages among cluster dwellers and further established the 'insider' / 'outsider' for non-dwellers inside the cluster.

The economic objectives in the transformations within the cluster were not uniformly determined and yet the resultant seemed systematic in the physical location. It also reflected a social logic of exclusion for non-owners as distinct

from the owner-occupiers. The rental units were located and accessed from outside the courts to reinforce the logic of exclusion of non-owners. The location of kiosks was mostly away from the court, ostensibly for ease of access for customers, was also a social construction. The need to exclude the 'external' economic function from the residential zone told story of a compromise between the individual economic drive against the social objectives preferred by the communal grouping in the cluster.

The key lessons from the UDI transformations therefore the need to:

- preserve a socially secluded grouping to preserve the middle-income status of the dwellership,
- provide a safe court through physical transformations actions that included the 'gating' and sealing of footpath accesses, and,
- contain the drive for economic profit by transformers so as not to compromise the social exclusivity and security of the cluster's dwellership.

5.5 The Dwelling Unit DIT characteristics

The section looks at the characteristics of the Dwelling Units[119] and the general propensities for transformations based on the sample. Later, case DUs are also studied.

5.5.1 General DU aspects

The house typology was a key ingredient of the architectural strategy since the social objective of a middle-income household of nuclear family could best be realized through the disposition of space within the unit. It also reflected the economic strategy through affordability realized through this morphology. The physical strategy was also manifest in the use of defined plots. This unit form was used to define the 'ownership' model preferred in this estate for middle-income dwellers. Characteristics to the six types investigated in the sample are shown in Table 5-7[120].

Unlike Kaloleni, the number of 'bedrooms' rather just 'rooms' defined the dwelling units in Buru-Buru. This was recognition of the preferred segregation of spaces to create a hierarchy of relationships for privacy and other functional needs conducive to a family. It was an attempt to accommodate a nuclear family structure, a preferred option for the contemporary Kenyan middle class. This contrasted from the 'bedspace' concept preferred in the colonial era DU for Africans unit in estates like Kaloleni. Chart 5-9 illustrates the spatial

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[119] Appendices 36 and 37 are two of the pages in the Owners Handbook by the consulting architects (MMI) available to the mortgagees in Buru-Buru. In first page (App.36) the floor areas of one of the DU types (Type 4.1) are shown, while the next (App.29) shows the contents of the typical Handbook. The Handbook includes default responsibilities for maintenance including those of the contractor during the Defects Liability Period and as well as the owners. It mentions the services, fixtures and fittings, the colour scheme (App. 30), and external features including boundary materials.

[120] Type 5.1, a four-bed roomed bungalow was also used but was not in the sample.

Table 5-7: Types and their frequency in the sample units

Type (MMI code)	Phase	Type characteristics		Sample	
		bedrooms	levels	frequency	%
3.1	I, II,III	2	1	12	11.7%
4.1	ALL	3	1	26	24.5%
4.2	ALL	3	2	40	39.2%
3.2	I, II, IV	3	1	6	5.8%
5.2	I, II, IV, V	4	2	14	13.7%
5.3	III, V	3	3	6	5.1%
total				103	100.0

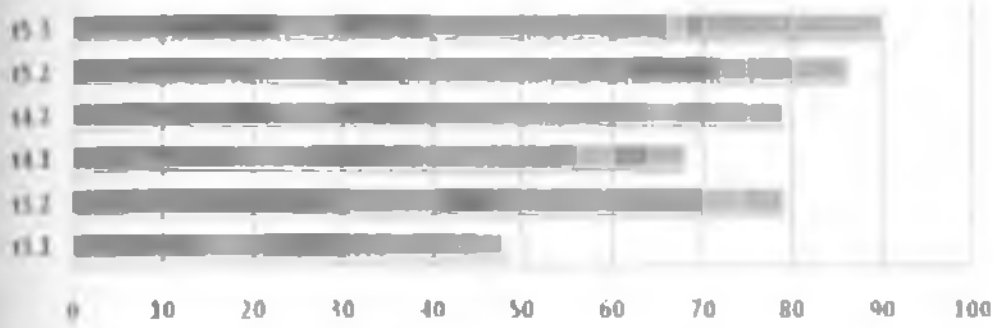
Source: survey, 2010

characteristics of the DU type in Buru-Buru from the survey. The other definitive characteristic of the typologies was the number of storeys. These varied from one (bungalow) to three.

Each plot had the single DU, which defined single household occupancy. However, additional unit used as a domestic servant's quarter was permissible later. Facilitated through Plot Ratio (PR) and Plot Coverage (PC) upward revisions, in substance, meant potentially two households would occupy the plot. The original design provided common visitors' car parking spaces within the court. External provisions included the double coat surface drive for car access, pre-cast concrete paving slabs at the front, and rear entrances to the unit. Access to the rear of the houses was by pedestrians only. In the original layout, each plot had boundary of a split bamboo fence and creosoted cedar boarding at the front and rear.

As with other formal projects, the responsibility for undertaking repairs relating to faulty workmanship fell to the General Contractor[21] in the first six months of the project's completion, the Defects' Liability Period. These repairs excluded redecoration, which was the preserve of the owner.

[21] Sector SC Phase 2, was built by Lalji Bhimji Sanghani



	t3.1	t3.2	t4.1	t4.2	t5.2	t5.3
[illegible]	15	31	18	17	22	11
[illegible]	0	0	0	5	0	12
Kitchen	6	9	8	7	6	6
bedroom 1	10	7	9	11	9	11
WC/shower	2	3	4	0	3	0
Bedroom 2	10	9	7	13	13	16
bedroom 3	0	11	10	11	9	10
bedroom 4	0	0	0	0	10	0
Bathroom	0	4	4	3	3	2
WC	2	0	4	4	1	2
Stairs	0	0	0	4	4	10
Circulation	3	5	4	4	6	10

Areas in m2

[illegible] survey, 2010

Table 5-8: DU type areas in Buru-Buru estate

DU type	Type 3.1	Type 3.2	Type 4.1	Type 4.2	Type 5.2	Type 5.3
area (m^2)	48	79	68	79	86	90

Source: survey, 2010

The total living space[12] areas varied from about fifty ($50m^2$) to ninety ($90m^2$) square metres of the six types investigated in the sample (Table 5-8). Chart 5-9 shows the distributions of the areas amongst the rooms and space types in DUs. The private spaces including bedrooms varied from two in the early phases (1, 2 and 3) to four in the final phases (4 & 5). Their areas ranged from seven ($7m^2$) to sixteen ($16m^2$) square metres. The public spaces included the living and dining rooms varied in area from fifteen to thirty square metres.

Most unit types combined these functions of the visitors lounge and dining and used furniture for identification. Each unit had a kitchen that separated from dining space, and the types varied in area from six to eight square metres with a minimum width of two metres. Utility spaces were provided in each unit type. Each unit type had at least two separate spaces reserved for utility function.

Circulation, a corridor and/or a staircase, was common space provided in each unit. Internally, the space types were meant to be amply spacious to reflect the socio-economic dweller status, as much as basic household requirements. The distinction and separation between public, private, utility and common space was central to the desired class of the dweller. Though the variations in the Type occurred mainly in magnitude, the plot size also contributed in the propensity for DUs.

[12] This, unlike plinth area, excluded areas contributed by walling which was about 20%

Figure 5-15: Some external surface treatment in Buru-Buru DUs
Source: survey,2010

Figure 5-16: Buru-Buru garbage bin chamber
Source: survey, 2010

Indeed, the architects determined the typological based on the plot size, its dimensions, and the location in relation to the street. These plots ranged from 5 metres to 9.5 metres in width, with little lengthwise variations from 21 to 24 metres. The areas varied by up to almost twice, with the minimum being 123m^2 and maximum 209m^2 (Table 5-5). Corner plots were normally the larger ones.

The external open space was detailed (Fig.5-15) with essential qualities, specifications and architectural landscaping features. The 'parking court', (as the courtyards are called in some of the drawings (Colin Buchanan & Partners (E.A), 1974), was the vehicular entrance to the units. The rear was exclusively for pedestrians. The various ground surface descriptions include: broke stone paving, round PCC slabs, paving flags, tree grids, and the graded footpaths. Street lighting was provided in courts. Separation of the plots was using bamboo and creosoted boarding. A dustbin shelter (Fig. 5-16), built from masonry was provided at the plot entrance.

5.5.2 DU size and transformations

Table 5-7 shows these typological characteristics and the frequency of extensions witnessed in the sample. Appendices 11, 26 and 28 are SPSS outputs between the physical variables of the sizes of the provided DU, plot and the resultant DUs. They showed to

significant relationships and that the transformations were randomly distributed.

This supported the architects' position of providing adequate physical space to the socio-economic class housed in Buru-Buru. The physical architectural strategy by the architects was thus appropriate as it captured the dwellers physical objectives for a middle-income family. It was supportive of the house unit basic size and typology. The presence of extensions however pointed to factors outside of the physical and social needs of a Buru-Buru family.

The other physical factor was the storeys. Of the multi-storeyed units 68% were extended as compared to bungalows (47%). This seemed to correlate the extensions to the storeys in the provided unit. However, the explanation was more to do with Plot Coverage (PC) that was less in the storeyed types leaving more ground space for additional space, than the bungaloid form. Indeed, closely associated with the unit type is the plot area. Since transformations occurred irrespective of the unit type, the next question was how the available land on the plot influenced the transformation propensity. The unit types were designed to fit the physical and locational characteristics of the plot. Understandably, there was a correlation between the plot size and the frequency of Type 'D' transformations with larger plots inviting more extensions. The smallest plots had only 40% extension compared to between 67% and 80% among the larger plots[123]. The combined dweller-satisfaction

[123] This is statistically supported with 0.045 ρ value.

with the provided unit and a spacious plot seemed a physical motivator for transformations.

The typology of the extensions was mostly (64%) single-storey units. A small (2%) number of plots had both single and double storeyed additions. Again, none of these correlated to the provided DU physical qualities. Instead, the plausible explanation was to do with the location as discussed under the UDE and estate levels.

5.5.3 Space types and transformations

From the analysis of the provided DU space types (Chart 5-9), the 'public' spaces that included the dining, living and verandah spaces varied in number from one to three, and the majority (94%) used the rooms with at least one space matching this 'public space' description.

The areas of public space varied from ten (10) to more than thirty (30) square metres, and from the respondents, this was acceptable to the majority of the dwellers. Thus, satisfaction for the available public space was positive with 62% happy, and even 1% feeling it was excessive. With regard to public use spaces, any additions were for use other than for owner-occupier household consumption.

Private use spaces were mainly the bedrooms and occasionally a study space. In the sample, majority of the units (65%) were three bed-roomed, with 15% with less than three bedrooms as private space. The average areas were mainly (38%) above thirty (30) square metres in totality of private spaces.

More than half (58%) of the respondents felt the space provided for private rooms was adequate.

The utility spaces included bathrooms and kitchens; the 'wet core'. It was a classification for functions for survivalist use, essential for hygiene in homes. Each house had at least these two utility spaces, with varying definitions. The areas ranged from ten (10) to twenty (20) square metres. Fifty-nine (59%) percent felt the spaces for utility functions were adequate. The rest complained mainly with sizes of the kitchen and the number of bathrooms. The latter was also about the separation on the toilets and washing spaces. Further, the non-separation bathroom between the children and the parents was not attractive to the owner-occupier families. The position inferred their preferences for the more contemporary master bedroom en-suite that accords more privacy for the parents.

With regard to non-core supplementary spaces, all the units had one ancillary space. This was for storage and a garbage collection chamber. Most respondents (58%) felt his was sufficient. The rest had added a temporary storage space.

In total, the drive to transform was not based on the inadequacy of the main spaces provided. However, some modifications (42%) to improve the minor spaces accounted for the dissatisfaction of the utility and ancillary spaces. This was broadly acceptable and caused negative sentiment, as the scale was small and went unnoticed. Indeed, it lent to the enhancement of the utility of the provided house. This type of transformation is condonable and should be

encouraged, as it was largely an aspect of personalization desirable in the consumption of human space.[124] These Type 'C' and 'D' transformations discussed in this section were the dwellers' verdicts on the space types.

5.5.4 Development control requirements

The development control requirements that controlled development in Buru-Buru included the Building Line (BL), the Plot Coverage (PC), and the Plot ratio. In addition, all permanent and temporary development on the plot required approval from NCC. Extensions mostly contravened these requirements to various degrees as discussed in this section. Table 5-9 shows a tabulation of the original and new physical development requirements as reported in the sample units.

Based on these, the plots had between 50-65% space spared on the plot, as open space, that was meant used for a variety of outdoor activities. However, only about 40% of the respondents felt the amount of space for these activities was adequate. The open space was used grassed (i.e. as a lawn) or paved using brick, stone or concrete slab paving. In reality, this was the space for extensions elaborated in the study.

All the added space encroached on the Building Line (BL) setback in Phase 4 and 5, but the degree of violation was not always the uniform. The majority (44%) encroached by less than 3 metres. The plots that almost eliminated the

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124 Indeed, in the CNU charter it is posited that such spaces that enhance utility of the provided space are welcome(CNU, 2009) (Jacobs & Appleyard, 2000) (Steino, 2004). The charter goes even further to advocate space for home offices, a direction that would add a new dimension and understanding to utility and ancillary space.

	ORIGINAL		NEW		PERCENTAGE
		Frequency		Frequency	
	25% -35%	103	35% and below	23	23%
			35-50%	27	26%
			50-75%	10	10%
			No violations	42	41%
Plot Ratio (PR)	ORIGINAL		NEW		%
	0.25-0.50	41	0.5 and less	22	22%
	0.5-0.75	60	0.5-0.75	24	23%
	0.75-1.0	1	0.75-1.0	11	11%
			above 1.0	3	3%
			0	42	41%
Building Line (BL)	ORIGINAL		NEW		%
	less than 3metres	21	less than 3metres	14	14%
	more than 3metres	80	3-5 metres	3	3%
			more than 5metres	45	44%
			3	1	
			No Violations	60	59%

Source: Author, 2010

setback provision were mainly commercial-use transformations. The setback requirement was only applicable to the later phases, and as such, it did not deserve to be a violation for it almost served no real purpose. According to the Physical Planning Handbook (RoK, 2004), a principal value is to achieve 'visual effect', which may not have been considered necessary by the transformers in Buru-Buru. The effect is subjective and ought not to be a requirement for a medium and high-density housing neighbourhood in urban settings.

As an urban planning and design instrument, the Plot Ratio (PR) informs the total floor area on the plot and ultimately guides the number of storeys. Other than the un-extended units, all the additions increased the Plot Ratio significantly. However, given the revisions from the initial 0.5 to 0.75 PR only

14% went beyond this new limit. The more significant effect was the increased building and population density on the plot and ultimately estate-wide.

The additions were of mainly an independent unit inhabited by new household, and this altered the demographic dynamics within the settlements. It had collateral effects on the social and physical infrastructure. The Plot Coverage was also violated, but mostly within the revised stipulations with only 10% outside these revisions of PC values of 50%. The effect of the PC violations was to reduce the amount of open space on the plot, which compromised the environmental quality.

The case DUs reported in the next sections were representative of the bungalow (Type 3.1) and maisonette (Type 5.2) types.

5.5.5 Case unit 1 –Type 3.1 in Unit No. 23

Located in Sector SC of Phase 2, this Type 3.1 unit in House Number 23 belonged to Charles, a male in his early fifties. In Sector SC, the six hundred (600) DUs clustered in twenty (20) to thirty (30) group groups fronting a landscaped common court. Sector SC was designed in1973. Other DU types in the sector were: 4.1, 5.1, 4.2, and 5.2.

Charles lived in the house with wife and four children. The eldest of the children was a son in his early twenties, attended college, and inhabited the extension. His siblings stayed in the main house, and attended schools in the city. Charles, the household head, was a professional working in the public sector and had lived in Buru-Buru since 1976.

Table 5-10 Physical characteristics in case DU- House No 23

	Original	New	Comment
Plot cover	32%	37%	The breach of the rules is hardly evident as the new unit is quite close to the stipulated
Plot ratio	0.32	0.37	
Building set-back	4m ---front 6m ----back	4m ....front 0m ...at at back	
Area	46m²	53m²	

The plot area was 144 square metres. The original unit had two bedrooms, a bungalow (single storeyed) and had area of 49 m^2, and consequently occupying 32% as Plot Cover and 0.32 as Plot ratio. This was below the statutory 35% and 0.50 respectively.

Figures 5-17 and 5-18 are the layout plans and 3-d CAD projections of prevailing physical conditions on the plot. The additional spaces included a stand-alone and independently accessed bathroom unit, and two semi-detached rooms. These were detached and independent of the main house. All the structures on the plot were all one-storeyed. These additions had increased the development parameters beyond the requirements. Thus, the additional spaces totalled about seven and half (7.3) square metres which amounted to only thirty-seven percent (37%) ground coverage and 0.4 PR, shown in Table 5-10 . The detailed transformation types in House No.23 are summarised in Table 5-11.

One of the additional rooms was rental while the other served as the eldest son's room. The three other siblings were girls and lived in the main house. The family and lodgers jointly used the external space for laundry and other outdoor activities. Rent from the extra unit was 5,000 KES. The additional

spaces were 'permanent' and were from masonry walling and concrete tile roofing. The extra units were at the rear of the plot, and were independently accessed from the sewer way-leave located between the plot and the adjacent one.

A hedge at the front defined the plot loosely, while the rear was walled. The presence of the hedge meant the original low bamboo walling had since decomposed and the front seemed bare in comparison to the walled neighbouring plots. The ground cover remained grassed. Similarly to landscaping, not much attention had been placed on decorating unit externally.

The openings were all burglar-proofed with iron bars. Internally, there were no subdivisions. Other routine maintenance including painting and repairs to joinery fittings, not much else had been addressed in modifying the interior.

The respondent voiced displeasure at the sizes of the rooms and service provisions in the main house and cited this as a main reason for the transformations that he had undertaken. The main reason for extending the unit was to house the adult son and supplement his income. He stated that he would have added more units if he had access to funds. These would be for subletting. He had managed the construction of the extensions and used 'fundi' labour contractors. Figure 5-17 shows the floor plan layout and the Archi'AID[c] projection are in

Table 5-11: Development Control condition before and after transformations in Unit No. 23

Unit Type	Description	Y/N
A	The boundary	1
	Surface water drainage	0
	Landscaping	0
	Paving	0
B	Finishes – external / internal	1
	Openings – modification / replacement	1
	Openings - burglar-proofing	1
	Fittings –joinery	1
C	fusion	0
	Conjunction - reduction	0
	Intercanary space	0
	Subdivision	0
D	Clip-on	0
	Vertical addition	0
	Bridging	0
	Add beside	1

Source: survey, 2010

Figure 5-18 of the transformed unit in the case DU; House No. 23.

The transformations in the case were modest and were close in scope and magnitude to the desired development control expectations. The additional spaces thus fulfilled both social and economic perspectives to the owner-occupier household.

5.5.6 Case Unit 2 – Type 5.2 in DU No. 104

The house type was 5.2, a four bedroomed maisonette with three bedrooms upstairs and another, used mostly as a guest bedroom, downstairs. Figure 5-19 shows the Layout Floor Plans, while the areas shown in Table 5-12 are from the working drawings from the architects (MMI, 1980).

The unit, DU No. 104 was located in phase 5. Pilato, the household head, a male, was the owner of the unit purchased through a mortgage loan availed by the Housing Finance company (HFCK). He was 55 years, and had thee children, aged between 15 and 25 years. He was a professional working as an academic staff at a local public university academic He had stayed in the house from inception in 1981.

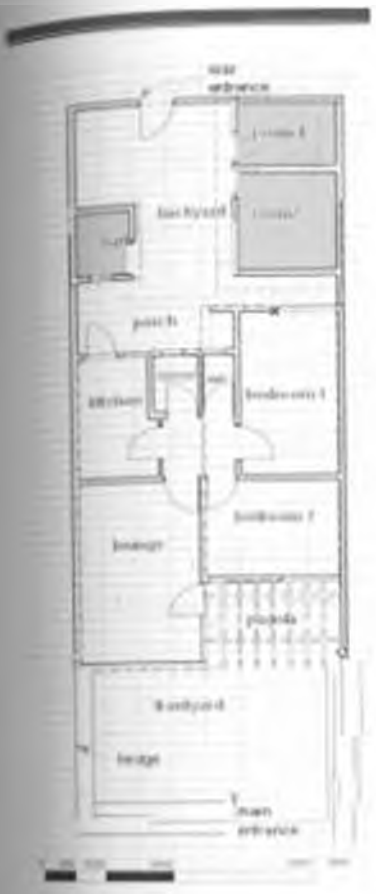

Figure 5-17: DUs in Type 5.1 -DU no. 23 Phase 2 plan
Source: survey, 2010

Figure 5-18: 3-d of transformaed du no. 23
Source: survey, 2010

The children went to school or college locally and lived in the house when out of college /school during holidays.

Almost all aspects of DITs are evident in the unit. Apart from 'skin'-based maintenance and repairs, the early transformation was the boundary wall erected from Nairobi stone with a metal-reinforced gate.

The plot area was 158 square metres, of which the plinth coverage was meant to be 35% before the extensions. The plot ratio was 0.75. The transformed exceeded these statutory requirements. Thus, the plot cover was now 55% and the ratio was now 0.96, more typical in Buru-Buru estate. The added unit were accessed from the cluster road and not from the courtyard.

Figure 5-19: Type ⅝ 2-ground and 1st floor plan s
Source: survey, 2010

Space types	Areas (M^2)
living / dining	21.84
kitchen	6.13
bedroom 1	8.97
wc/shower	2.63
bedroom 2	13.04
bedroom 3	9.28
bedroom 4	9.73
bathroom	3.18
wc	1.35
stairs	3.85
circulation	5.91
TOTAL	85.91
Total area (includes walls)	103.36

Table 5-13 Development Control condone before and after transformations in Unit No. 104

	ORIGINAL	NEW	Comment
PLOT COVER	34%	55%	Exceeded current acceptable development in the zone. Retained building line
PLOT RATIO	0.52	0.96	
BUILDING LSET-BACK	6.8m	6.8m	
PLINTH AREA	82m2	152m2	

Source: 2016

Table 5-14: Transformation types in Unit No. 104

DIT Type	Description	Y/N
A	[illegible] boundary	1
	Surface water drainage	1
	Landscaping	1
	Paving	1
B	Finishes - external / internal	1
	Openings - modification / replacement	0
	Openings - burglar-proofing	1
	Fittings - joinery	0
C	Fusion	0
	Conjunction - reduction	0
	Integratory space	0
	Subdivision	1
D	Clip-on	0
	Vertical addition	1
	Bridging	0
	Add beside	1

Source: survey, 2016

Table 5-13 shows the extension and original DU violations and conformances. Table 5-14 are some of the details of the transformation types.

There were two extra households, all tenants, who domiciled in the house. They paid ten thousand Shillings (10,000 KES) for each for the thirty-four square metre (34) one bed-roomed unit. This was to offer some privacy between the owner-occupier household and tenants. The households however shared a small open space at the rear of the main house, which was used mainly for laundry and other domestic private chores.

On the main house, a space formerly used as a splash area had been converted into a study room, a deficiency in the main house, which the owner felt, was supportive of the professional class and middle-income families. The

respondent was not entirely satisfied with the space in the house for his own use, and this led to the modifications on the main house. The extension was for additional income. 'Fundi' labour contractors undertook the extension. Figures 5-20-and 5-21 show DU 104 transformations.

5.6 Summary of transformations in Buru-Buru estate

The chapter investigated dweller-initiated transformations in Buru-Buru estate based on the adopted physical strategies of the estate, UDE and DUs. The questionnaire-based responses by the dwellers helped understand opinions by the agents of transformation within the estate, the dwellers.

From the responses, the physical and social motivation by the dwellers was minimal; instead the need for added income was paramount. The position here is that social and economic motivations are but basic and even primordial requirements by humanity that are a basis for survival of the species. The real motivator was the physical opportunities accorded by the architectural strategy enshrined in the location of the unit within the estate, the DU type and scale, as well as proximity of economic opportunity guided by these locational factors. Thus, though a middle-income estate, extraneous factors somehow conspired for the dwellers to move towards using the unit for extra income translated into the dweller-initiated transformations.

This seems to have happened despite the compromised social consequences of crowding and even likely invasion by lower-income groups. This lowered the social quality. Though not proven, the likely economic consequence of lowering resale and rent value is likely to be the next level of devaluation of the units. The analyses informed the physical opportunities that guided the nature and form of the DITs.

5.6.1 Estate level DITs characteristics

At estate level, the key factors influencing transformations were the circulation arteries. Hierarchically arranged, they guided the transformation nature and scale. The estate was framed around a circulation network that focussed on the spine, Mumias South Road. These transformations were primarily for economic purpose and objectives of the dwellers. The scale of the street ant the nature of frontage however calibrated this economic drive. They represented a common response that guided by the socio-economic background of the estate dwellers.

The hierarchical scaling of the circulation element from the Mumias South Road down to the feeder roads and cluster roads, elicited diverse transformation responses. The spine road was perceived as a public forum suited largely for non-residential developments. Thus, the major functions were common-use activities suited for commercial and social spaces. This was at the expense of dwellings.

Residential DITs were located within the estate, but mainly away from the spine road. Thus, these were evident along estate roads, the inter cluster

feeder roads and sometimes close to the cluster courts. another distinction also emerged here with residential DITs fronting these feeder roads and away from the inner courtyard spaces. This court was a private space amenable to the owner-occupier usage.

These physical manifestations evoked social concerns of inclusion of the owner-occupiers and exclusion of tenants accommodated in the DITs. Household use residential DITs were accessed from the inner courts, ostensibly to distinguish the socially accommodated owner at the exclusion of the alien tenant, who accessed units mainly from the more public feeder roads.

A dimension of the locational aspects of transformation was the form and magnitude. Court-focussed DITs were often lower in scale and storeys, presumably not to deface and dehumanise the human-scaled courts. The multi-storeyed types were outward in orientation.

At this estate level, the technology guided the dwellers attitude to the actions they took in engaging in the DITs' activity. This was locational but couched in first, the legality or otherwise of the activity accommodated. Secondly, the ownership of the land it was based also guided the technology in the DITs. DITs' development was hardly on common use land, but when this happened, it was exclusively from 'temporary' technology and un-durable materials. This reflected encroachment hence the inherent illegality of such acts.

Other than the illegal encroachments spaces and the ancillary spaces, most transformers used durable materials that reflected he higher income status of

the dwellership. It was also a statement of attracting a higher income tenancy, presumably at the similar middle-income bracket as the original owner-occupiers.

5.6.2 The UDF -Cluster level DITs characteristics

The only UDF was the cluster. Its morphology was also transformed by the dwellers to fulfil both their social and physical objectives. For instance, whereas the original design of the cluster preferred interconnected clusters through footpaths. The transformation result was the sealing of these paths, and their substitution by 'gated' cluster formations. This fulfilled the social objectives of exclusion of the owner-occupiers from outsiders. The stance was also physical as it restricted accessibility to the 'gated' cluster communities' by anti-social elements.

The social grouping was for a middle-income community that encouraged the 'owners' of the units at the exclusion of the 'others' including the rental dwellers. It was manifest through the form and orientation of the added units as broached at the estate level. The minimal development within the court-fronting spaces and the extroverted orientation of the extensions bore further proof of the approach.

5.6.3 Dwelling Unit level DITs characteristics

From the findings and analysis, the DU was the focus of most transformations activities in a variety of ways. These included the plot formation, the dwelling type, and the space types. However, the most significant physical factor was the use of the plot as a defining element and the

catalyst for the type, magnitude and use of the DUTs.. The unit typology, its size and storeys, contributed minimally to the (type 'D') transformations. The same could asserted to the space types as contributors to extensions.

The underlying explanation was that the provided DU sufficed for the household's needs. Thus, its scale, organisation, and physical disposition of the major spatial elements were adequate and met the middle-income objectives targeted in the socio-economic grouping in Buru-Buru estate. The conclusion was that transformations enhanced this socio-economic class. Indeed, the types 'A', 'B', and C' that displayed high frequencies were purely to reiterate this position and hence were not significant variables in the discussion.

The drive for extensions was to serve the economic objectives only. This stance however, came with a social price. It was so as the economic-driven extensions entailed comprises on the social objectives. Central to these social objectives was territorial exclusivity and privacy for the owner-occupier dwellership.

The plot though physical defined a social control territory owned by the individual dweller. The individual dweller-control over the plot explained its utilisation as the appropriate avenue for transformations. This plot was thus physically amenable to functional transformations to express this individuality. The economic uses in the extensions, including sub-tenancy rents and commercial activities, required physical articulation as demonstrated in the findings.

The primary control regime for the extension transformations was the physical. This was realised also type 'A', 'B', and 'C' DITs like boundary and unit enclosing elements that accorded increased security for the dweller. Others were the internal modifications and the 'skin'-based internal finishes that aimed at the retaining the social status of the middle-income dwellership. However, the major added spaces hardly served the householders, ostensibly because the provided units suited the basic physical needs for a nuclear family that reflected the vast majority of the dweller-householders.

Another dimension of the extensions added was the durable technology of 'permanent' units. This signified the confidence; the minimised fear of demolitions and eviction, the dwellers had placed in these 'owned' dwellings. The 'permanent' technology implied reliance on the contracted[125] builders or contractors for the process. Again, this reflected the up-scale professional and business class dwellership. This had added cost implication[126], acceptable to the middle class.

These trends were irrespective of the house typology and it was a situation typical of this middle-class housing. The open space on the plot was the first major driver for extensions. Secondly, the location in relation to major circulation arteries was the other. The dictum that emerges here was, dweller-

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[125] Yet some DITs were prone to collapse leading to fatalities. This further supports the position that the failures were a result of failed inspection department that have failed to adhere to their stipulations of periodic inspects during the construction activities.

[126] It however noteworthy that the materials utilised were locally sourced, and mainly processed in cottage Jua kali workshops that dominate contemporary construction material sourcing in urban and even most rural Kenya.

initiated extensions' 'form follows location'. This contradicts long-held notions in conventional architecture that the 'form follows function'.

The second dictum, dweller-initiated extensions 'function follows location', is also valid. This position is justified as the functions in the extension, which ranged from 'owner-dweller', 'tenant-dweller', and 'commercial-dweller' use were locationally determined within the plot. For instance, the DIT for the owner-dweller was located within the court frontage and accessed from there. This was contradictory to spatial stance for the tenant dwellers as these were inclined towards the inter-cluster streets. Their physical and functional detachment, and thus, the independent articulation was an added supportive qualification. Regarding legality, legitimacy or otherwise[127], it should be noted that most major transformations contravened planning conditions including plot coverage (PC), plot ratio (PR) and the building line (BL). Despite this reality, the dwellers felt un-remorseful about this due to partly, the breakdown formal control of building development, but more fundamentally the legitimacy of the extensions. The legitimacy was the fulfilment of the functional needs that the provided DUs did not bridge.

[127] The terms of 'legality' and 'legitimacy' were used deliberately to introduce values the dwellers attached to space. The former, 'legality' implied adherence to the law. While the latter illustrated the felt, need from the dweller's perspective. It argued that DITs reflected the legitimate spatial actions even if they contravened the law.

6 THE ANALYSIS

The two case estates represented two strategies of the frequently used in formal housing production in Kenya. In the literature reviewed, a conceptual model was established which cited the social and economic drivers for transformation but which lent less credence to the physical strategy. However, as established in the empirical findings, transformations were operationalized within the provided physical frame of the context and architectural design, over time and as guided by forces inherent the human agency operating within the urban context. Thus, it can be asserted that the spatial (place/space[128]) and temporal (time) constraints, as well as the urban institutional and human framework (agency) which guide housing development influenced the nature and extent of transformations in formal housing.

The transformation propensity is seen as an act initiated by the dweller (agent)[129] in bridging the gaps emerging from the architectural strategy[130] over time. Time, as a factor in dweller-initiated transformations, was seen as a factor manifest at the three levels of the physical, social and economic needs of the dweller in several ways. At the physical level, time acts on the provided physical object demanding change and hence the transformations

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[128] space and place are used interchangeably in the discussion although they are different as the former refers the Cartesian (geometrical) concept, while the latter refers to when the same acted in space by human agency), personalized' space

[129] The dweller is their own agent because though they transform the space for their own use, the dwellers operate in an institutional frame that guides the actions.

[130] The architectural strategy is operationalized in the physical characteristics of the site and the space plan used by the architect, using graphical and other representational models

that emerged. In the investigation, four (A-D) categories of transformations used in turn reflected time-based priorities for transformation. At the social level, time reflects the temporal changes that a household undergoes that demand physical action as space in DITs. Similarly, the economic circumstance and priority of a household catalysed the DITs' type and propensity within formally developed estates. Time was also an economic factor given that capital investments in transformations attract time-based costs.

Whereas time influences the sequencing of DITs' action, the physical space is what propelled the type and scale of transformation. These included the architectural design elements like DU, UDE and entire estate, which also determined the social linkages. This culminated in the direction transformations took in respect to issues of privacy and other interpersonal social order. The economic order was similarly space-bound for perceived strategic locations.

Agency in DITs is mistakenly taken as resting solely on the dweller. In its complexity agency at the social level is reflected in societal impetus for the changes, a collectively driven impetus, reflecting culture, institutions guiding urban development. At the physical scale, the agencies include institutions that determine construction, and range from the sources of building inputs, and the market forces that drive them.

6.1 The Physical Strategy

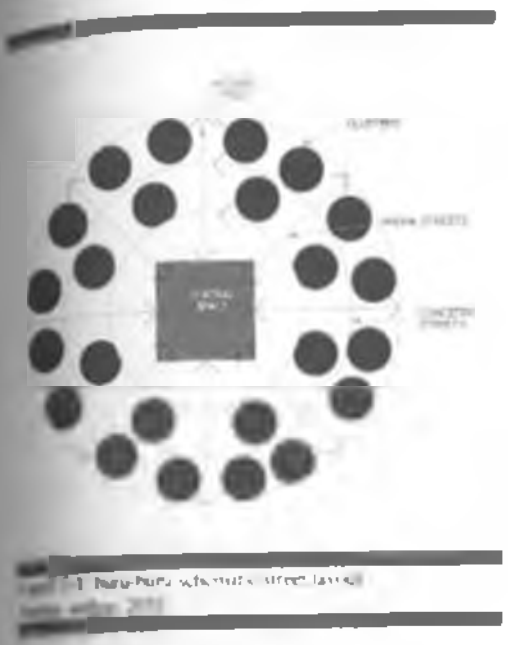
Transformations in the two cases had divergent, yet related physical and physical manifestations at all the three levels of investigation.

6.1.1 Estate level

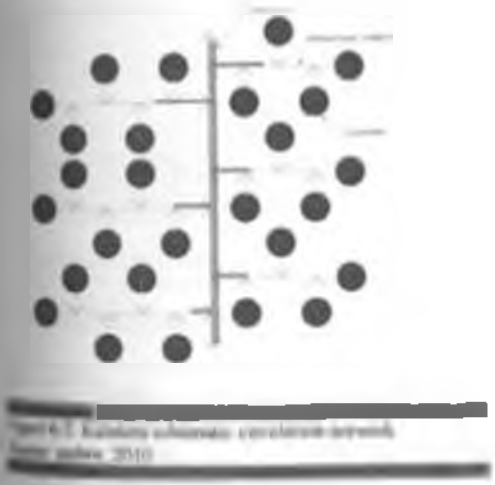
The two aspects of DITs noted at this level included those along the boundary and the estate's circulation arteries. Regarding the edge condition of the estate, two factors that contributed to DITs were the designated edge and the socio-economic classification. Physical demarcations of the edge were never overt in all the estates; and thus no deliberate 'walled' estates existed. Instead, individuated DITs, tended to create the 'walling' effect in the case of Buru-Buru estate. The Kaloleni edges remained porous and ill defined. This was mainly because the adjacent neighbourhoods were similar where the dwellers were also of the low-income.

Transformation attitudes towards the circulation arteries in the two schemes contrasted sharply reflecting the spatial strategies in the blueprints. Whereas in Buru-Buru the streets were the locus for DITs, in Kaloleni they were not. In the latter, the edges attracted transformations.

In Kaloleni, this diminished transformation activity on the circulation arteries was largely because of the amorphous, unrestrictive, and porous layout of the clusters. This spatial strategy promoted pedestrian movement between cluster groupings that was not restricted to the paved streets: hence, the impetus to transform along there was wanting. The lowered level of vehicular traffic observable in estate meant the streets were not motorised. This factor combined with the lack of the physical edge definition (estate and cluster) meant no obvious hierarchy and network of the circulation arteries was attractive to transformations.



Kalokeni had clear network of circulation arteries organised radially from the NUC central space (Fig. 6-1). However, the transformations acted indifferently to this rigid geometry. Instead, the small-scaled individual DUs were in the expansive cluster court spaces of the clusters.



For Buru-Buru estate, the tree-like[131] hierarchy of the circulation network (Fig. 6-2) was more conducive for extensions. The arteries along which motorised and pedestrian motion was possible were transformation magnets[132].

These transformations reflected different natures in the use, magnitude, technology used and typology. Common to the DITs along the major circulation paths were attitudes that defined privacy gradients (public/private), nature of function (commercial/residential), morphology (single/multi-storeyed), technology ('temporary'/'permanent'), as well as space use orientation

[131] Though reduced into the hierarchical format, the reality was an organic layout ostensibly to allow motorised traffic conducive to the desired communal neighbourhoods.

[132] It can further be explained that apart from being catchment of the populations, they also attracted layers of infrastructural services, which were also magnets of human activities and hence transformation activities.

(introverted/ extroverted). These dichotomies of public/ private, commercial/residential, 'temporary'/'permanent', introverted/extraverted, all form the structure of the DI1s' articulation. The schematic graphics shown in figures 6-3 & 6-4 illustrate the prevailing scenario on these main roads.

The choice of technology along the major streets was informative. The 'permanent' technology was restricted to the plot and hence owned domain, while the 'temporary' was exclusively on the 'un-owned' street reserves. This was but a mark of security and fear of admonition from the authorities, since the act was a violation and encroachment on common land.

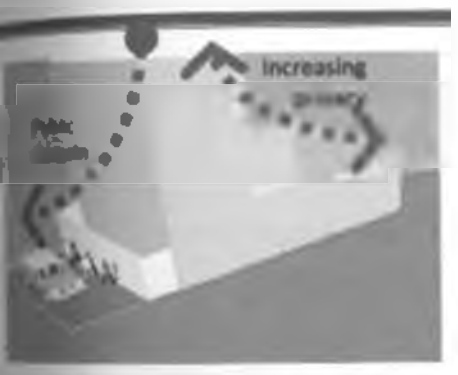


Figure 6-3: Physical-functional Order on the spine road
Source: author, 2010

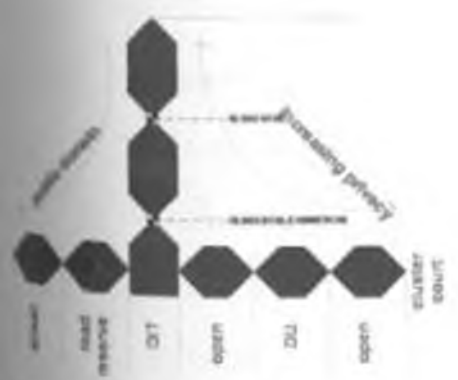


Figure 6-4: Vertical and horizontal layer along estate streets
Source: author, 2010

Another factor, significant in the transformational qualities, was the uses in the extensions along the paths. The activities accommodated in the extensions encroaching on common land were exclusively commercial and /or public oriented in use. This featured kiosks for petty trades. The plot demarcation often marked the use of permanent technology for on-plot DI1s. This use of 'temporary' materials, reflecting illegality and lack of tenurial security, was in two ways. First, 'temporary' extensions were in DITs outside

of the plot, on the road reserve, that was thus encroached land. Secondly, it was on those of a non-residential function, alien to the mono-functional estate, like the trading kiosks. In conclusion, in Buru-Buru, the drift was that the technological choice was, but a manifestation of the legality or otherwise of both the function and the siting.

Typologically, a majority of storeyed developments occurred along the main roads especially the spine. This was a verdict on the locational and hence prevailing higher land use premium. The privacy index also increased vertically as indeed tenement units were on the upper floors. Horizontally, DITs close to the road were commercial. Figure 6-4 illustrates the position.

Traversing into the interior, the core was the original unit that was often owner-occupied, presumably because this had the highest level of social and functional privacy. It was also the justification of lower-scaled DITs, positioned on the cluster courtyard side, which were almost exclusively for the owner-occupier usage in these lessons from, mainly, Buru-Buru estate.

Another observation of the higher commercial intensities were at abundant at junctions was a further confirmation of the circulation artery as the locus of activity and thus suited for transformations.

The lesson from the two cases is that with a clear circulation artery network as was in Kaloleni coupled with loose cluster morphologies, the DITs' propensity was away from the streets to focus on the clusters. On the other hand with an organic street geometry and clear cluster morphologies, as was the case for Buru-Buru, the DITs locus was the streets.

6.1.2 UDE Level

As gathered from the cases, the UDE, the spatial grouping entity adopted by the architects, was central to the DIIs formation. This was realised in divergent ways, but in essence aimed to enhance the social 'territorial' order by the dweller community often in contradiction to the architect's provision. However, if the social demands were the apex of the DIIs' priorities, the physical provisions at hand calibrated them. The UDEs adopted, the clusters in both cases, and the apartments in Kaloleni, demonstrate this position.

6.1.2.1 The clusters in Kaloleni

The physical formation of the clusters was realised through the location of the units on the edges of an open court, and were noted for their porosity and amorphous definition. The units were however not contained within a territorial space and thus a 'plot-less' formation.

The extensions aimed to redefine the 'plotless' form and the attitude towards the open space. The evidence of the unkempt lawns and physical traces of pedestrian circulation that intermittently criss-crossed them, was a demonstration that the court un-appropriated by the individual dwellership.

It was also manifest in the dweller-initiated transformations, where the open court attracted most extensions, individually occasioned, and thus negating its usage for communal purpose. There seemed a deliberate individual effort to contain space surrounding their unit thorough the extensions and deliberate enclosure of the own unit. A consequence was a smaller courtyard space emerged from the extensions, and one whose locus was on the individual unit. Figure 6-2 is a generic schematic 3-D layout of the

Figure 6-6: Generic cluster formation in Kaloleni
Source: author, 2010

emergent scenario of individualised smaller courtyards. The main reason that accounted for these trends was improper gradation of the hierarchies of public and private space domains.

This reflected some of the lessons from Oscar Newman (1972) 'defensible' space concept (Fig. 6-6). Thus if the Central Space that accommodated the social and commercial facilities was the public domain, an intermediate scale, a semi-public space was necessary to mediate between the expansive cluster court and the more private DU space. The added 'mini-court was this intervening scale which had not captured in original provision.

The two lessons here are that the absence of a defined space for the individual dweller led to unilateral efforts to bridge the gap through the DU territorial formation in close proximity to the unit. The territory delineated through the layout of the DIT rooms, their 'wet' service spaces and the 'mini'-court.

Figure 6-5: Newman's sketch illustrating definitions of space
Source: Newman, 1972

The second lesson was that in essence, it also bridged the vacuous gap of a compound

on a plot, territorially controlled by the DU dweller. It was thus a rejection of the provided 'plot-less' formation and also the massive, impersonal scale of the cluster courtyard. This was an effort to control space in line with Habraken's (1998) spatial 'orders' of 'form', 'space' and 'understanding'. This example that was based on the Kaloleni case produced an inward-oriented formation of rooms and edges that contained the dweller in a defensible space. 'Defensible' space was also about security of the dweller as provided for in the cluster. There was therefore a lack intermediate semi-private space, realised by the introduction of the mini-courts.

The new spatial formation could be looked as both a cluster when more than one household dwelt there, but also as courtyard unit typology when it was only a single household. The former was driven by economic demands, while later was socially justified by the sizes of the dweller households. The former introduced a pseudo-rental formation, common and echoing lessons in the 'owned' estates and people's homes. The latter addressed a deficit in the available space available to the original household in the original DU. That both these scenarios existed in Kaloleni, sometimes even concurrently, was a pointer to merged social and economic value dimensions prevalent in formal housing[11]. Figure 6-7 shows the hierarchic gradation of 'defensible space within Kaloleni estate.

[11] It should be noted that the 'plot-less' attitude was probably imposed by the rental strategy, in which the care of the common space was NCC's duty. The laxity by the council in performing its duty may thus have contributed to the vacuous scenario that played in the hands of the tenants. This is however valid to the extent of appropriating physical space. The socio-economic formation was however more in character with an effort to create convivial environments within the formal estates.

Figure 6-7 : Illustrating defensible space formation in the cluster formation in kaloleni
Source: author, 2010

6.1.2.2 The clusters in Buru-Buru

Plots on which individual units were located defined the other type of cluster formation in Buru-Buru estate. It was a case that of carefully planned groups that were to mimic middle-class aura and reminiscent of the 'Garden City' of Ebenezer Howard (1898) developed at Welwyn by Unwin (Burke, 1975) (Barnett, 1986) (Kigondu 1989)[134]. The meandering inter-cluster roads, designed so to slow down traffic and endorse pedestrians movement, were the focus for the major DITs that emerged. The cluster courts defined by cul-de-sac roads had a lesser propensity for transformations internally.

The first transformation at the cluster level secured and enclosed the clusters. This was through the 'gating' and sealing of inter-cluster footpaths. Another dimension was the exclusivity of the cluster space, and thus its reservation for the owner-occupiers. That the major DITs were oriented towards these inter-cluster roads, while the minor ones occurred within the cluster courts, denoted both the social and economic attitudes spatially so

[134] He states '... Buru-Buru had a recognizable borrowing from Welwyn city in terms of individual plots, fencing, cu-de-sac roads, that were then a new ... Each house was provided with a space at the back- lawn for planting and trees' (Kigondu, 1989, p. 92)

accentuated. The cluster, in Buru-Buru rechristened the 'court', assumed a social grouping entity operationally strengthened with the powerful 'court' RAs, was thus a socially defensible and communal space for these owners.

The DITs emerged largely to address an economic value, not wholly accepted by the dwellers. That these commercial (and tenement) extensions were extraverted reflected the 'outsider' social placement of the tenant accommodated in the DITs. The same is an accurate assessment of the DITs that fronted the spine road and other major circulation arteries. This left the cluster interior less prone to haphazard DITs to maintain the socially defensible space. The management and physical measures that operationalized the social propensity included the 'gating' of the cluster. Figure 6-8 represents the generic DITs' propensity in the Buru-Buru clusters.

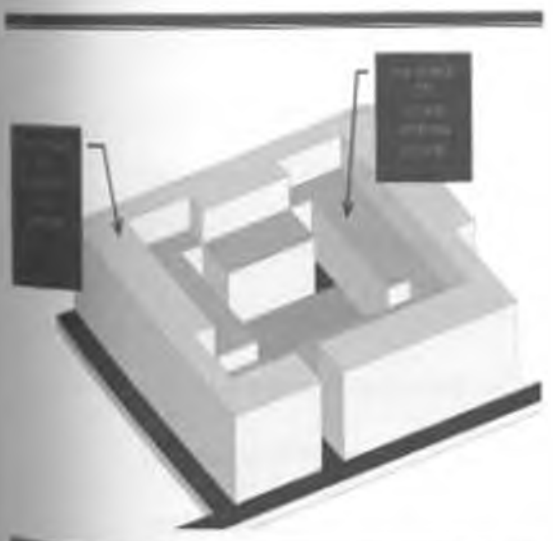


Figure 6-8 The Physical, social and economic order in the Buru-Buru cluster
Source: author, 2010

One can disaggregate the social, economic and the physical manifestations in DITs realisation in this UDE. The physical attitude was based on the scale adopted for the DITs situated within the inward, court-wards location that was largely lower than those on periphery were. Further the interior DITs were often minor in the vertical scale, and used for ancillary purpose like garages, storage,

garbage sheds, and other ancillary uses. The interior 'court' was thus a socially delimited space reserved for the owner-occupier owners of the 'court'. The socially 'defensible' space attitude prevailed over other space uses.

Thus, the extensions, located on the edges of the courts were on the other hand meant to accommodate the economic space propensity by the dwellers. These DITs were excluded socially from the 'court' as manifest physically. Access here was thus mainly from outside the court. The vertical physical scale also reflected the same. They were, multi-storeyed and of 'permanent' technology. Functionally, the inner courts avoided non-residential functions like commercial shops and kiosks. The ambivalence imposed by the accommodation of the 'outsider' tenant and the privacy and middle-class aura was thus realised, through this mutual accommodation of the social and economic functionality.

Compared to the clusters in Kaloleni, the 'defensible' space concept can be understood in Buru-Buru in several ways. Though appropriately scaled, the Buru-Buru clusters however made porous due to the pedestrian linkages amongst them. This fact led to Type 'A' DITs at cluster level represented by the scaling and usurping of these accesses. The lesson here is that the hierarchy of the public/ space dichotomies established was tampered with and made ambiguous by the introduction of these pedestrian passages. Pedestrian paths introduced a conflict between the pedestrians and cluster dwellers, and in the process distorted the established neighbourhood hierarchies. Indeed, it

is a common architectural folly to create accessible neighbourhoods by this overabundance of spatial freedom in place of the preferred containment and thus, 'gating' by the urban dwelling communities.

This spatial freedom must have prevailed more prominently in the Kaloleni case with the porous cluster formations. The architectural lesson was then that containment within clusters was premised in the controlled access through lockable and manned points, and not the merely symbolic cluster geometry. As defined, the clusters were useable by a limited number of people but this did not exclude the pedestrian passers-by. Another dimension was that the security of a contained court was by virtue of constant use rather surveillance, and this explained the need for the appropriate scales and the exclusion of porosity occasioned by the paths.

In summary it was the physical scaling (single vs. multiple storeyed), the access orientation (extroversion vs. introversion), functional exclusion and inclusion (commercial vs. residential), (tenant vs. owner-occupier), and the technological ('temporary' vs. 'permanent'), which guided the DITs propensity in the clusters.

In studying clusters, the scale of the open span courtyard the units fronted seemed central to the decisions to transform space in the two case estates. The large courts in Kaloleni invited the urge to redefine the shared space, seemingly due to the expansive and hence impersonal scale. This position echoes concepts of New Urbanism (Steino, 2004) (wikipedia, 2009) (CNU), 2009) where buildings should be scaled to appropriately define urban space.

Such building should 'define and enclose public space' and not just 'sit in space' (Steino, 2004, p. 73), reminiscent of Leon Krier's (1981) 'urban quarters'. The transformations in physical space that centre on the cluster were but dweller expressions to redefine the otherwise ill-defined urban space in the cluster formations.

The low density in Kaloleni is also another factor contributing to transformations. Adhering to the 'Garden City' concept, the neighbourhood units created low-density sub-urban environments that were devoid of urban qualities. Jacobs and Appleyard (2000) advocate 'livable streets' with a minimum density as a supplement to maximum density requirements. The low density for the detached dwelling neighbourhoods, which inadvertently has been the result of the Kaloleni courts, created scant avenues for the necessary social and physical interaction.

6.1.2.3 The apartment block in Kaloleni as UDE

On the evidence of the Kaloleni flat blocks one can conclude that, as a grouping element it was singularly unsuited for DITs. This can be related to the technological challenges and inhibitive costs such a venture would attract. Such constructions require more sophisticated agency arrangement rather self or self-managed construction processes that dominate most DITs' processes. Indeed, only minor internal (Types 'B' & 'C') transformations were the only ones observed in this UDE type. Nothing was observed that seemed to promote the grouping type.

Although, not fully explored in the present study but briefly broached in the above comment, if the evidence of DITs was the measure, then the apartment block can be termed as a 'negation of the city'. Panerai etal. (2004) in their study of their urban block, believe the typology as articulated in the Le Corbusier's Unite d'Habitation was the 'last metamorphosis of the block' as:

> 'The absence of articulation is cruelly perceived with the consequence that making modifications, other than the addition of new units or limited individual appropriation within the dwelling cell is impossible.' (Panerai, Castex, & Depaule, 2004, p. 121)

Positions on the on the suitability of the apartment typology for transformations can assume two divergent poles. The first views the lack of room for adjustments as negative, while the other does not.

The later condones transformations and condemns the lack of such avenues in the apartment as bad. Such positivist views condoning to transformations are prone to use DITs as an alternative housing production mode, and thus relegating the government and formal institutions to a mere dormant observers. Further, this ignores the likely negative effects, of crowding and strains on infrastructure, of the uncontrolled transformed spaces.

The other view prefers controlled environments that retain the architects' objectives and condemns transformations. The apartment block suits this stance, and with some apparent merits. In the apartment UDE typology, the apparent indifference to the 'defensible' spatial transformation was

illustrative of the block's suitability as a defensible space as it were, requiring no further adjustments. Thus contrary to the thesis by some that apartment block was the 'negation of the city' (e.g. Panerai *etal*., 2004), the DITs study of the apartment block seems to confirm that the apartment block was 'defensible' and no efforts were needed to contain it further through transformations.

The lesson applicable to housing strategy gathered from the apartment typology was its suitability for controlled aesthetic in formal housing schemes. This may be suited for group-owned schemes. This can apply to housing, managed through the 'corporation' stipulated of the Sectional Properties Act (RoK, 1987) and rental apartment blocks privately owned or by the public sector. Other ownership formations include housing cooperative society and employer-provided housing. This aims to deter transformations that may affect of the desired society/spirit and goals. This discourages the DITs' propensity, a strategic choice suitable to some.

Despite their divergent results from the UDF sub-units of analysis from Kaloleni and Buru-Buru a common strand emerges where transformations were geared to creating a defensible spatial formation. From Buru-Buru clusters, one learns that the clusters defined socio-physical territory only reinforced by the dwellers' communal actions.

The two UDF typologies in the Kaloleni case were equally informative. With the courtyard clusters responding to the provided court typology and scale by recreating the preferred 'defensible' space. The same can be said of

Table 6-1 Comparison of DITs' type in the cases

DIT type	Kaloleni %	Buru-Buru %
A	10	98
B	[illegible]	100
C	[illegible]	[illegible]
D	[illegible]	41

Source: survey, 2010

the apartment block, yielding contrary results that reflected its containment and hence the futility of further DITs. It was only a theoretical and not literal affirmation of the courtyard 'defensive' space.

6.1.3 DU Level

The physical order in transformed units used the four categories of transformation; types A-D. These results were all a reflection of the physical transformation imposed by time, place and agency, as elaborated in the following sections.

6.1.3.1 The time factor in DITs' types

Undisturbed by the human agent, the physical entities provided in the formal estate would be subject to transformations necessitated by the passage of time. The other direct reference to time passage as an agent for change is the wear and tear that buildings are exposed to over time and usage. Transformation at this level responds to issues of sustaining a use value through maintenance. The two cases reflected two approaches, adopted by the dwellers, in the frequency and hence timing of the transformation types (Table 6-1).

Kaloleni dwellers prioritised internal transformations (Type 'B') as first priority. This reflected their tenancy status, a fact of the limited rights to the house. The internal acts were about fortifying the unit to secure and establish 'defensible space' for the household. For Buru-Buru, type 'A' was the

commonest and therefore priority DIT, simply because securing the plot and hence defining territory was paramount to ownership in this mortgage scheme. Although the results were contradictory, the two findings support each other in that the dwellers in either case aim to secure the DU for basic utility.

The second priority and thus the timing of the DIT type in Kaloleni were the internal subdivisions (Type 'C' DITs), which aimed to convert space for better utility, for instance the internal incorporation of the semi-enclosed kitchen as well as the verandah. This was also understandable given the paucity of spatial provision in single, double and triple roomed typologies used. This however was internal to avoid overt change that attracted the wrath of the authorities. For Buru-Buru the second (and Third) priority change was mainly the 'skin'-based in addition to the internal modification (type 'B' & 'C'), to create more conducive internal space.

In Kaloleni, the last two changes (Types 'A' & 'D') often merged, with quantitative DITs and boundary definitions coming concurrently. Thus, added space went some way in defining the edge of perceived territory in the rental scheme. In addition, the added space was used for household consumption to alleviate the paucity imposed by the smaller units now inhabited by a mostly larger household.

These later phase changes constituted structural changes as they added an independent structural entity in the 'lean-to', 'clip-on', and 'add-beside' units that physically defined DITs in Kaloleni. They also implied larger capital

investments that affected the householders' budget. Such choices thus invoked adequate financial planning that consumed time. In Buru-Buru, the last DIT was also space-adding (type 'D'). These additions of new units were driven largely by the economic drive, to earn more income form the tenements.

With regard to timing and prioritisation of the transformation type, the two cases concurred. Qualitatively, security and territorial definition, basic utilitarian functionality was the topmost priorities. They concluded with the quantitative additions of the extensions used variously for sub-tenancy to subsidize the household income. This was also for social ends in supplementing the householder's space needed additional to the basic DU in Kaloleni. Figure 6-9 illustrates this hierarchical order of transformations the cases.

This model approximately echoes Brand's Schemata (Brand, 1994) of the six 'S's: site, structure, services, skin, space-plan, and stuff. Thus the first priority approximates to the first 'S'-site, the next priority matches the 'skin' and 'space-plan', and the final priority of the extension concerns the 'structure' and the 'space-plan'. The 'services' (the 'guts' of a building) and 'stuff' (artefacts and furniture) were not investigated, and are not ranked in our schemata. Because of their quantitative nature and prominence, the type 'D' transformations deserve particular attention.

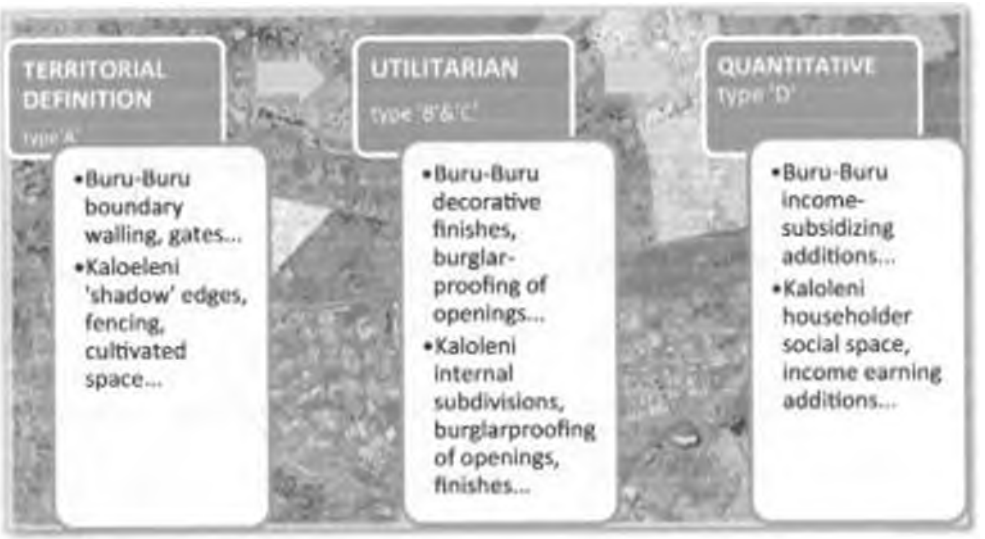


Figure [illegible] DITs' hierarchical order
Source: author, 2010

6.1.3.2 Extensions -quality and Independence

The spatial strategy at DU level, spurred the nature and articulation of the extensions. This affected the spatial quality of the environment on the micro and broader levels of the neighbourhood. The extensions are 'additive' transformations as opposed to the 'subtractive' ones which are internal modifications. The DU level strategy can be understood at two levels: the unit typology and the relation to the site. The former investigated the spatial qualities of the type plan; including the space types, their areas, room types and numbers, the storey levels (bungaloid or maisonette types), physical articulation (detached/ semi-detached/ terraced/ apartment types), organisation (courtyard/linear), among other considerations. The site articulation defined the territorial control the unit to immediate ground. Thus, the plot or 'plotless' articulation influenced the DITs' propensity, articulation, and scale.

Table 6-2 Comparison of site definition and extension technological choice between the cases

Site definition		plotless	
Frequency of Extension technology (%)	temporary	89	2
		11	98

Source: survey, 2010

independently was safer as it did not affect the provided dwelling structurally. It was also prone to compromised technological quality and would thus be experimented with without impacting the provided dwelling. However, such additions were invariably more expensive and this accounted for their limited frequency.

The most obvious spatial contributor was the independence of the provided DU occasioned by the plot formation in Buru-Buru as opposed to the undefined Kaloleni articulations. The plot defined compound and thus the spatial territorial extent. Between the case estates, the initial concern was the 'plotted' site as a form in Buru-Buru versus the 'plotless' formation in Kaloleni.

The plot, defined some legal jurisdiction over the land, and this spurred confidence to the dweller to embark on durable additions. The opposite was true for the plotless formations, with 'temporary' additions prevalent in Kaloleni estate. Its DUs which were horizontal clusters or vertical apartment block, were ambiguously defined by the expansive courts, and amenable to these unilateral DIT formations at the expense of the common courtyard.

The ambiguity lied in the 'plotless' formation of the large courts which related poorly to the dwellers. The poor relationship was because of inability

to 'own' court communally. This led to DITs whose initial objective was to create an 'owned' territory in a 'mini' courtyard abutting individual units and/or indeed a preferred plot formation; the 'shadow plot. The impermanent 'temporary' technology employed in the extensions was a further reflection of this ambiguity of space. Table 6-2 tabulates the case characteristics and frequency of different technologies used in the extensions.

The 'plotted' forms, on the other hand, were most amenable to DITs erected within the plot, further illustrating that the unilateral action was an individual choice, rooted in the tenure, and perceived 'ownership'. In Buru-Buru, such was reinforced with the use of durable materials in transformations. 'Plotting' seemed to instil more confidence amongst the dwellers, and resulted in notable transformations.

Central to the DITs propensity, to the 'plotting' strategy was the ownership and creation of a defensible territory. To the dwellers, this pointed to the legitimacy of the act of transformations.

For the apartment typology, it was apparent that the grouped forms, as in the apartment block, restricted the desire to transform, a factor that was eliminated within the 'plotted' types. The 'plot' was thus the catalyst for transformations.

6.1.3.3 DU form and extensions

The DU provided influenced the nature of extensions in divergent ways.

The Buru-Buru independent typologies of mainly semi-detached maisonettes and bungalows were largely indifferent to the form and typology

of the result. This was because the dwellers' objective to create independent additions to be used independently as tenements. This was because of the spatial provision in the original DU, were adequate for the middle-income owner-occupiers.

The extensions were for economic fulfilment only, and this elicited unforeseen functional deficits. This was because the economic objective contradicted privacy requirements. The result was public orientation of the additions towards major circulation arteries, an extroverted articulation. It was thus of an economically fulfilling space that was socially accommodated and realised physically within the scope of the plot. The siting of the extension on the plot and its location within the scope of the estate, all confirmed the position by Brand (1994) that the geographical setting, its urban location and the 'legally defined lot', were central to the transformation propensity of a building. Unlike cities with deep-rooted histories in which he based his analysis, Nairobi is reliant on the economic reality and the need for the DU to subsidize the economy of the household. Figure 6-10 illustrates the articulation of the Buru-Buru extensions.

Figure 6-10: Schematic DU in Buru-Buru - correspondence of DIT
Source: author, 2010

Kaloleni estate had linearly organised bungaloid units with minimal private space. The extensions therefore aimed to bridge this void by creating the defensible 'mini-court', the key ingredient of the transformations. The 'mini-court' was a family private space or a

Figure 6-11: Kaloleni schematic DU layout - mini-court creation
Source: author, 2010

common semi-public space shared with the sub-tenants. The linear typology in the original units adjudged as less responsive to the household's privacy needs, elicited the 'mini-court' formation. Figure 6-11 illustrates the 'mini-court' formation in Kaloleni.

In Kaloleni, Brand (1994)'s schemata was in the actions on the open court that represented DITs imposed by and on the 'site' shearing layer. As in Buru-Buru, the 'additive' transformation were the main one possible, and this excluded 'structure' based transformations.

The analysis of the units indicates a direct relationship between the site formation, represented in the 'plotted' or 'plotless' formation and the extensions prevalent in either case. The apartment form formed the opposite position, whereby the 'site', deleted from the equation, formed the basis for not transforming.

6.1.4 The Technological strategy for DITs

Technology in building and housing transformation was viewed as composed of the process of construction, the materials used and the design form. The DIT was the technological product and this was manifest as design (the 'architecture'), the materials and the construction 'process' of its production. For a formally evolved estate, the technology used is seen as

imposed to the dwellers who in turn attempt to appropriate it through transformations.

The process of transformation contributed immensely to the spatial quality of the product. As implied in the term, the process was dweller initiated, but this went further into management of the construction activities that included procurement of materials and site administration. This is normally a preserve of the professionals and contractors. The DITs technological form, defined as 'temporary' or 'permanent', exposed various aspects of housing production. This ranged from the materials employed, nature, and form of the self-initiated design and the role of the dweller in the DITs' realization.

6.1.4.1 Builders of DITs

The two cases contrasted in the process of realisation. The case of the DIT process in the rental estate of Kaloleni anchored in the 'illegal' nature and the 'temporary' technology they invoked. No formal contractors were involved in these 'temporary' extensions as a result, relying more on the artisans and sometimes through direct participation by the dweller. Similarly, in Buru-Buru, though the extensions were still mostly illegal, the predominantly 'permanent' additions demanded builders that were more skilled.

The transformation process was thus self-initiated and the builders were predominantly *fundis* guided by the dwellers in the design, budgeting and programming, as well as material procurement. Thus, the *fundi* 'contracts' were dominant in both 'temporary' and 'permanent' DITs[135]. Total self-help

[135] Ackom (1991) has three categories for self-help building that dominates the building process in Kenya, where the dweller does the; (a) building, (b) management and (c) only self-initiated

building was rare[18]. Participation with external support was mainly possible in the 'temporary' additions like in those of the Kaloleni Rental Estate. Here, the members of household performed most of the building tasks, with occasional assistance form the friends and other relatives, or the artisan (the *fundi).* Procurement was localised, from the nearby hardware shops and timber stores, and managed locally.

6.1.4.2 Transformation Materials

Unlike, the formal housing provided in both case estates where the materials used were predominantly factory processed, the DIYs chose other alternatives. This ranged from those semi-manually processed from *Jua kali* yards in the vicinity, to the use of the factory-processed ones like *mabati* and timber. Some recycled materials were also evident in the 'temporary' extensions.

The use of manually and *Jua kali* processed materials in the 'temporary' or 'permanent' additions was a positive verdict on the informal economy as a resource for urban housing. It was thus also a pointer to the economic, social and physical aspirations of the dwellers, in that the dwellers controlled the supply chain of their shelter materials' procurement process.

It was also a comment on the Building Code requirements as applied in the city. Indeed, the Grade I Bylaws sanction only 'permanent' materials, but the dwellers seemed to balance and prioritise their physical, social, and economic resources with the aid of these technological choices.

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[18] There was only one case of a dweller directly engaged and in self-building. This case was only possible in the transformations of Kaloleni. The incident however involved both 'temporary' (external) and permanent' (internal modifications) technologies

From a physical stance, the 'temporary' inferred a short duration but it also about the insecurity of development on often-encroached land and of a function out of line with the land use planning by the authorities. In Kaloleni, it also invoked the economic perspective of the low-income dwellers with their constrained disposable capital towards housing. In Buru-Buru, the 'permanent'/'temporary' dichotomy was reduced to encroachment or otherwise of common land.

The 'temporary' materials often were locally sourced or recycled factory products, and this inferred lowered costs to the dweller developer. It was noteworthy that not all materials used in the 'temporary' DUTs were manually processed. The construction detailing of the units was also informative as some products were used in their traditional roles. For instance in the extension in Kaloleni, walling materials included CGI sheeting that is traditionally for roofing.

This was a pragmatic choice to save costs. The 'temporary' classification was thus about the elemental detailing and not the materials used, *per se*. The floors were a slightly elevated plinth based on manually compacted rubble stone or broken brick for hardcore, which were finished with screed, avoiding a concrete floor slab in the process, another cost-saving measure.

These were technologies improvised and outside of the Building Code, Grade I Standards. The dwellers also improvised openings as in walling and floors. The openings of doors and windows were also often from the CGI and timber shutter combination. Thus, a framed timber shutter could be finished

on the exterior with a CGI sheet piece, in addition to a normal timber shutter. The dwellers thus preferred the functional, cheaper but less durable roofing materials of CGI and timber for the wall and openings as this conformed to their economic wherewithal and in the fear of legal repercussions.

6.1.4.3 The design of DITs

Who shapes the design products in the DITs' environment is as crucial to the process of DITs' formation as the materials and constructions discussed. The dominance of the self-help actions, supported in the materials used, their processing and application to the house. In construction process, the *fundi* and dwellers worked to shape the emergent DITs environment.

The design products were equally self-made and evolved spontaneously through felt spatial needs by the householders. For instance in Kaloleni, the natural tendency was to evolve a 'compound' based on the 'starter' original unit that the household rented. The domestic spatial needs determined the additions and hence their limits, as was witnessed in the DITs. Thus, the scarcity of space to accommodate an adult member of the household, for instance, was a primal demand and need for the move to transform. Here, the subsequent additional DIT space for a sub-tenant respected this newly defined 'territory' in the compound. Such was the evolution of the design product in the cases; a responsive action based on the dweller's needs.

The role of the dweller in the design of the product in the 'temporary' technology DITs was total. The 'permanent' had a minimally diminished[131]

[131] Out of the sample, only one case was designed by an architect, representing less than 1%. That figure may however be less than accurate as significant numbers engage professionals for permanent

role for the dweller. Regardless of the delivery strategies, the resultant DITs were represented as either 'temporary' or 'permanent' technology, and this pointed to the origination, roles and level of participation by the dwellers in the housing process. Table 6-3 summarises these levels, roles and phases in building of different DITs.

The dweller participated in all levels of material /component, the building and the design, in the 'temporary' DITs as witnessed in all the cases. Stooped

Table 6-3 Technological Characteristics of DITs

1	LEVEL	Material / component	Self & family	Family
		Building	Self and family	Family
		Design	Self and family	Self, family & architect
2	ROLE	Decision making	Self and family	Self
		Use	Rented	Rented
3	PHASE	Investment	Self, social loans	Self, bank loans
		Operation / rehabilitation	Rental, 'pseudo-tenancy', self occupied	Rental, tenancy
CASE EXAMPLES			Kololeta court extensions Huru Huru encroachments	Huru-Huru mini plot extensions

Source: survey, 2010

in illegality, the 'temporary' additions demanded an audacity and courage to confront the law-enforcement actors of the NCC. The *fundis* were like an extension of the dweller's arm and thus often enabled the process. This situation prevailed even at the roles of decision-making and production through the self-help process.

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construction. This is mostly to attract finance using the approved drawing as collateral. However fewer adhere to the approved designs, preferring to unilaterally adjust the approved provisions. The approved DITs were in conformity with the change in Huru-Huru estate initial control regulations of 35% plot coverage (PC) and 0.50 plot ratio (PR) that were revised upwards to 50% PC and 0.75 PR; thus giving allowance for spatial additions. This change permitted an additional domestic servants quarters (DSQ) only. The DITs' findings showed that this had never been overdeveloped. Thus, the approvals seemed only an excuse to keep off the NCC inspectors, when in reality the dwellers developed what they preferred

The dwellers thus directly financed the temporary extensions, as no financial institution would not oblige. The family sourced, 'social' loans were another avenue for financing. In summary 'temporary' extensions remained a sole responsibility and a risk taken by the dweller.

6.2 The Social Strategy

Dweller-initiated transformations as a social phenomenon was the response to the provided strategy in realising a convivial urban environment. The dwellers respond within frameworks of space, time and agency- their own social aspirations and within a formal institutional frame.

6.2.1 Time in the social strategy

Over time, formal housing assumes different social meaning to the dwellers. In Kaloleni, the lengthy stays generationally by members of the same family implied a transformation of the mode of dwellership from tenancy to a *de facto* 'ownership'. This spurred transformations to accommodate social needs. Buru-Buru's case was different as the duration of stay was shorter. The short stays in owned units spurred transformations of both a social and economic nature.

In Kaloleni, the elongated dwellership was a key social driver for transformations. This was manifested in several ways including social 'triggers' (Seek, 1983)that included the maturation of the offsprings and siblings, the demise or retirement (and hence translocation) of the original tenant. The DITs thus reflected the social transformation. The growth of the household demanded more social and physical space. Thus, maturation of

offsprings promoted privacy amongst different age and gender groups. Long-stay dwellers illustrate the link between physical transformation and household evolution. In Kaloleni, given the limited housing choices tenants had, they opted to unilaterally add space (type 'D' DITs) and /or modify internally the NCC provided spaces.

A longitudinal and biographical study of the respondents in Kaloleni guided the discussion of time as social driver for DITs. The long-stay was manifest in that only a handful (8%) of the respondents had tenancies of less than ten years. The rest had generationally transferred tenancies that stretched over fifty years, back to the colonial era.

Concerns for privacy occasioned by the maturing offsprings occasioned subdivision of the main spaces provided. This recognised the limited space provided for a household, given the multiple children most families had. Further transformations, in the additional rooms (type 'D' DITs) and usurping adjacent common spaces like verandahs, corridors and stores as living space (type 'C' DITs), were also socially driven by the need to accommodate demands for more privacy for more independence needed for emerging married offsprings or single parenthoods.

The common strand was that no alternative affordable accommodation was at hand, and the household had to manage within the physical resources at hand within the Kaloleni DU. These social functions demanded new meanings imposed by time aimed at social accommodation of the emergent scenario.

Buru-Buru dwellers had more options given their middle-income status, and higher security of tenure accorded by the mortgage ownership of the units. Time in the social dimension less important given the short duration of dwellership, and hence could not be associated with the emergent DITs. It was also noted that the largely nuclear and monogamous family linked to the more socially westernised middle-class that dwelt here was well-suited for the house typologies used. The impetus for time-based social growth that would have demanded more space was lacking.

6.2.2 Space in the social strategy

Transformation of physical space reflected the dynamic social demands of the dweller-household. Kaloleni was the obvious case given the paucity of space with their low-income in the provided unit. In Buru-Buru, this social dimension was manifest in another way as the drive to earn income from the owned space through extensions imposed conflicting social demands of privacy between the new sub-tenant household and owner-occupier.

In Buru-Buru, the physical manifestation was the independence of the added units that was always an extension (type 'D' DITs). For Kaloleni, when there was a subtenant, the same social distinction and segregation trend was not obvious since the sub-tenant was of the same social strata. The social separation in the extensions was therefore in the creation of a privacy gradient and distance from amongst the dwellers of a different social class and functional orientation.

In Kalolcni, Habraken's (1998) 'orders' of control of space through 'place' formation as well as Newman's (1972) take on 'defensible' space is a key social connotation that explained the transformations. Indeed, it signified the aim to create territorial order as much as it was a physical one. It was a reaction to the impersonal open space and defined the desirable alternative. This was different in Buru-Buru where it was fortification through 'gated' cluster communities and social exclusion of the economically driven extensions. The aim was however similar- to create socially exclusive space that could afford social privacy and control by the dweller.

6.2.3 Agency in the social strategy

The most important aspect in terms of implementation of DITs was the central role of the dweller and hence the exclusion of the agent, unlike the provided units in the formal estate formation. DITs thus reflected the direct and felt needs of the dweller. This however did not mean that no social conflict emerged from the realised products. Indeed, as seen above in Buru-Buru, the drive for commercial gain, created spaces where social conflict was rife. The adjustment in the physical articulation of the added unit was thus inevitable.

In the transformation process, the dweller was always in control in aspects of design and construction management. The drive to transform can therefore be seen as re-asserting the lost role of the user common in vernacular dwellings (Anyamba & Adebayo, 1994) (Denver, 1978) (Rapoport, 1969)

and/or encouraging dweller participation lamented by several authors (Shihembetsa, 1995) (Turner, 1977) (Hamdi, 1991) as alienating the dwellers.

Some authors perceive the use of the owner-occupier to guide transformations negatively as it led compromised spatial standards. Indeed, Rukwaro (2009) views this 'owner occupier democracy' as only violating building by-laws, and advocates a consultative process and inclusive process of revising the by-laws as the guide to mainstreaming the felt needs of the transformers in housing neighbourhoods.

6.2.3.1 The Ownership Strategy and DITs

The ownership model in the study defined the mode of housing consumption but it also inferred the legal status of the occupation. The extent and nature of transformations elaborated the dwellers' understanding and legitimate appropriation of these concepts. It is so given the use of the space also implied some form of 'ownership' as established in the guiding covenants as well as its interpretation by the parties. This direction introduced and distinguished the two terminologies of 'legitimacy' and 'legality' of spatial consumption in housing[138]. Transformations were legalisation or legitimisation of space use, within or outside of the individual's perception.

The rental[139] stratagem in the in Kaloleni implied minimised 'ownership' rights, while the owned alternative in Buru-Buru implied more dweller-

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138 These terms, that often largely mean the same, are distinguished to introduce the position where the 'legal' is as defined in the law while the 'legitimate' is authentic, made acceptable and justified by need even if were not legal. Webster's The New International Comprehensive Dictionary of the English Language, Encyclopaedic Edition, 2003 Edition, is useful in the definitions.

139 A distinction is however, necessary as the case was a public scheme that was conveying a social service value to the public by the authorities. Indeed, a private rental scheme would infer more restrictions to the tenure, in

autonomy[140]. These two cases aimed to illustrate that the *legitimate* demand for space that addressed the physical, social and economic demands of the dweller, was the driving force for DITs. The cases amply illustrated the point in a somewhat contrasting fashion.

In Kaloleni, despite the rental strategy, transformations were unabated. The new 'mini-courtyard' formation in the DITs signified the social creation of a 'defensible' space near the provided DU. It contradicted the conventional explanation that such additions signify economic greed and thence a justification for demolitions often adopted by the authorities. It was thus more conducive to the conventional dweller usage as the DITs entailed improving security and privacy and 'containment' through the creation of the compound court. Other uses supportive of the socially justified addition included, a garden, a fence, cultivation, and ancillary spaces like storage.

These seemed legitimate spatial aspirations for 'home-making' in the otherwise 'ill-defined' house of Kaloleni estate. Thus, despite the assured non-compensation and even demolition by the authorities, the dwellers defied the legal restrictions to erect appropriate spaces for their own use. The key lesson in Kaloleni was that the legitimacy of space as DITs was accepted but it was constrained because of the low premium accorded to rental tenure in the public estate.

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reality, even if on paper there were no such variation. This is compounded by the fact that public rental schemes have large subsidies that make them highly popular to the low income

140 The autonomy in the mortgage models is also qualified and not absolute, as the authorities [illegible] urban settlements control the physical developments possible. Further, the mortgagor would also worry of unilateral physical alterations as this may affect its economic value against which a loan is advanced.

The 'owned' strategy in Buru-Buru was different in form and yet equally legitimate in the spatial and functionality aspirations contained in the emergent DITs. The use of 'permanent' technology in the DITs was but an allusion to confidence and security of tenure in the 'owned' strategy. It also aimed to maintain the 'middle' income status of the estate and the unit. Supportive of this faith, the 'permanent' development on the plot, legally owned, was contrasted with the 'temporary' technology on the encroached public common spaces like the road reserves.

Spatially the DITs in Buru-Buru (save for the use of 'permanent' technology), were inferior to those of Kaloleni from a social space formation perspective. They did not define spaces conducive to household use within the plot, 'compound-formation' as witnessed in Kaloleni. Instead, they were extraverted and even independently accessed, which led one to believe they responded largely to an economic rationale of income generation as private rental housing or commercial purpose shops and kiosks. It was probably understandable given that the spatial requirements of the Buru-Buru dweller had been satisfied through the ample spaces within the provided units.

The essential remark regarding the ownership models and DITs is that regardless of the legal tenure, spatially there was legitimacy in adding space The actualisation in technology used, was tampered by the legal status. The position taken in the study is that the dichotomy of 'legitimacy' and 'legality' is a valid point of departure for the discussion on the DITs' role in shaping

living environments. It is also about *de jure* and *de facto* 'ownership' and self-appropriation by dwellers of their living environments.

The 'legal'/ 'legitimate' dichotomy is a useful tangent to the discussion of DITs in two schemes of Buru-Buru and Kaloleni. The 'legal' is viewed as that encapsulated in the tenure rights and by-law requirements; whereas the 'legitimate' is what is felt functional need by the dweller. Thus, what is 'illegal' is legitimised through DITs.

Key to the functionality in the cases was the mono-functional nature of the formal housing estate. This stratagem assumes that spaces in housing estates are exclusively utilised for residential ends, a social function. Yet the reality of income generation, was evident in all the schemes. This multi-functional nature of housing was evident, more powerfully, in the 'owned' strategy adopted in Buru-Buru. The case in Buru-Buru was not of household spatial deficiency, but lack of accommodation of alternative income generating function.

6.3 The Economic Strategy

Long understood as investment (Skotte, 2004) (Wells, Spence, & Dudley, 1993), housing in the context of dweller-initiated transformations needs to be appreciated for her contribution to the a rollout of such benefits to the city and country. Already Tarekegn (2000) and Tipple (2000) recognise that transformations are to large extent used for home-based enterprise in the low-income areas they studied. De Soto's (2000) (1989) (2002) (2002) (2004) argument for tenure rights and privatisation to realise economic benefits from housing goes some way to promote dweller rights and assumed in DITs.

Nguluma (2003) also states the use of local *Mafundi* - local artisans in the modernisation in Dar-es-salaam, that was employment generating. Thus, the findings illustrate the likely benefits accruing from housing when the dweller assumes some autonomy.

6.3.1 Time in economic strategy

As an economic strategy, transformations are timed to merge the dweller's economic priority objectives. This caters for flexibility in the timing expenditure to capture the felt needs. The scale of developments encountered in DITs are small and demand a responsive retail market for building inputs as much as the anticipated rental market for the housing stock added to the market. As an investment, the dweller sources input costs from savings, social agencies, or micro-finance institutions that may only allow time-based flexibility in repayment terms.

Income levels[91] in Kaloleni were below KES 25, 000, those of Buru-Buru's middle-income dwellers ranged between 25,001 KES and 120,000 KES. An obvious justification for the emergence of DITs in formal housing is economic and with assumption, the dweller establishes beforehand the endeavours was economically viable and thus a good investment

DITs were drivers for economic needs of the dweller and hence useful in their empowerment. The Kaloleni example illustrated this position. Rents paid to NCC in Kaloleni varied from KES[92] 700 per the single room to KES

[91] According to the Kenya Central Bureau of Statistics, income brackets in Kenya are: low income- below 25,000 KES, middle income- between 25,001 and 140,000KES, while high-income is above 140,001 KES (CBS, August 2007).

[92] 1US$ = 70KES-Kenya Shillings

1500. Returns from added rooms, built from mabati on a timber frame, was from KES 2000 to KES 2500 per room. The dwellers were able to repay NCC rents and other charges[141] from the added dwelling and use the surplus income to subsidise other domestic needs.

6.3.2 Space in economic strategy

Use of space for housing development is necessarily an economic choice since it consumes resources: land, building materials and capital. The decision to transform presumes the availability of a site or space within the provided DU on which to base the DITs. Thus, for transformation to emerge, the spatial strategy must have provided for this eventuality, an economic consideration.

The first indicator of spatial resources that informed the DITs' choices was the individual DU definition of the 'plotted' in the Buru-Buru estate and the 'plotless' morphologies in Kaloleni. The lack of a defined spatial form catalysed extensions in Kaloleni. These were however aimed at defining territorial and hence economic control. They were thus minimised and used 'temporary' technology. The plots in Buru-Buru further spurred extensions since the territorial control was in place. The reasons were however different as locational factors, that spurred the economic drive, played a dominant role. Thus, the differring forms of access to land defined in the 'plotted' and 'plotless' options were however not a deterrent to DITs, only the physical quality and the thus investment value.

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[141] Includes estimates for NCC water and sewerage charges, KPLC electricity supply charge as well as a garbage charge paid to freelance youth groups (e.g. FLITE group) within the neighbourhood that charge about KES 20 / polythene garbage bag full of garbage

Another special strategy with economic implications was the grouping form, distinguished by the cluster and apartment typologies. As a physical strategy, the apartment form optimised on land-use; saved space by accommodating more units on a given acreage. However, the choice reduced the chances of the dwellers, to engage in extensions due to the economic and technological consequences. The horizontal ground-based UDI typology was always prone to DITs with both case estates reporting a high propensity. This was as much an economic choice due to ease of adding units technologically.

At the DU level, the variation in the typological types was limited and as such, the most significant effect was the areas. The storey levels were hardly a contributor to the DITs' choices. The size of the provided was however influential in the DITs propensity. In Kaloleni where all unit types seemed ill-suited in size for the large household sizes, DITs were added to satisfy the shortage of physical space in the provided DU. This had the inevitable economic consequences.

6.3.3 Agency in economic strategy

The economic agent in the development of the housing estate invariably excluded the dweller by using formal production agencies like contractors for the building process. The direct benefit to the dweller was thus reversed in the participation during the dweller-initiated process that guided the DITs. This was a major advantage for the dweller.

7 CONCLUSIONS AND RECOMMENDATIONS

The components of the conceptual model and the analysis, guides the conclusions of the study presented in this chapter. To restate the position: the social, economic, and physical dimensions were contributors to the nature of transformations in the case estates of Buru-Buru and Kaloleni.

7.1 Conclusions

The conclusions refer to the established social, physical and economic dimensions of transformations as related in the earlier chapters.

7.1.1 DITs as creation of Social Space

The two cases illustrated that transformations were efforts at the level of dwelling unit (DU), urban design grouping element (UDE) and estate level to create social meaning. However, this was guided by the physical strategy at these respective various scales. The social entity at those physical scales determined the social influence to the emerging DITs. As such, the occupant householder characteristics influenced DITs to the DU, while the cluster /apartment community guided (often covertly) the direction at the UDE level. The same can be said, but to a lesser extent, of the estate level.

At the lowest social level of the unit, the social dimension was about the spatial attitudes of accommodation of the new tenant or other non-residential functions that were now socially intruding. Transformations at this level aimed at socially consolidating the original householders' vital role and pre-eminence.

This stance served to alienate these new dweller(s) and was only realised by the re-definition of the existing physical space through the transformations.

The two cases, however, demonstrated this principle in divergent ways. In Buru-Buru, with her middle-class genesis, assumed the socially exclusive attitude by the spatial disposition and articulation in the extension. The attitude in Kaloleni was different, and aimed to socially 'enclose' and 'include' include the new tenant household, if at all, otherwise the added space was predominantly for the household's own consumption. The explanation was physical as it belied the adequacy of the provided unit in Buru-Buru. In Kaloleni, the paucity of the provided DU catalysed the drive for extensions.

In the former, the added space was exclusively for economical gain and hence the new dweller/function was grudgingly accepted but socially (and physically) alienated from the original. In the later, Kaloleni, the added space defined the court and 'shadow' plot exclusively controlled by dweller in the original dwelling unit. Since in Buru-Buru the sub-tenants were of a tenant class, it was presumed that they of a different social extraction, that was unlike the owner-occupiers in the original unit. The case in Kaloleni was different in that the new household was also of a similar low-income class stratum as a sub-tenant. They therefore socially merged into social environment within the 'mini-cluster' and easily mingled with NCC tenant household.

The grouping element the, UDE, was equally clear as a social manifestation of the DITs' propensity. Whereas, the disintegration of the cluster UDE in Kaloleni was attributable to the massive physical scales of the provided

courtyards. Buru-Buru's was a case of a cluster entity accentuated through the DITs by physically (and through management) excluding non-owners from the cluster courts, and thus the creation of a cluster 'gated' community. Largely a security measure, it also marked the creation of grassroots' social organisational resident's entity, in which other social and physical control matters common to the cluster dwellers were voiced.

Kaloleni cluster level extensions aimed to create a more socially cohesive entity, smaller in scale than the provided cluster typology. This marked the rejection of a social entity proposed by the architects and the emergence of a re-defined one. The mini-cluster formation, centred on the NCC tenant, mirrored the 'gating' witnessed in the Buru-Buru. It created a new 'territory', unilaterally assumed through *'de facto'* ownerships of the rental houses.

Another important lesson at the UDE level was the distinct attitudes demonstrated by the ground-based typology as opposed to the vertical type used in the flats. Thus, as already explained, the two ground-based 'horizontal' clusters demonstrated a propensity for extensions regardless of other socio-economic factors. The 'vertical' UDE of apartment typology demonstrated that the vertical physical UDE was ill suited for transformation activity initiated by the dwellership. This led to the conclusion that the 'vertical' grouping strategy served exclusively as deterrence to extensions. The reasons were indeed also economic as much as technological, but it confirmed that this vertical type created no social avenue and incentive for transformations. All transformations

at UDE level were but measures to preserve the social 'class' that was guided spatially through the physical provisions.

The extensions in the UDEs created the appropriate dwellers' response to, architects' social strategy. Central to the verdict on the architectural strategy were physical factors like the scale of the grouped intervention, the number of dwellers in the UDE, area/distance between the units, and the location of common physical spaces. Based on these variables, the Kaloleni case marked a rejection of the provided strategy. To the same extent, the Buru-Buru clusters were largely a positive verdict, reinforced through the 'gating' transformations.

Estate level social dimensions to DITs were not collective but were an accumulation of lower scale individual DU and UDE transformations. The individual propensities that contributed, in turn, responded to locational and incidental factors, like the proximity to a natural or manmade socio-economic feature. Thus, for example, Buru-Buru seemed 'walled' from the lower-income estates in the vicinity. Kaloleni was bordered by low-income neighbourhoods that were similar its dwellership, and easily fused into the adjacent districts.

Therefore, as a social phenomenon, the DITs phenomenon was legitimised at the three scale levels of the unit, the UDE and globally at estate level. This aided the clarification of the 'insider'/ 'outsider' spatial territorial demarcation at these scales. Legitimacy in the social DITs' formation was thus ensuring privacy, exclusivity, and ownership at these levels, and therefore creation of a socially 'defensible' space

The transformations are a further legitimisation of Newman's (1972) 'defensible' space thesis. This established a hierarchic gradation of spaces that occur within neighbourhoods to distinguish private, semi-private, semi-public and finally, public territorial control. The extensions were about physically defining the optimal extent of social control.

However, though not accurately Newman's objective, the creation of the defensible territory by the extensions aided in the control of antisocial actions[44]. The extensions defined socially manageable numbers necessary for the formation of a viable cluster. In Buru-Buru, the blocking and usurping of footpaths linking the clusters established a clear hierarchy in the use of the cluster spaces like the courts and common parking. This was also realised in Kaloleni by reducing the porously defined cluster forms though the introduction of the extensions

The findings in the cases correspondingly support Habraken (1998) in his thesis on the 'orders' of 'form', 'place' and 'understanding'. The order of 'place', territorial order, however is prominent and was well manifest in the transformation used to define the DUs and UDEs. Transformations were thus the demonstration of control of space where a choice about what was part of the social order or otherwise, was evident.

If extensions were efforts to control form, then their emergence is a reflection of the paucity of the formal design that largely alienates the dweller. Consonant with Forrester's (1989) cognitive limits of the designer in the

[44] Like crime reported in the clusters of Kaloleni

rational process, the social dimension is harder to capture to all, especially, if they are from a different social class. The 'soft' dimension to need entails an appreciation of 'hunches, intuition, loyalties, and doubts', all hard to satisfy and leading to the 'satisficing' (Forrester 1989, p. 55) stance that was the reality in the case estates. One may argue that with increased technology and sophistication in the tools of trade, we should have less of the fallible designer.[145] These only improve perception and comprehension of the past but can never simulate human nuances in the future. Secondly, the digital age has never adequately captured the social phenomenon, leading to the inevitability of transformations.

7.1.2 DIIs as creation of Economic Space

The economic motive was manifest in two ways- the tenement[146] formations and secondly, the introduction of the commercial functions at the levels of the DUs, UDE and the estates. DIIs as 'forward linkage' (Skotte 2004) where dwellers benefited directly or otherwise from housing was evident. The direct impacts were many and include home-based trade and production (Tipple's 2000) (Tarekegn 2000), and income from the rented extensions.

The premise to the addition of commercial-use space was highly dependent on the physical location relative to the circulation networks. This physical factor dominated economic choices for extensions used for income-generation. In Buru-Buru, though the dwellership was middle-income, the economic

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[145] E.g. Geographical Information Systems (GIS) and CAD as explored by some, like Napier (1994)

[146] Tenements refer to private rental space often associated with the owner-occupier subletting. See also (Huchzermeyer, 2006)

motive was surprisingly high, given that it had the effect of crowding and lowered the social and economic value of the units. As earlier related, the physical articulation of the extensions salvaged the situation.

In Kaloleni, the economic motive was limited mainly because the units were small and the legitimacy of extensions was predominantly in favour of the householder's social space. Despite this reality, the low incomes that prevailed within the dwellership meant some measure of sub-tenancy was an option adopted by a few.

7.1.3 DITs as creation of Physical Space[48]

The physical motive dominated all aspects, including the scale, nature, and type of transformation. The definition of DITs relied on four defined categories of: edge definition, 'skin'-based aspects, internal modifications, and extensions.

7.1.3.1 Edge definition (Type 'A' DITs)

A predominant concern across the cases was the boundary definition, and this preceded all other aspects of DITs. Indeed, where not defined as was in Kaloleni estate, creation of a 'shadow plot' was the first transformation type. In Buru-Buru, it was upgrading from the temporary bamboo and/or hedge to a masonry wall to define the plot.

The first conclusion is that a prerequisite to any other form of transformation was to establish a territory within which to operate, the plot.

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[48] Physical space usually entails the use of shelter for enclosure against the elements of the natural environment. In the cases, on did not witness transformations driven by enclosure conditions as Nairobi generally comfortable throughout the year.

Thus the ground based units aimed for land around the DU and UDE for ultimate control by the dwellers. The 'plotless' typology, as was the case in Kaloleni, was thus instrumental in edge-defining extensions and fueled the process.

The second lesson, which countered the above, was that transformation on un-owned and ill-defined land necessarily led to compromises in quality. This was thus evident in the case of Kaloleni[148] clusters and apartment zones. This was because by the absence of the plot, the designers had vouched for common usage and ownership of the space and thus any physical addition there would be unsanctioned. This is normally the excuse for informality[149].

Thirdly, the vertical typology posed a different and contrary proposition in the cases[150] as the avenue for creating a plot was absent. Thus it posed no avenue for extensions, and can only therefore be instrumental as deterrence to the phenomena of transformations.

7.1.3.2 'Skin'-based transformation (Type 'B' DITs)

The key to 'skin'-based DITs was the social and survivalist roles. Thus the type of transformation engaged the dweller to personalize and increase utility of the unit for basic functionality. Personalization engaged the dwellers aesthetic fancies, sensorial values like colour and texture and thus introducing

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[148] In Buru-Buru such was only possible through encroachment on public space, like the kiosks on the road reserves.

[149] Indeed, De Soto's (2000) (2004) (1989) (2006) (2002) treatises often dwell on the lack of tenure as the major reason for low-end quality and capital encumbrances in squatter settlements.

[150] This was only in Nairobi cases, as the examples from Cairo city, Egypt illustrated that the vertical typology was not a hindrance. This may have been due to higher economic and technological resources available to the Cairo dwellers. It should be noted the cases in Egypt were *de facto* owned dwellings, which was an added dimension.

new finishes. It was also about concerns for personal security and privacy, and thus the burglar-prooling of openings. It should be observed that since 'skin'-based DITs did not violate any development control regulations and enhanced the unit's value, they do not feature in most transformations studies.

7.1.3.3 Internal modifications (Type 'C' DITs)

Similar to 'skin' based DITs, the internal modifications aimed at enhancing the units' value and attracted minimal mention and thus elicited neither negative nor positive comments

7.1.3.4 Extensions (Type 'D' DITs)

The most overt DITs type, the extensions, had various dimensions that could ultimately guide policies and the management of residential neighbourhoods. These include the technological, encroachment on common ground, typological/ morphological, cluster definition, and locational articulation.

Non-physical factors of legality and tenure rights, the cost to the dweller as well as the social ramifications of the form were the main determinants to the materials and technology in the extensions. Thus, tenurial security and rights towards the land on which the units stood were the important factors in whether the extension was 'temporary' or 'permanent'. A further determinant was the affordability of the structure to the dwellers, as ultimately its cost mattered. The social aspirations of acceptability within the socio-economic context similarly guided the form through technology of the extensions.

The second factor also bordered on legality since encroachment on public land invariably constituted a violation of the legal Building Line setbacks. The

lesson is that the building line would have to be eliminated altogether as it served no further purpose in rapidly growing urban settlements. A policy angle here would be to cede some rights of control of the street reserve fronting the unit to the plot owner for better control and management. By this stratagem, the dweller is permitted to develop non-permanent extension on the road reserve in the short term that they could later delete for infrastructure expansion later.

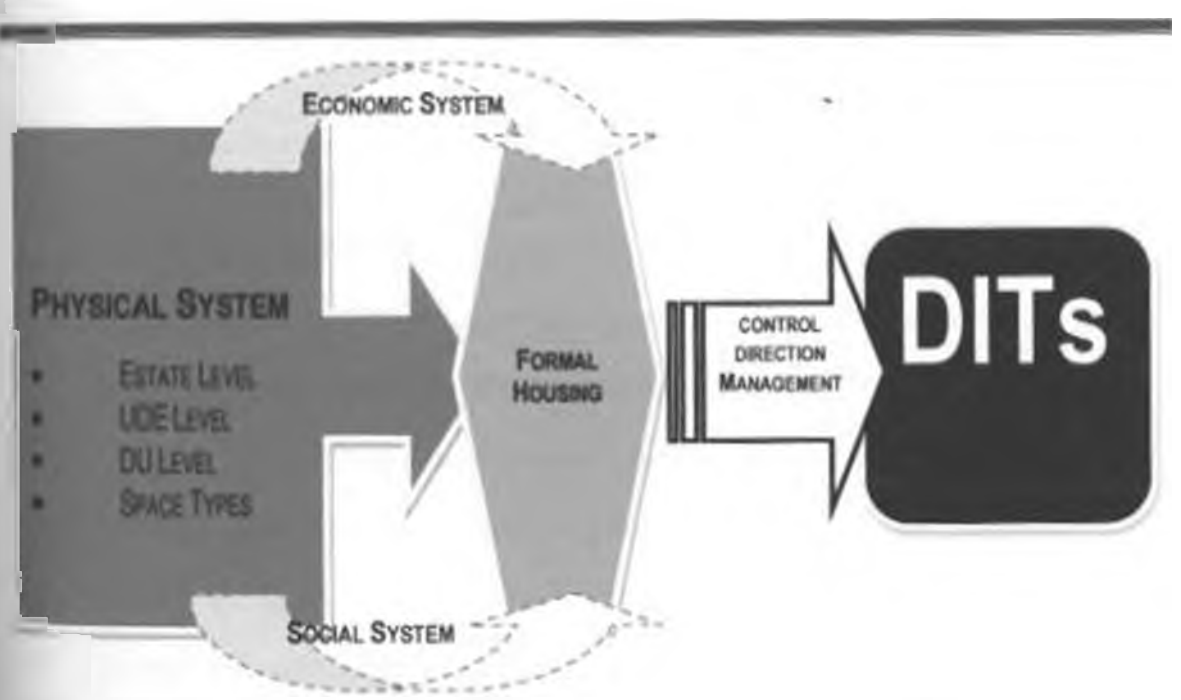
The third lesson on extensions was typological. The linear typologies in Kaloleni encouraged extensions that created enclosure through the mini-court formations. In Buru-Buru, the trend was to create structurally and functionally independent additions, away from the properly enclosed and articulated clusters and dwellings. These two lessons were verdicts on the physical strategy and hence the need to encourage containment in the typology.

The fourth lesson on extensions emanated from their use for defining the edges of clusters. This defined territorial extent and control of the space. The tendency to add spaces used for non-residential functions and for tenant households on the edges were such an indicator. This aimed at defining physically the insider/outsider roles of the dwellership in neighbourhoods. This was clear in Buru-Buru clusters, while in Kaloleni the new introverted mini-courts confirmed the same. A likely recommendation for the design of clusters is thus to develop core unit on the inner layer fronting the cluster courtyard, while leaving room for future income-based extensions on the edges.

A fifth lesson related also the definition of the edges and was in relation to the circulation paths. These paths formed the avenue for income oriented DITs and accorded room for unique developments that included the mixed-use vertical typology. The emerging multi-use typology located the commercial use space on the ground level whereas; residential use spaces were on the upper levels.

7.1.4 A conceptual Model for DITs' management

Figure 7-1 is a recommended Conceptual Model illustrating these new directions that reinforce the primacy of the physical strategy. It shows the diminished role of the primordial human functional requirements within the



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physical form in order to better mainstream the transformations' strategy in the architectural design for housing.

The analysis led to the conclusion that the despite the functional value objectives of the social relations and economic use of the dweller that drive transformations of housing, the physical strategy informs the nature, magnitude and overall quality of the extensions. This consents to the assertions and positions in the theoretical and empirical explorations that human function is captured through their society and resource utilisation, but goes further to assert that these are enshrined in the physical space available. Thus, the drive to transform housing to fulfil economic and social need is inevitable; however, the physical form enshrined in the architectural strategy informs the ultimate result.

7.2 The Recommendations

The section will offer physical recommended proposals for aspects of a formal housing estate in conformity with these findings. These include the Estate level, UDE, DU level, and Space Types. The objective remains to have better prediction models for transformations by dwellers in formal housing. This entails direction, management, and control of dweller-initiated transformations. This will engender the phenomenon as a legitimate mode for housing production. This will engender higher physical and social quality control of dweller-initiated transformations.

The policy direction and emphasis on the physical strategy does not exclude the roles played by the social and economic parameters. Indeed, some

prediction model for economic and financial aspects of transformations is possible in further studies[151]. Similarly, strategies that could capture the legal aspects that govern transformations as well social organisational systems are important and as well constitute subjects for further study.[152]

7.2.1 Policy implications

At policy level, the recommendation is to mainstream and hence provide incentives for transformations as an accepted mode of housing delivery. Thus design of housing should accommodate transformations as an inevitable and necessary eventuality. The same policy should allow the necessary legal framework to deter vindictive and undue demolitions. This would also open avenues for access to individual or community micro-finance loans for development of DITs. It would also open avenues for legalisation of the existing extensions and access to finance by dwellers for more additions.

7.2.2 Development Control – transforming standards

The inevitability of transformations, as supported by the cases, should form strong basis for mainstreaming the phenomenon within development control regimes. The recommendation begs for Building and Planning Codes that accommodate transformations. Thus, based on physical factors like location and unit size design, proposals should envisage growth initiated by the dwellers. Architects will provide alternative expansion channels the unit was

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[151] This is recommended for further study, and is based on papers by the author and others (Du Troyer & Allacker, 2004) (Shen & Castillo, 2002) (Makachia, 2004) (Makachia, Tahakhaba, & Omenya, 2005)

[152] These presume the need for a form to guide the phenomenon that echoes previous taken in Organized Self-Help Housing thinking by the author and others (Rodriguez & Asenad, 1996) (Makoto, 2005) (Makachia, 2005a) . These are strategies for formalization of existing informal housing, which mirrors the phenomenon that govern extension of formal housing.

amenable to, and channels that the dweller may adhere. This will take cognisance of the likely infrastructure expansion demands for the likely population. The planning and building codes will thus permit this flexibility.

As such, the local governments will set aside condonable alterations and additions. The stance should not insist on normal building development control procedures in order to minimise costs and time.

7.2.2.1 Condonable Transformations

The following are suggested aspects of transformations already unilaterally undertaken that should no longer constitute violations:

- Addition of grill and glazing in verandahs;
- Raising of boundary walls up to 2.1 metres in the front yard and higher up to 2.5 metres in the rear yard;
- Addition of living space in the individual yard(s) for domestic use;
- Providing of burglar-proofing grills and sun shading devices in openings;
- Sealing of doors and windows;
- Fixing of new windows and doors in front of backyards;
- Raising of walls of balconies or terraces of up to lintel height;
- Construction of additional bathrooms and WC in rear yards;
- Inter change of 'wet' services' areas like bathroom and kitchens;
- Construction of external open staircases as access to balconies and terraces;
- Addition of external water storage tanks within the compound;

- Shifting of glazed openings by up to 600mm. outside the provided;
- Provision of internal fittings like shelving and wardrobes in the provided spaces;
- Removal of non-structural walls (100mm or less);
- Change of finishes on walls, floors and ceilings;
- Provision of ramps that do not disturb the common passage;
- Covering of open terraces with an awning or light sheeting like *mabati*

7.2.2.2 Encroachment on common /others' land

The above flexibilities, as a rule should only be possible within the plot boundaries or established territorial extent of the DUs. Encroachments of public and neighbours land should remain prohibited as this may endanger common good like expansion of services common social services.

7.2.2.3 Zoning

Single-use zoning should change to permit socially acceptable user changes as envisaged by the immediate community. Such change-of-user at the micro scale should elicit empowered neighbourhood Residents' Associations (RAs) to determine the permissible conversion from purely residential to other uses.

7.2.2.4 Density and infrastructural services

In anticipation of an expanding population and increased strain on the infrastructural services, the physical planning should provide for expandable infrastructure provision. The responsibility of LACs would be mainly to

protect these common spaces by permitting only 'temporary' technological transformations.

7.2.2.5 Safety, health and environment

Transformations should not compromise the safety and health of the community. It is recommended that a neighbourhood RA be tasked to oversee transformations and vet known dangers to the immediate dwellership.

7.2.3 Social and Organisational Strategies

The above legal flexibilities also mean a more accountable dwellership. Thus, the second recommended objective is to create a social organisational structure that assume legal responsibility over the environment and make democratic decisions. The scales will be hierarchical reflecting spatial organisational entities ranging from the block, the cluster, street up to the entire estate. These RAs will also have some budgetary control in management of common spaces, services, and facilities. Thus, the 'corporation' in Sectional Act (RoK, 1987) would be the starting point of such social structures.

The organigram (Fig. 7-2) shows the management of such an elective entity reliant on the neighbourhood dwellers' membership. It envisages a hierarchy of at least two levels of the Neighbourhood Residents' Association Board (NRAB) that is composed by committees of dwellers. Their duties and responsibilities are shown. The LACs and / or professional bodies may offer advice through some form of representation in these residents' bodies. There will be a hierarchy of relationships based on the number of houses, urban design, and locational factors. Common space like cluster courts, streets and

green spaces will aid in the formation of the basic unit. These units will link to others through social networks established by a facilitating agency[63] at estate level. This RA is a legal and democratic entity composed of between 40 to 60 dwellers, but its numbers is more of a product of physical and proximity factors.

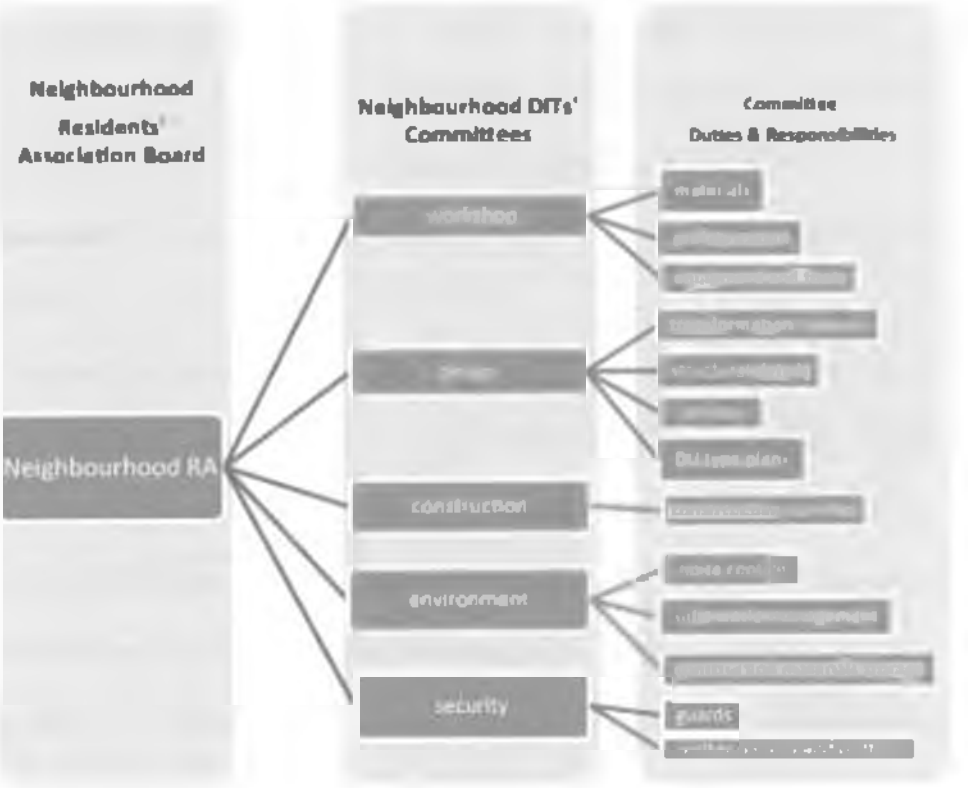


Figure 7-2 A Neighbourhood Residents' Association Management Model for the control of dweller-initiated transformations
Source: author, 2010

7.2.4 Legal Strategies for DITs

Legal empowerment is through transferring ownership and thus tenure rights to the sitting tenants. It is felt that this will enable them take more

[63] In Organized Self-help Housing (Makachia, 2005a) (Rodriguez & Aristand, 1996) this takes the form of an NGO or a Faith-Based Organization like a community church

responsibility for physical and social environmental quality. It also gives them the confidence in investing in their homes. Two legal instruments. The Sectional Properties Act (1987) and housing cooperatives, should be adopted in the proposed dispensation.

The Sectional Properties Act (1987) that facilitates common ownership of a building block (apartment block, condominiums or indeed any two or more 'conjoined' building units) will be the guiding legal frame for covenants for individual-communal rights and responsibility. The Act stipulates individual ownership of a unit coupled with common ownership of the land on which the block stands as well as common spaces and parts of the entire building like staircases.

The dwellers operate as tenants in common to these spaces. The sale of any unit by dwellers, who are conjoined in a 'corporation' for the block, is not restricted as in a cooperative housing alternative. The Act does not restrict individual proprietors from owning multiple units at any stage in the life cycle of the building. The use is also not restricted, but in the proposed structure, this may have to be amended by members so as permit the membership to veto such functions they feel not conducive to common good.

Another legal structure proposed would borrow from the housing cooperative modes ownership. In Kenya, the National Housing Cooperative Union (NACHU), an umbrella organ charged with offering technical services and coordinating shelter issues to housing cooperatives and other deserving causes would feature prominently.

Registered under Cooperative Societies Act (Cap 490), NACHU would aid in coordinating cooperative practices in the proposed structures. These include control of transfer of the unit. A right of pre-emption would be enacted by members and enforced so that transfer of the unit should be subject to other society members having the first right of refusal before outsiders can be offered the unit for sale and transfer. A restriction to the number of owned units and their use by member would be clearly stipulated unlike the Sectional Act.

7.2.5 Physical models for transformations

7.2.5.1 Transformation Manuals

At the dwellers level, a guide for transformations is envisaged and hence the architects would avail Transformation Manuals, envisaging a self-managed extension process. This would be preceded or accompanied by individual dweller and/or communities' civic education which would avail a 'do-it-yourself' software strategy for the future[154]. This strategy does not eliminate the architects in the transformations process, but it allows the inevitable DITs to be of an informed standard and spatial quality.

The recommendation is to guide the possible growth patterns and hence the framework for its use in formal housing. The physical proposal assumes the legal and social frameworks that will provide the enabling environment are operational and relies on covenants that facilitate the administration of common and boundary areas. The technical framework thus defines the extents through cadastral and topographical survey of individual and shared spaces and

[154] Other supportive training models include Home Maintenance Manuals that are often lack leaving inevitable costs that could be otherwise avoided

service lines. The physical model operationalized at the scale levels of the DU, the UDE and the estate.

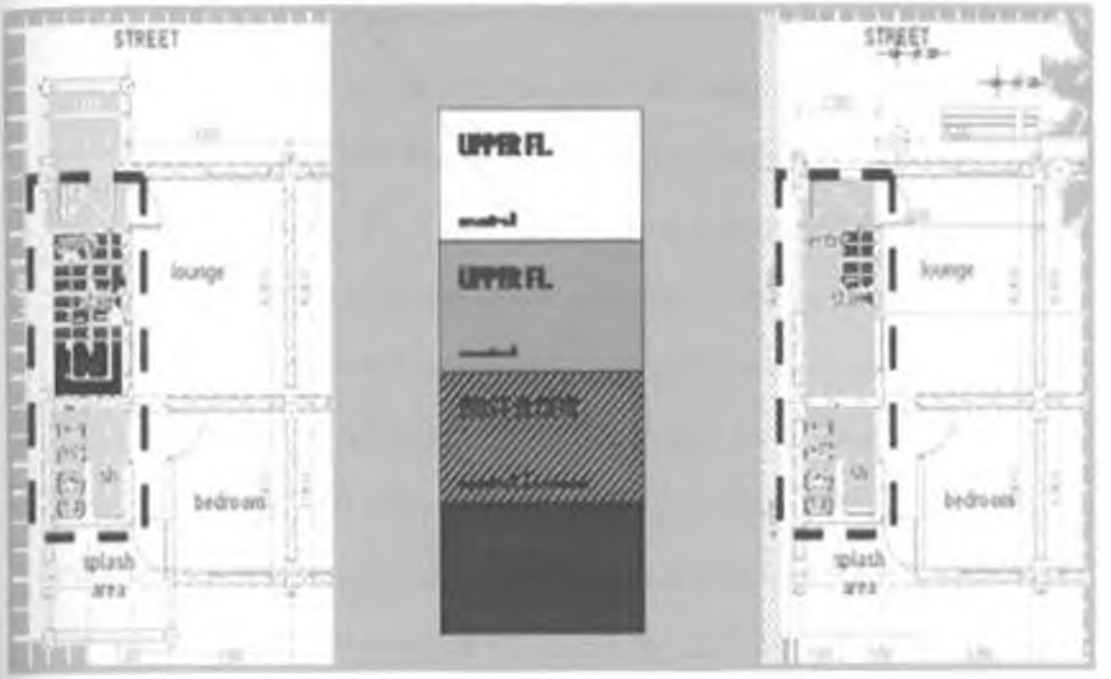
Central to the physical framework proposed are:

- The incremental nature of the designed unit, allowing for progressive dweller-initiated transformation is at both spatial as well as structural level using a reinforced concrete structural frame.
- Flexibility in the incremental options (Figs. 7-3 & 7-4) is through a definition of the structural frame that permits partitions (as 'structure-and-infill' model) using demountable technology and materials.
- The DITs allow a functional mix between commercial, residential, and other uses as evidenced by the case findings. To reduce functional and land use-conflicts, the recommended models create layers of privacy and public interfaces. This realised at the vertical scale as shown in Figure 7-3.
- The technology used anticipates progressive up-grading sequentially from temporal to more durable materials within the provided structural frame.

The recommended models utilise the already established physical hierarchies of the estate, urban grouping design elements (UDEs) and dwelling units (DUs).

7.2.5.2 Estate level

At estate level, the only spatial elements that could be directly linked to the smaller entity were used and these included mainly the circulation arteries. The street attracted common function including and mainly the commercial activities. These were also mainly at the ground level for the ease of access.



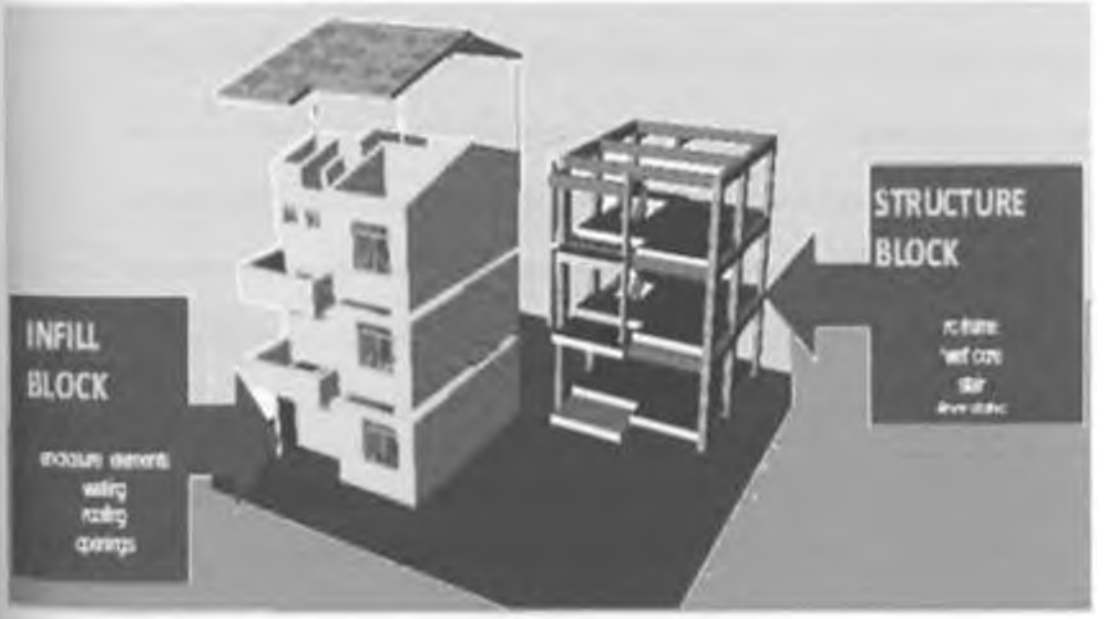


Figure 7-4: structure and infil systems for transformations
source: author, 2010

The recommendation is to allow for street-accessed units which were oriented away from the original unit. This street access created sufficient privacy and retained control by the original dweller-unit. The gradation of privacy is illustrated in Figure 7-5. The street frontage will reserve a pedestrian walkway to be used for accessing the commercial unit on the ground floor.

The walkway will form the public façade (PU) and will act as a buffer from the vehicular street. It will also be the avenue for landscaping features like greenery and hard landscape features. This is shown in Figures 7-5 and 7-6; crosectional orthographica and perspective illustrations of the generic model. The DITs unit should allow for vertical development to accommodate rented tenement accomodation above the commercial unit (Figs. 7-3 and 7-4).

Behind the extesnion (DIT) unit should be reserved for a semi-private court (SEMI-PRI) useable by the original household and the DIT unit and for services. This layer would remain un-built and paved, left green or both. The original unit would have a front garden exclusively for domestic by the original household. This space personlised with appropriate landscape featres including garden furtniture and private parking space/garage. Acces to the original unit should be from a cluster inner court shared with cluster groups.

7.2.5.3 UDE level

The cases had apartment type and horizontal cluster morphologies. The apartment type invited minimal transformations. The UDE typology of the apartment block is suitable as deterrence to extensions. This would suit rental accommodation where a creditable proprietor outfit would be in place.

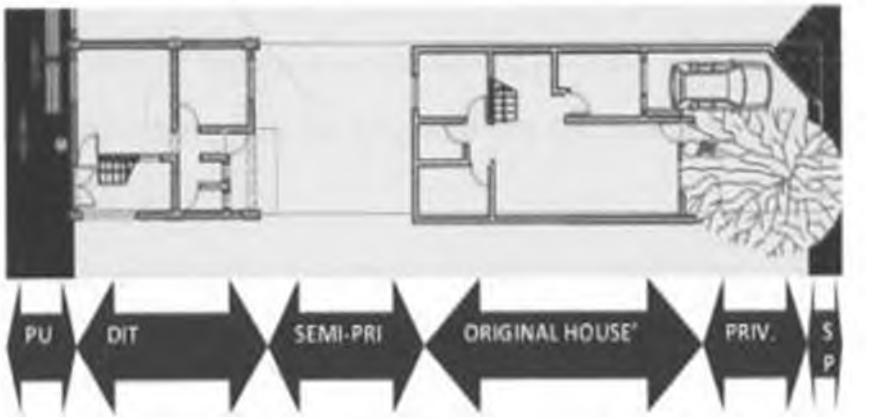


Figure 7-5 Layout of transformations along an estate street illustrating privacy gradients
source: author, 2010

Figure 7-6 Street based transformation model 3-4
source: author, 2010

The horizontal cluster formation would be suited for transformations since the ground on adjacent unit is the avenue for additions. There is however need for individualised ground space that would be owned by the household. This would form space additions within defined conditions. Therefore there is need to define extents of each unit *vis-a-vis* common and neighbours' space using the plot formation.

7.2.5.4 DU level

The unit type shown in Figures 7-3 and 7-4 is flexible and can be used in variety of ways as residential or commercial purpose. The model shows a residential unit that appears on the ground and first floor (with balcony) Key elements include;

- The vertical circulation core that will enable access to upper floors (Fig.7-3)
- The other constant if the structural frame from which the dwellers can (Fig. 7-4)
- Infill partition demountable or temporary elements wall describe privacy and space use differentiation (Fig.7-4)
- The service core incorporating the 'wet areas' of water closet (WC), shower, splash area and kitchen are developed to be shared on the each storey level regardless of the number of the units on the floor (Fig.7-3)
- The street fronting balcony is the only available space for sub-tenant household recreation. The upper floors also have a splash area near the wet core that also is used for semi-outdoor cooking.
- The unit has two rooms possibly for private and public purpose. These spaces are convertible into residential, offices, commercial or a combination of these activities depending on the location on the ground or upper floors, as well as fronting street within the scheme (Fig. 7-3).

7.3 Areas of further research

The study was able to identify the factors driving dweller-initiated transformations in strategies used in formal housing production within Nairobi, and Kenyan urban settlements. It recognised the inevitability of the process given the mismatch between the designers' objectives and those of the dweller in the emerging urban settlements. In the face of the dearth of the formal housing, the transformation phenomenon deserves to be inculcated in polices.

Its mainstreaming will however demand more research in other aspects of transformations that may include the following:

7.3.1 Informal building contracts

The Informal contractor and *fundi* frameworks as the main builders in dweller-initiated transformations are not in the mainstream of the housing construction industry. This study would entail evolving suitable conditions that would be the core to valid contracts necessary for the erection of extensions and other types of DITs.

7.3.2 Manual for self transformers

This would investigate Housing Transformation sequencing and phasing to guide self-managed transformers. This is a technical frameworks exploration to sequencing transformation activities.

7.3.3 Building structure

Structural systems for multi-level transformation are not understood and were common in the Nairobi studies. This study would evolve technical support manuals that would guide self-developers for appropriate spatial

additions and that are structurally sound. The recommendations under the physical aspects are only a framework for such direction.

7.3.4 Dweller mobility and house types

This would explore the spatial qualities and the extent to which dwellers make choices about moving or transforming their houses.

7.3.5 Social aspects

This would explore management systems for Residents' Associations to help in managing transformations within estates or clusters. It would propose frameworks that would empower Residents' Associations to manage DIT design and the implementation process in given neighbourhoods

7.3.6 Finance for transformations of housing

This is about operationalization of formal financing for Dweller Initiated Transformation as a way of mainstreaming dweller-instantiated transformations. Such would enable financial management of savings, subletting incomes and loans for transformations, as well as other market instruments.

7.3.7 Upgrading infrastructure services technology

These are technologies for progressive upgrading of infrastructure would explore cost-effective yet performing technologies for transformations of infrastructure services.

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APPENDICES

Appendix 1 Historical and Bio Data Sheets used in Kalulam (based on AGI-VTN data sheets)

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	name of artisan													
2	name of interviewer												IMAGES	
3	name of respondent													
4	date													
5	year	age	local calend	family event	residence	status of occupatio	relationship to HH	construction activi	size of added / demolished unit					
6	2009													
7	2008													
8	2007													
9	2006													
10	2005													
11	2004													
12	2003													
13	2002													
14	2001													
15	2000													
16	1999													
17	1998													
18	1997													
19	1996													
20	1995													
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31	1984													
32	1983													
33	1982													
34	1981													
35	1980													
36	1979													
37	1978													
38	1977													
39	1976													
40	1975													
41	1974													
42	1973													
43	1972													
44	1971													
45	1970													
46	1969													
47	1968													
48	1967													
49	[illegible]													

[illegible]

Appendix 2 - Pg 1 Base Data Questionnaire

BURU-BURU ESTATE NAIROBI

PLEASE
CLASSIFY
TYPE
HOUSE NO

- Identity of interviewees remains confidential
- Tick the correct response

(A) SOCIO-ECONOMIC FACTORS

1 HOUSEHOLD

a) Sex of household head

Female		Male	

b) Household Status

Married with children		Married without children		Single with children		Single

c) Age of Head

Below 30		31-40 years		41-55 years		Above 55 years

d) Size of household

One		Two		3-4		Above 4

e) Age in years of children

Less than 6 years		6-15 years		15-21 years		Above 21 years

f) If offspring above 21 years, where does he/she reside?

Main house		Extension		Off-plot	

2 WORK / EDUCATION

g) Education Status

Primary / below		Secondary		University		Other Tertiary

h) Occupation

Professional / public		Professional / private		Non-professional / public		Non-professional / private

3 RESIDENCY ASPECTS

i) What is your residency status in the unit?

Owner		Tenant		Sub-tenant		Other,

j) If owner for how long?

Less than 2 years		2-4 years		10 years		Above 10 years

k) If tenant how long have you been residing in unit

Less than years		2-4 years		10 years		Above 10 years

l) How much rent do you pay (KShs)?

m) What are your comments on

	Average	Low	Excessive
Rent paid?			
Service provided?			
Space Provided?			

n) State where the domestic worker resides

In the main house		In the extension		With your children		Outside your plot

Source: author 2010

(B) SPATIAL ASPECTS

4 OPEN SPACES

(i) Does the plot have any un-built space?

Yes		No	

(ii) What is the finish of the un-built space?

[illegible]	Paving	Other, (sp)

(iii) What activities are undertaken in un-built spaces on the plot?

Recreation	Laundry	Parking	Storage	Agriculture	Other

(iv) Do you find the provided space adequate or inadequate for the activity?

Recreation	Laundry	Parking	Storage	Agriculture	Other,

(v) What do you think of the activities in the un-built space?

Recreation	Laundry	Parking	Storage	Agriculture	Other,

5 URBAN AGRICULTURE

(i) What type of agricultural activities is undertaken on the plot?

Food crops	Decorative plants	Trees	Livestock/animals	Other, state

(ii) Do you think the agricultural activities on the plot are appropriate? Explain

Food crops	Decorative plants	Trees	Livestock/animals	Other, state

6 ON PLOT SERVICES

(i) What services are available on the plot?

Water	Sewer	Solid waste	Other

(ii) Comment of the services on the plot

Water	Sewer	Solid waste	Other

Source: author 2010

URBAN TRANSFORMATION IN BURU-BURU ESTATE NAIROBI

7 PLOT DEFINITION

a) What materials defined the plot?

Wall	Hedge	Other, state	None

b) Comment on the way the plot is defined?

Wall	Hedge	Other, state	None

8 UNIT DESIGN

a) Main house

	Number	Area (m²)	Comment
Public (lounge, dining)			
Private (bedroom, study)			
Utility (kitchen, WC, shower)			
Other (specify)			

b) Is the main house occupied?

Yes, by tenant	Yes, by plot owner	Yes, partially (explain)

c) Secondary house (if any)

	Number	Area (m²)	Comment
Public (lounge, dining)			
Private (bedroom, study)			
Utility (kitchen, WC, shower)			
Other (specify)			

d) Is the secondary house occupied?

Yes, by tenant	Yes, by plot owner	Yes, partially (explain)

e) Outhouse

	Number	Area (m²)	Comment
Public (lounge, dining)			
Private (bedroom, study)			
Utility (kitchen, WC, shower)			
Other (specify)			

f) Is the outhouse occupied?

Yes, by tenant	Yes, by plot owner	Yes, partially (explain)

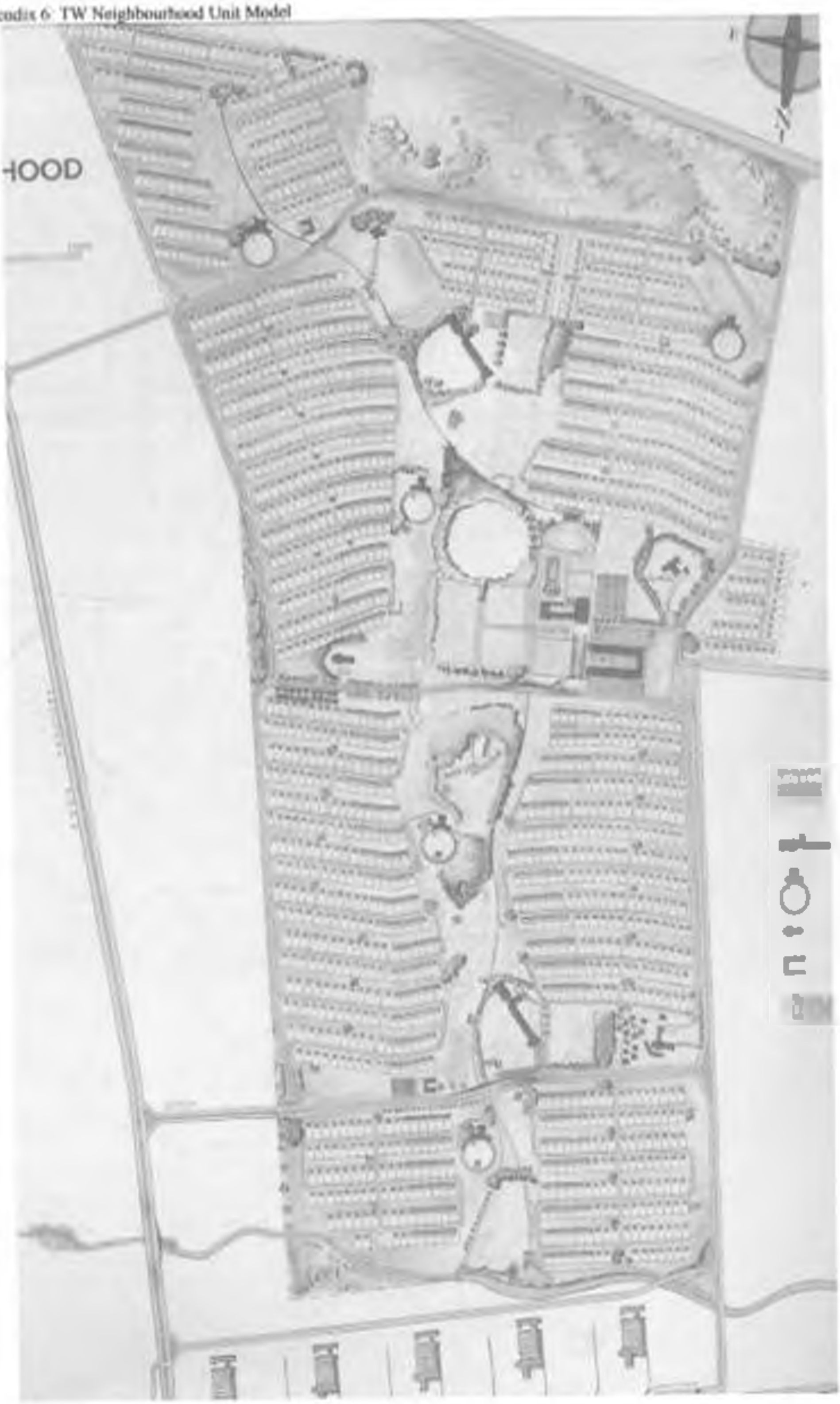
Source: author 2010

Appendix 5: Measures of variables used at various scale levels

Variables	Surrogate variables	Code	Estate	UDE	DU
Economic factors					
	Income of household	(HHH-income)	Na	Na	Ordinal
	Occupation of household head	(HH-occupation)	Na	Na	Nominal
	Rental / mortgage repayment of main house		Na	Na	Ordinal
	Income from rent from dits	(dit-rent)	Na	Na	Ordinal
	Income from business in the dits		Na	Na	Ordinal
	Cost of transforming unit		Na	Na	Nominal
	Technology of dits	(dit-technology)	Descriptive	Descriptive	Nominal
	Materials used in dits	(dit- materials)	Descriptive	Descriptive	Nominal
	Financial costs. Interest rates, inflation, growth of construction costs		Based on market descriptions		
Social factors					
	Household size	(HH-size)	Sample nominal		
	Household head gender	(HHH-sex)	Sample ordinal		
	Householder duration of stay	(HH-duration)	Sample nominal		
	Household structure		Sample nominal		
	Socio-economic bracket of estate dwellership		Descriptive		
	Social organizations within the estate residents' association (RAs)		Descriptive		
Physical factors					
	Dwelling unit (DU) parameters		Na	Na	Na
	Type		Ordinal	Sample & cluster nominal	Nominal
	Size		Ordinal	Sample scale	Type scale
	Storeys		Descriptive	Na	Type scale
	Space types		Na	Na	Type scale
	Boundary definition		Descriptive / graphical	Descriptive / graphical	Nominal
	Location		Descriptive / graphical	Descriptive / graphical	Descriptive
	Urban design element (UDE) parameters		Na	Na	Na
	Cluster		Nominal	Na	Type scale / graphical
	Apartment		Nominal	Nominal	Type scale / graphical
	Street types		Descriptive / graphical	Nominal	Descriptive / graphical
	Estate parameters		Na	Na	Na
	Boundary definition		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical
	Location		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical
	Social amenities provision and location		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical
	Commercial amenities location and provision		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical
	Transport nodes		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical
	Landscape features		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical
	Street types and location		Descriptive / graphical	Descriptive / graphical	Descriptive / graphical

Source: survey, 2010

Appendix 6: TW Neighbourhood Unit Model



Source: Thomson-White et al. 1948

Appendix 7: Kaleidoscope Layout adapted from NCC Archive drawing showing neighbouring districts, case IIDE location and key planning areas

Source: adapted by author (2010) from NCC archival drawing

Appendix 8 SPSS cross-tabulation for household size and activities in the IDTs in Kalolen

			1 to 3	3 to 5	5 to 10	above 10	
What activity is housed in the extension?	residential self	Count		3	4	1	10
		% within how members are the household		33.3%	50.0%	20.0%	33.3%
	residential - tenant	Count	8	4		4	16
		% within how members are the household	100.0%	44.4%		80.0%	53.3%
	other	Count			4		4
		% within how members are the household			50.0%		13.3%
Total		Count	8	9	8	5	30
		% within how members are the household	100.0%	100.0%	100.0%	100.0%	

Source: survey, 2010

Appendix 9 Kalolen- SPSS Correlation Matrix for economic variables in the sample

Correlations

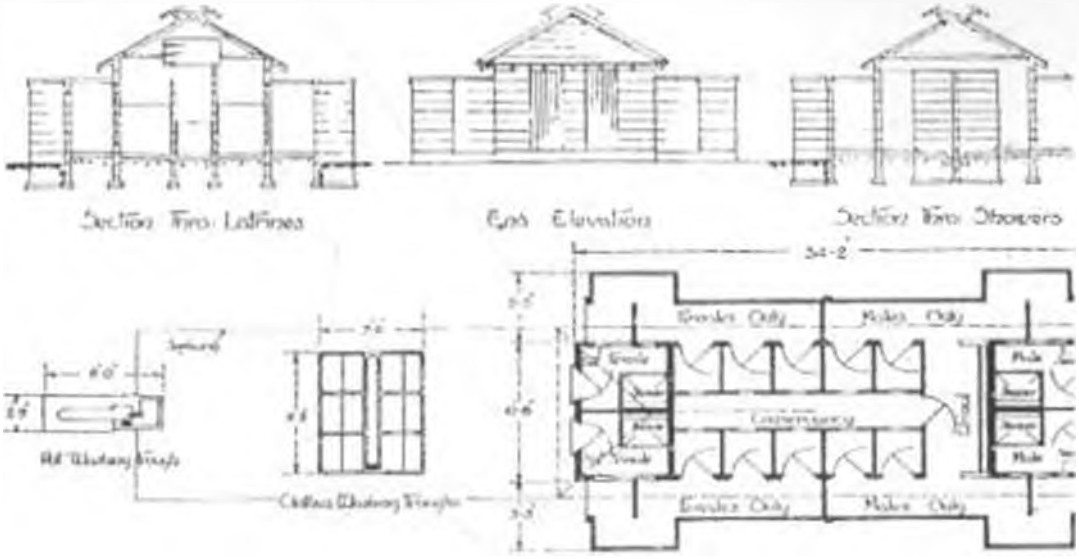
		do you have type 'A' transformation?	do you have [illegible] transformation?	do you have type 'C' transformation?	do you have type 'D' transformation?	how much do sub tenants pay?	how much do you pay to NCC?
do you have type 'A' transformation?	Pearson Correlation	1	.389*	.193	.056	.070	.083
	Sig. (2-tailed)		.029	.179	.698	.629	.564
	N	50	50	50	50	50	50
do you have type 'B' transformation?	Pearson Correlation	-.318*	1	.661**	.305*	.007	.212
	Sig. (2-tailed)	.025		.000	.031	.959	.138
	N	50	50	50	50	50	50
do you have type 'C' transformation?	Pearson Correlation	.193	.661**	1	.175	-.201	.101
	Sig. (2-tailed)	.179	.000		.224	.162	.485
	N	50	50	50	50	50	50
do you have type 'D' transformation?	Pearson Correlation	.056	.305*	.175	1	.581**	.341*
	Sig. (2-tailed)	.698	.031	.224		.000	.015
	N	50	50	50	50	50	50
how much do sub tenants pay?	Pearson Correlation	.070	.007	-.201	.581**	1	-.173
	Sig. (2-tailed)	.629	.959	.162	.000		.230
	N	50	50	50	50	50	50
how much do you pay to NCC?	Pearson Correlation	.083	.212	.101	.341*	-.173	1
	Sig. (2-tailed)	.564	.138	.485	.015	.230	
	N	50	50	50	50	50	50

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Source: survey, 2010

Appendix 10. Original ablution and latrine block in Kaledeni



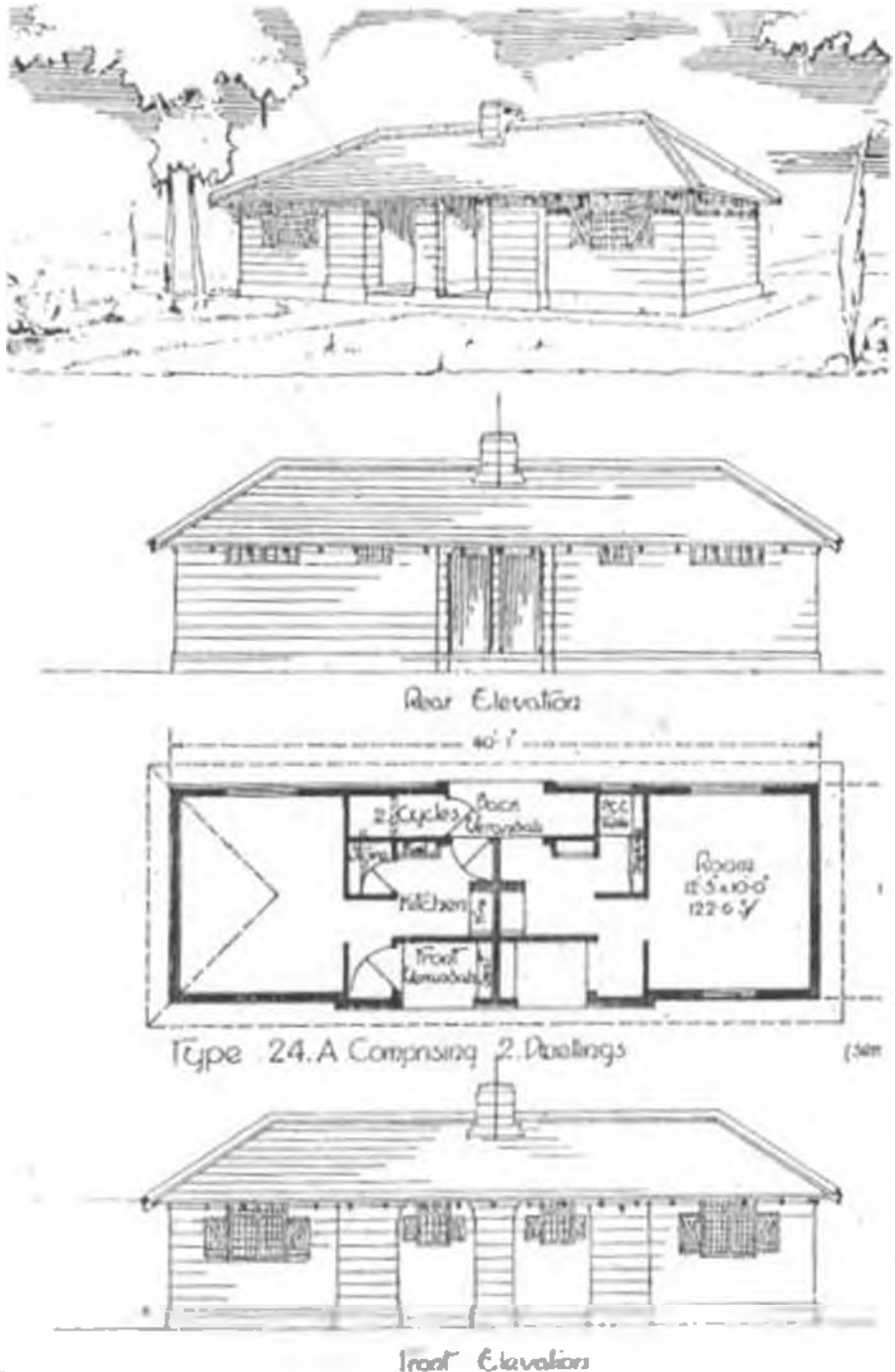
Source: Ogilvie, 1946

Appendix 11 SPSS C[illegible] of between the provided and the extension typologies in Buea Bora

			What unit-type was used in the provided house?		Total
			bungalow	multi-storey	
What is the type of unit used in the extension ?	bungalow	Count	18	22	40
		% within what is the type of unit used in the extension?	45.0%	55.0%	100.0%
		% within what unit-type was used in the provided house?	85.7%	53.7%	64.5%
	multi-storey	Count	3	18	21
		% within what is the type of unit used in the extension?	14.3%	85.7%	100.0%
		% within what unit-type was used in the provided house?	14.3%	43.9%	33.9%
	both	Count		1	1
		% within what is the type of unit used in the extension?		100.0%	100.0%
		% within what unit-type was used in the provided house?		2.4%	1.6%
Total		Count	21	41	62
		% within what is the type of unit used in the extension?	33.9%	66.1%	100.0%
		% within what unit-type was used in the provided house?	100.0%	100.0%	100.0%

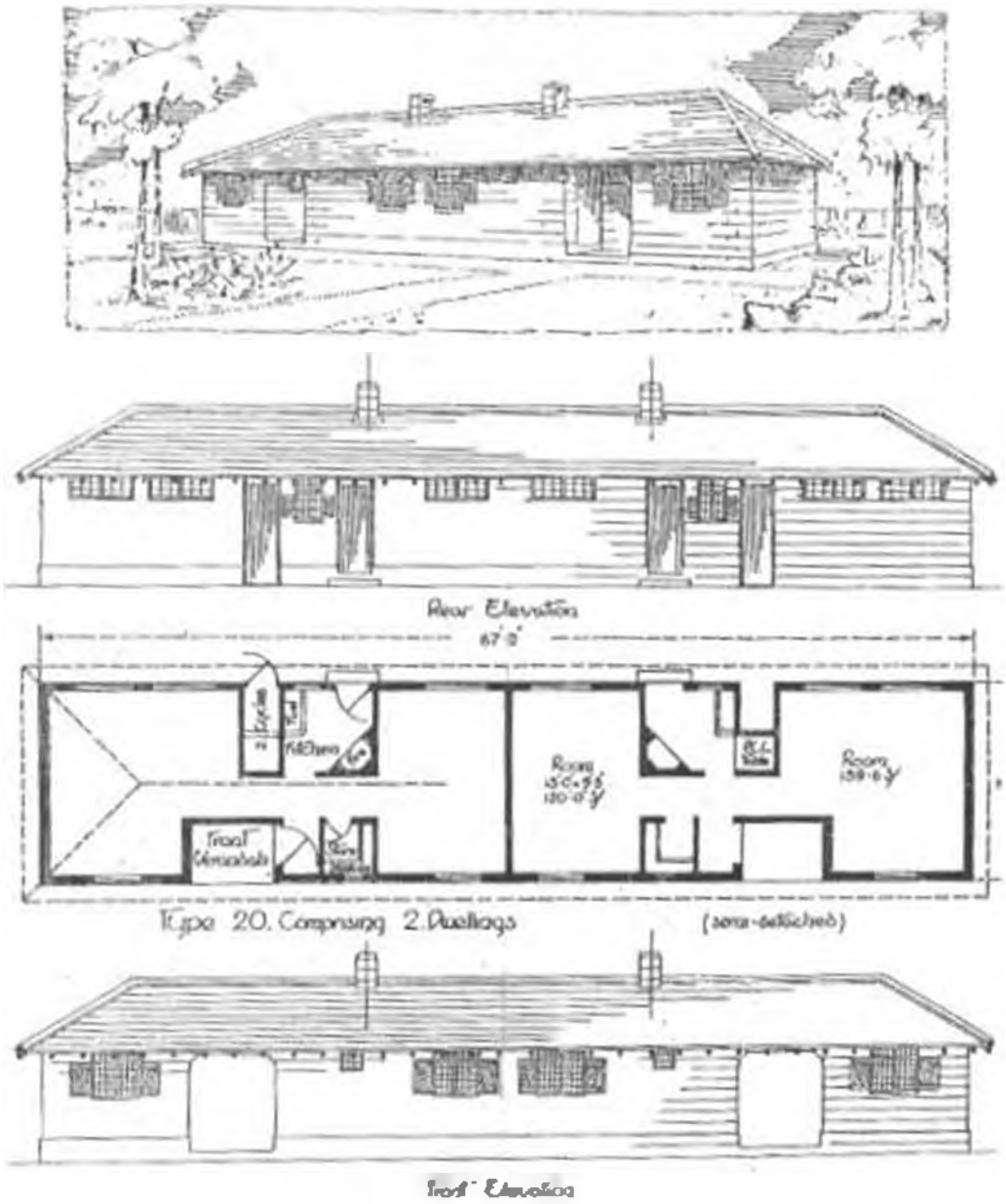
Source [illegible] 2010

Appendix 12 Block of semi-detached one-room dwellings



Source: Ogilvie 1946

Appendix 11 Block of semi-detached two-roomed dwellings



Block of two two-room dwellings

Source Ogilvie, 1946

		do you have type 'A' transformation?	do you have type 'B' transformation?	do you have type 'C' transformation?	do you have type 'D' transformation?	who was the household sex?	what is the age of household head?	how members are the household?	what is the occupation of household head?
do you have type 'A' transformation?	Pearson Correlation	1	-.309*	.144	.205	.049	-.284	.196	.046
	Sig. (2-tailed)		.026	.178	.888	.741	.017	.172	.033
	N	60	55	57	60	55	56	55	55
do you have type 'B' transformation?	Pearson Correlation	.309*	1	.481**	.365*	.547**	.067	.494**	.228
	Sig. (2-tailed)	.026		.000	.417	.000	.066	.284	.124
	N	53	60	55	53	55	52	53	56
do you have type 'C' transformation?	Pearson Correlation	.144	.481**	1	.175	.759**	.281*	.404**	.219
	Sig. (2-tailed)	.178	.228		.224	.000	.034	.002	.129
	N	58	58	57	56	55	55	58	59
do you have type 'D' transformation?	Pearson Correlation	.266	.309*	.173	1	-.074	-.046	.136*	-.218
	Sig. (2-tailed)	.888	.221	.224		.613	.781	.017	.361
	N	46	55	58	60	55	58	56	50
who was the household sex?	Pearson Correlation	.049	.847**	.759**	.074	1	.213	.441**	.287**
	Sig. (2-tailed)	.742	.000	.000	.613		.626	.391	.336
	N	60	52	55	50	44	55	50	52
what is the age of household head?	Pearson Correlation	-.284	.067	-.281*	-.046	.213	1	.298**	.219
	Sig. (2-tailed)	.017	.066	.034	.781	.626		.059	.129
	N	55	55	53	55	56	56	55	54
how members are the household?	Pearson Correlation	.196	.494**	.405**	.136*	.491**	.468**	1	.415**
	Sig. (2-tailed)	.172	.066	.003	.017	.391	.004		.006
	N	55	58	53	60	56	55	58	56
what is the occupation of household head?	Pearson Correlation	.046	.228	.219	-.014	.383**	.219	.415**	1
	Sig. (2-tailed)	.353	.124	.129	.387	.000	.129	.006	
	N	55	50	55	50	55	56	60	60

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: survey, 2010

Appendix 14 Correlation of physical parameters and types of transformations in Kalolenі estate

Correlations

		are you satified the dwelling provided ?	do you have type'A' transformation?	do you have type'B' transformation?	do you have type 'C' transformation?	do you have type 'D' transformation?	what activity is housed in the extension?	what is the housetype?
are you satified the dwelling provided ?	Pearson Correlation	1	-.113	-.134	.113	-.583**	a	-.123
	Sig. (2-tailed)		.431	.355	.434	.000		.358
	N	60	60	60	60	60	31	60
do you have type'A' transformation?	Pearson Correlation	-.318	1	-.209*	.144	.208	.171*	-.052
	Sig. (2-tailed)	.413		.039	.179	.999	.038	.719
	N	60	60	60	60	60	31	60
do you have type'B' transformation?	Pearson Correlation	-.134	.209*	1	.681**	.007*	.183	.099
	Sig. (2-tailed)	.355	.039		.000	.031	.286	.000
	N	60	60	60	60	60	31	60
do you have type 'C' transformation?	Pearson Correlation	-.113	.183	.681**	1	.175	-.007**	.154
	Sig. (2-tailed)	.434	.179	.000		.119	.000	.059
	N	60	60	60	60	60	31	60
do you have type 'D' transformation?	Pearson Correlation	-.583**	.059	.007*	.175	1	.258	.091
	Sig. (2-tailed)	.000	.888	.031	.224		.165	.530
	N	60	60	60	60	60	31	60
what activity is housed in the extension?	Pearson Correlation	a	-.171*	.183	.667**	.258	1	-.067
	Sig. (2-tailed)		.038	.286	.000	.165		.722
	N	31	31	31	31	31	31	31
what is the housetype?	Pearson Correlation	-.123	-.052	.099	.154	.091	-.067	1
	Sig. (2-tailed)	.358	.719	.000	.059	.530	.722	
	N	60	60	60	60	60	31	60

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

a. Cannot be computed because at least one of the variables is constant.

Source: survey, 2010

Appendix 15 Correlations table of sex and variables in Kalolenі estate

Appendix 16 Social parameters and transformations in Buru-Buru – SPSS correlation table

Correlations

		what is the size of the household head?	what is marital status of the household head?	what is the age of household head?	what is the size of household?	what are the ages of eldest children in years?	how long has the household stayed in the unit?	has the unit undergone type_B transformation?	has the unit undergone type_C transformation?	has the unit undergone type_D transformation?	has the unit undergone type_A transformation?
what is the size of the household head?	Pearson Correlation	1	-.309**	.136	.204*	[illegible]	.013	.a	.214*	.288**	.015
	Sig. (2-tailed)		.000	.169	.039	.307	.895		.030	.003	.882
	N	103	102	102	103	94	100	103	103	101	103
what is marital status of the household head?	Pearson Correlation	-.309**	1	-.448**	-.379**	.066	-.109	.a	.028	.219	.126
	Sig. (2-tailed)	.000		.000	.000	.516	.284		.782	.080	.204
	N	102	102	102	102	94	99	102	102	100	102
what is the age of household head?	Pearson Correlation	.136	-.448**	1	.460**	.322**	.461**	.a	.082	.084	-.060
	Sig. (2-tailed)	.169	.000		.000	.002	.000		.411	.405	.539
	N	102	102	102	102	94	99	102	102	100	102
what is the size of household?	Pearson Correlation	.204*	-.379**	.460**	1	.128	.207*	.a	.035	.039	-.037
	Sig. (2-tailed)	.039	.000	.000		.158	.065		.726	.698	.714
	N	103	102	102	103	94	100	103	103	101	103
what are the ages of eldest children in years?	Pearson Correlation	.094	.066	.322**	.128	1	.373**	.a	.019	.027	-.025
	Sig. (2-tailed)	.307	.516	.002	.158		.000		.856	.797	.813
	N	94	94	94	94	94	91	94	94	93	94
how long has the household stayed in the unit?	Pearson Correlation	.013	-.109	.461**	.207*	.373**	1	.a	.051	.079	-.013
	Sig. (2-tailed)	.895	.284	.000	.045	.000			.614	.441	.897
	N	100	99	99	100	91	100	100	100	98	100
has the unit undergone type_B transformation?	Pearson Correlation	.a	.a	.a	.a	.a	.a	.a	.a	.a	.a
	Sig. (2-tailed)										
	N	103	102	102	103	94	100	103	103	101	103
has the unit undergone type_C transformation?	Pearson Correlation	.214*	.028	.082	.035	.019	.051	.a	1	1.000**	.047
	Sig. (2-tailed)	.030	.782	.411	.726	.856	.614				.640
	N	103	102	102	103	94	100	103	103	101	103
has the unit undergone type_D transformation?	Pearson Correlation	.288**	.219	.084	.039	.027	.079	.a	1.000**	1	.002
	Sig. (2-tailed)	.003	.080	.405	.698	.797	.441				.985
	N	101	100	100	101	93	98	101	101	101	101
has the unit undergone type_A transformation?	Pearson Correlation	.015	.126	-.060	-.037	-.025	-.013	.a	.047	.002	1
	Sig. (2-tailed)	.882	.204	.539	.714	.813	.897		.640	.985	
	N	103	102	102	103	94	100	103	103	101	103

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: [illegible] 2010

Appendix 17 Buru-Buru economic data and transformation correlations table

Correlations

		has the unit undergone type_B transformation?	has the unit undergone type_C transformation?	has the unit undergone type_D transformation?	has the unit undergone type_A transformation?	what is the occupation of household head?	what is residency status of unit occupants?	how much monthly rent or mortgage is paid for the house?
has the unit undergone type_B transformation?	Pearson Correlation	.a	.a	.a	.a	.a	.a	.a
	Sig. (2-tailed)							
	N	103	103	101	103	102	103	28
has the unit undergone type_C transformation?	Pearson Correlation	.a	1	1.000**	.047	.103	.102	.042
	Sig. (2-tailed)				.640	.305	.303	.838
	N	103	103	101	103	103	102	28
has the unit undergone type_D transformation?	Pearson Correlation	.a	1.000**	1	.002	.136	.090	.042
	Sig. (2-tailed)				.985	.181	.310	.838
	N	101	101	101	101	100	101	28
has the unit undergone type_A transformation?	Pearson Correlation	.a	.047	.002	1	.115	.256	-.169
	Sig. (2-tailed)		.640	.985		.251	.373	.379
	N	103	103	101	103	102	103	28
what is the occupation of household head?	Pearson Correlation	.a	.103	.136	-.115	1	-.079	-.158
	Sig. (2-tailed)		.305	.181	.251		.430	.446
	N	102	102	100	102	102	102	28
what is residency status of unit occupants?	Pearson Correlation	.a	.102	.090	.256	-.079	1	-.243
	Sig. (2-tailed)		.303	.373	.373	.430		.231
	N	103	103	101	103	102	103	28
how much monthly rent or mortgage is paid for the house?	Pearson Correlation	.a	.042	.042	-.169	-.158	.243	1
	Sig. (2-tailed)		.839	.838	.379	.446	.231	
	N	28	28	28	28	28	28	28

**. Correlation is significant at the 0.01 level (2-tailed).

a. Cannot be computed because at least one of the variables is constant.

Source: survey, 2010

Appendix 18 Buru-Buru Correlations between type 'C' and 'D' transformations, unit and plot size

Correlations

			what is the area of the plot?	what is the area of the provided unit?	has the unit undergone type_D transformation?	has the unit undergone type_C transformation?
Kendall's tau_b	what is the area of the plot?	Correlation Coefficient	1.000	.296**	.222*	.196*
		Sig. (2-tailed)	.	.000	.019	.045
		N	103	103	103	103
	what is the area of the provided unit?	Correlation Coefficient	.296**	1.000	.149	.084
		Sig. (2-tailed)	.000	.	.096	.349
		N	103	103	103	103
	has the unit undergone type_D transformation?	Correlation Coefficient	.222*	.149	1.000	.888**
		Sig. (2-tailed)	.019	.096	.	.000
		N	103	103	103	103
	has the unit undergone type_C transformation?	Correlation Coefficient	.196*	.084	.888**	1.000
		Sig. (2-tailed)	.045	.349	.000	.
		N	103	103	103	103
Spearman's rho	what is the area of the plot?	Correlation Coefficient	1.000	.237*	.235*	.199*
		Sig. (2-tailed)	.	.016	.017	.044
		N	103	103	103	103
	what is the area of the provided unit?	Correlation Coefficient	.237*	1.000	.166	.093
		Sig. (2-tailed)	.018	.	.097	.352
		N	103	103	103	103
	has the unit undergone type_D transformation?	Correlation Coefficient	.235*	.166	1.000	.888**
		Sig. (2-tailed)	.017	.097	.	.000
		N	103	103	103	103
	has the unit undergone type_C transformation?	Correlation Coefficient	.199*	.093	.888**	1.000
		Sig. (2-tailed)	.044	.352	.000	.
		N	103	103	103	103

**. Correlation is significant at the .01 level (2-tailed).

*. [illegible]

Source: survey, 2010

Appendix 19 Correlation between the area of the provided unit and extensions

Crosstab

			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Total
has the unit undergone type_C transformation?	[illegible]	Count	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.0%
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Count	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	41
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.0%
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60.2%
Total		Count	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	103
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100.0%
		[illegible]	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

[illegible]

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		

[illegible]

Source: survey, [illegible]

Appendix 20 SPSS cross-tabulation between DEV extensions/ articulation to extension to the original DU

			What activity is done in the extension?			Total
			commercial	residential	other	
Is the extension physically independent form the provided house?	attached to original	Count	2	6	2	10
		% within is the extension physically independent form the provided house?	20.0%	60.0%	20.0%	100.0%
		% within what activity is done in the extension?	40.0%	12.5%	25.0%	16.4%
	detached from original	Count	3	41	1	47
		% within is the extension physically independent form the provided house?	6.4%	87.2%	6.4%	100.0%
		% within what activity is done in the extension?	60.0%	85.4%	37.5%	77.0%
	part independent	Count		1	3	4
		% within is the extension physically independent form the provided house?		25.0%	75.0%	100.0%
		% within what activity is done in the extension?		2.1%	37.5%	6.6%
Total		Count	[illegible]	48	8	61
		% within is the extension physically independent form the provided house?	8.2%	78.7%	13.1%	100.0%
		% within what activity is done in the extension?	100.0%	100.0%	100.0%	100.0%

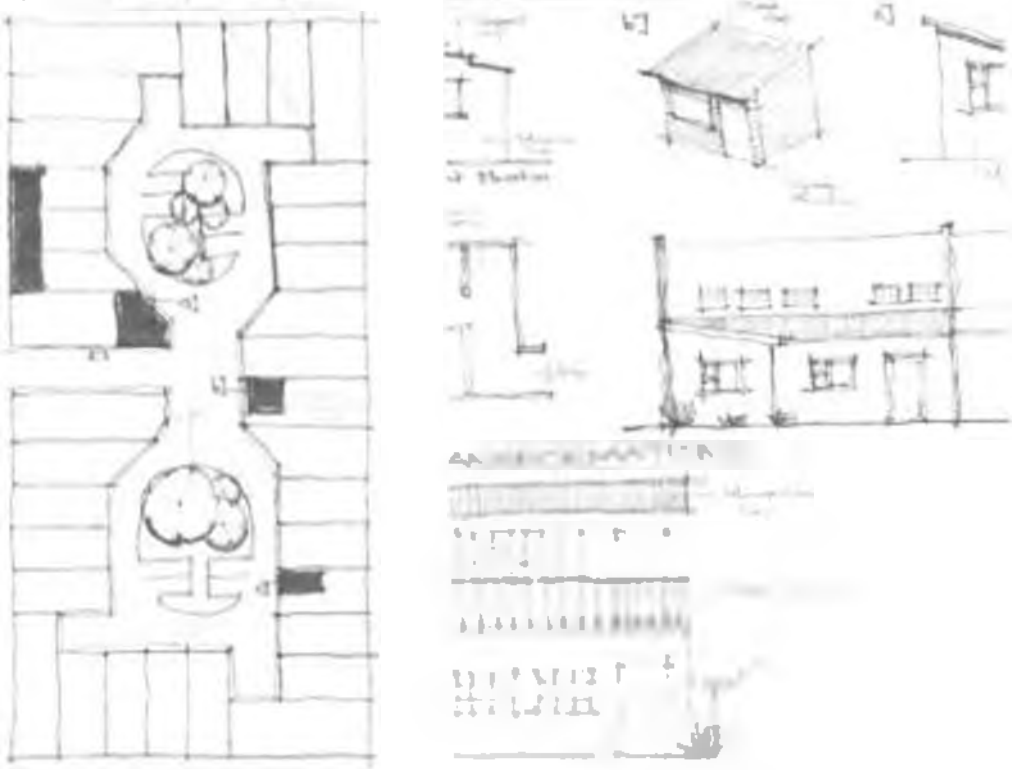
Source: survey, 2010

Appendix 21 Buru-Buru SPSS output of cross-tabulation between activity type and street location

			What activity is done in the extension?			Total
			commercial	residential	other	
Where is extension located on the plot?	spine	Count	3	39	2	44
		% within where is extension located on the plot?	6.8%	88.6%	4.5%	100.0%
		% within what activity is done in the extension?	60.0%	84.8%	28.6%	75.9%
	Court-wards	Count	2	3	1	6
		% within where is extension located on the plot?	33.3%	50.0%	16.7%	100.0%
		% within what activity is done in the extension?	40.0%	6.5%	14.3%	10.3%
	estate road	Count		4	4	8
		% within where is extension located on the plot?		50.0%	50.0%	100.0%
		% within what activity is done in the extension?		8.7%	57.1%	13.8%
Total		Count	5	46	7	58
		% within where is extension located on the plot?	8.6%	79.3%	12.1%	100.0%
		% within what activity is done in the extension?	100.0%	100.0%	100.0%	100.0%

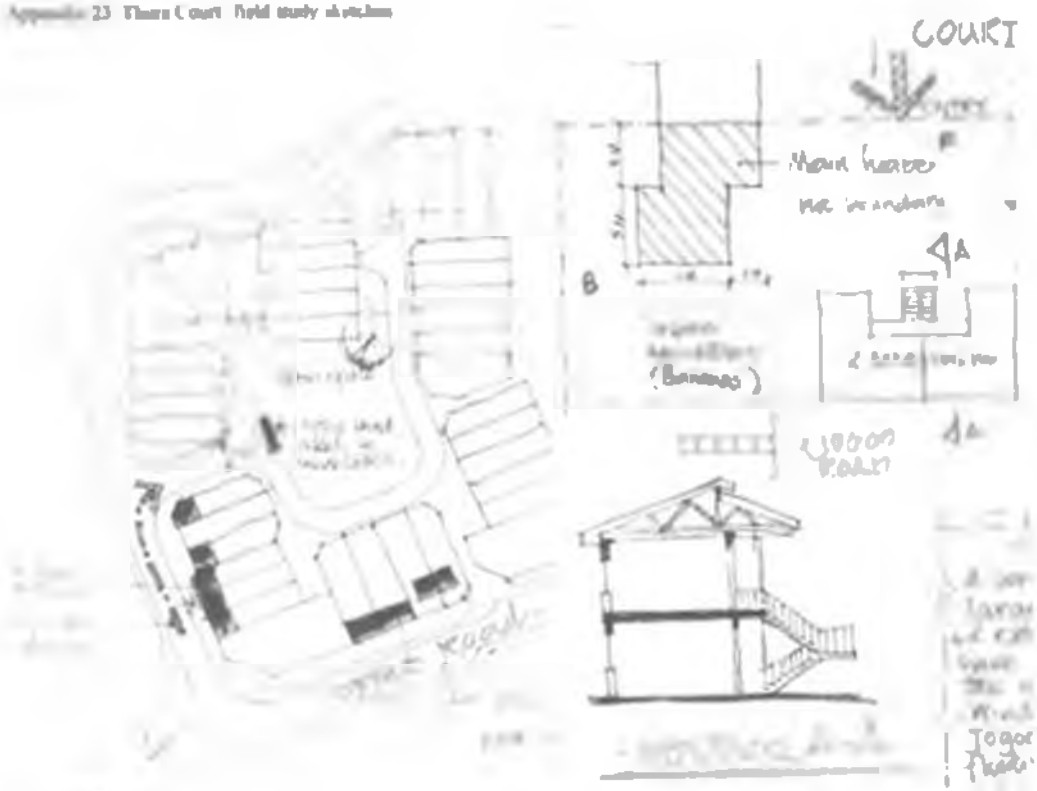
Source: survey, 2010

Appendix 22 Lusitana Court - study sketch



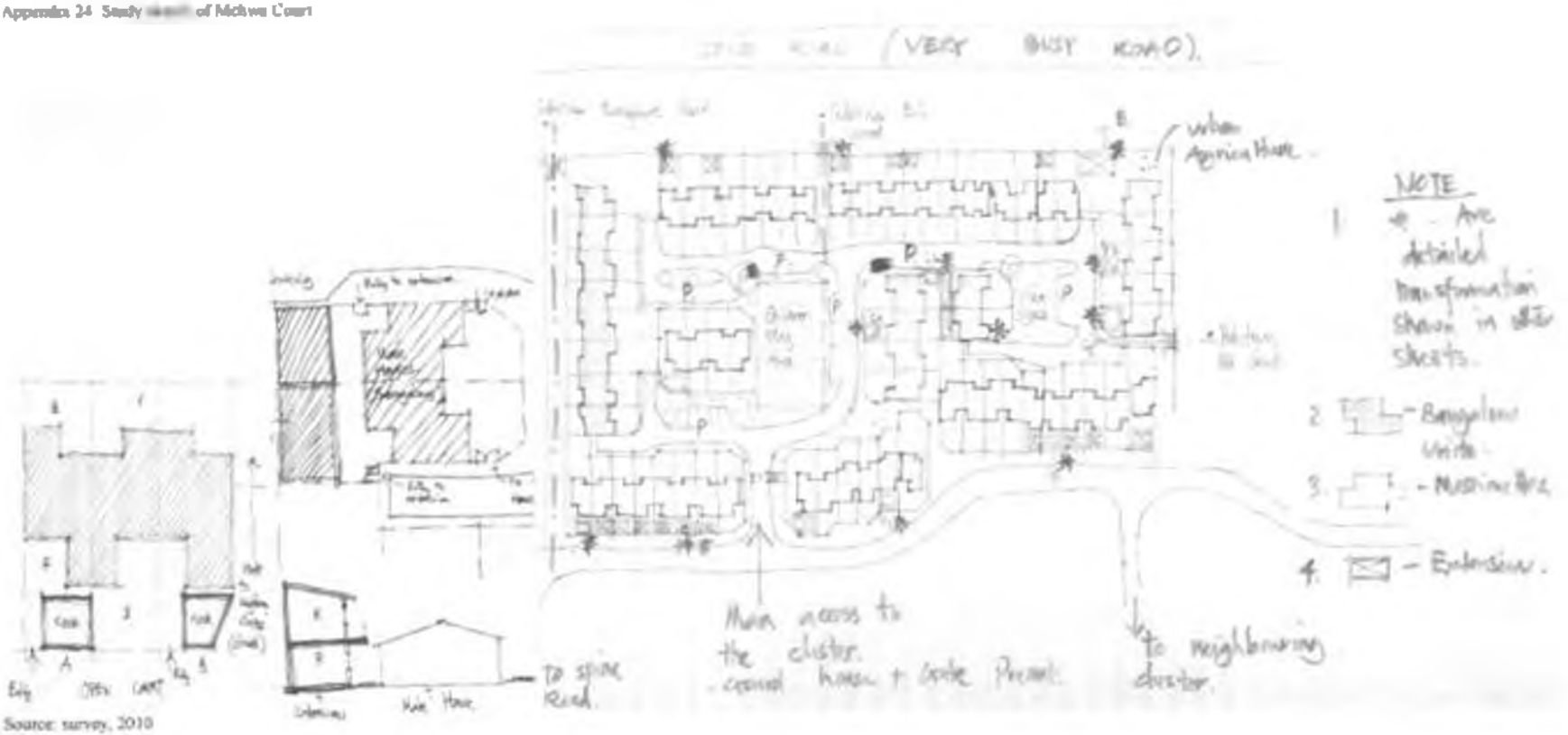
Source Survey 2010

Appendix 23 Thara Court field study sketches



Source survey 2010

Appendix 24 Study sketch of Mchwa Court



Source: survey, 2010

Appendix 29: Building elements technology used in the Buru Buru and Kaloleni estates

BUILDING ELEMENT		TECHNOLOGY TYPE				
		Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
description		'permanent'	'permanent'	'permanent'	'temporary'	'temporary'
Substructure	Foundation Footing	Mass concrete	Reinforced concrete	Reinforced concrete	Timber posts embedded in concrete footing (or in hole)	Timber posts embedded in concrete footing (or in hole)
	Foundation wall	Natural stone	Natural or concrete block wall	Natural or concrete block wall	NA	NA
	Hardcore	Rubble stone	Rubble stone	Rubble stone	Rubble stone	Rubble stone
Floor	Slab	Mass concrete (BRC reinforcement)	Mass /reinforced concrete	Mass /reinforced concrete	None (compacted hardcore)	None (compacted hardcore)
	Finish	Screed	PVC tile, screed	PVC tile, screed	Screed	Screed (sometimes absent)
	Skirting	Concrete	Timber/Concrete	Timber/Concrete	None	None
Wall	Wall	Natural stone	Natural stone/ concrete blocks	Natural stone/ concrete blocks	Mabati on Timber frame	Timber panels on timber frame
	Internal finish	None	Plaster /paint/glazed tiles in wet areas	Plaster /paint/glazed tiles in wet areas	None (occasional old newspapers)	None
	External finish	Dressing	Painted	Painted	None, mabati sheet	None
Boundary wall		None	Timber / hedge fences	Stone wall	None, mabati, hedge, barbed wire fence	
Roof	Structural material	Timber	Concrete slab	Timber	Timber rafters, purlins	Timber rafters, purlins
	Finish	Clay tiles	Clay tiles	Concrete tiles	Mabati	mabati
	Ceiling finish	None	Plaster /paint	Soft board/ ceiling board/ chipboard	None	None
Openings	Doors	Z- braced timber shutters hinged on timber frames	Metal casement / timber flush doors (internal)	Metal casement with burglar-proofing grills on external doors	Mabati on timber frame hinged onto wall	Mabati on timber frame hinged onto wall
	Windows	Timber shutters hinged on timber frames	Metal casement	Metal casement with burglar-proofing grills on external doors	Metal casement and Mabati shutters	Timber, mabati and metal casement shutters
Services	Water supply	Piped water	Piped water	Piped water	Common water point with main DU	Illegal connection or none
	Sewage disposal	NCC Sewerage system (originally on "bucket" toilets)	NCC sewerage	NCC sewerage	Common with main DU	Undefined or related to main DU
	Power	Electricity	Electricity / solar panels	Electricity	Illegal connection to main DU	Illegal connection to main DU
Structural system		Load bearing walls	Load bearing walls	Reinforced concrete frame / load bearing wall (combined	Self-supporting partition walls and roofing structure	Self-supporting partition walls and roofing structure
DU typology		Bungalow	Bungalow /maisonette	Apartment	Bungalow	Bungalow
Case examples		Kaloleni DU (original)	Buru-Buru (original)	Buru- Buru DITs, Kaloleni flats and Kirima block	Extensions in Kaloleni	Extensions encroaching on the road reserves

Source: author, 2010

Appendix 26 Buru-Buru Phase IV cluster characteristics

Cluster court (NHD) code	Number of plots	Average width of court	Average length of court	Approximate area of court
A	[illegible]	[illegible]	[illegible]	[illegible]
B	[illegible]	[illegible]	[illegible]	[illegible]
C	[illegible]	[illegible]	[illegible]	[illegible]
D	[illegible]	[illegible]	[illegible]	[illegible]
E	[illegible]	[illegible]	[illegible]	[illegible]
F	[illegible]	[illegible]	[illegible]	[illegible]
G	[illegible]	[illegible]	[illegible]	[illegible]
H	[illegible]	[illegible]	[illegible]	[illegible]
J	[illegible]	[illegible]	[illegible]	[illegible]
K	[illegible]	[illegible]	[illegible]	[illegible]
L	[illegible]	[illegible]	[illegible]	[illegible]
M	[illegible]	[illegible]	[illegible]	[illegible]
N	[illegible]	[illegible]	[illegible]	[illegible]
P	[illegible]	[illegible]	[illegible]	[illegible]
Q	[illegible]	[illegible]	[illegible]	[illegible]
R	[illegible]	[illegible]	[illegible]	[illegible]
S	[illegible]	[illegible]	[illegible]	[illegible]
T	[illegible]	[illegible]	[illegible]	[illegible]
U	[illegible]	[illegible]	[illegible]	[illegible]
V	46	[illegible]	[illegible]	[illegible]
MEAN PER CLUSTER	42	[illegible]	[illegible]	[illegible]
MAXIMUM	65	[illegible]	[illegible]	[illegible]
MINIMUM	22	[illegible]	[illegible]	[illegible]
MEDIAN	40	[illegible]	[illegible]	[illegible]
MODAL AVERAGE	29	[illegible]	[illegible]	[illegible]
TOTAL NUMBER OF PLOTS [redacted] PHASE 'IV'				[illegible]

Source: survey, 2010

Appendix 27: DU finishes in Buru-Buru

ELEMENT	B.S. COLOUR REF.	FINISH	COMMENTS
Walls	White	Plastic Emulsion on plaster	Not washable. Excessive dirt will require redecoration.
Ceilings	White	Plastic Emulsion on Plaster	Not washable. Excessive dirt will require redecoration.
Floors		P.V.C. tiles	Wipe with damp cloth and non-abrasive cleaning fluid or soap powder. Do not use large quantities of water since this will cause the tiles to lift.
Skirtings	08 B 29	Timber Gloss painted	Washable.
Doors Internal	08 B 29	Hardboard Facing on frame. Gloss painted	Washable
Doors External	Vary	Hardboard Facing on frame Gloss painted	See external colour schedule for individual house.
Kitchen Worktops	White	Formica Faced	As for floors. Abrasive cleaning agents, i.e. "Vim" will scratch the surface.
Kitchen Cupboards	Frames & Fixed Panels. 08 B 21 Doors - 08 B 51	Hardboard facing on framework. Gloss painted.	Washable.
Kitchen Cupboards High Level	White	Hardboard facing on frame. Gloss painted	Washable

NOTE:

For accurate colour matching, colours are referred to by B.S. numbers only, and not by name.

Source: survey, 2010

Appendix 78 Sector SG layout and sketch notes on the location of DETs surveyed in the sector

Source: survey, 2010

Appendix 29: Typical Owners' Handbook in Buru-Buru estate-pg1

mutiso menezes international

Source: survey, 2010

Appendix 30: Typical Owners' Handbook-pg.2

Source: survey, 2010