Reversing Horizontal Sprawl

Towards more compact city neighbourhoods

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"Resources need to be utilised efficiently. The use and occupation of available space and vacant land should be rationalised. Public utilities must be efficiently managed .Municipal services must be financially sustainable and housing projects must fit into available land and be economically and environmentally sound"

Claudio Acioly Jr and Forbes Davidson, *Density in Urban Development*, Building issues 8.3, Lund, page 12

1. Shelter Situation Analysis

Like many parts of developing world, Kenya has in recent past witnessed a large influx of young population into urban areas causing a major strain on existing services and rapid growth of slums. Nairobi, the country's capital with an estimated population of over 3million people has the highest urbanisation rate in East Africa at 7.5% p.a. In February 2008, the Kenya Government established the Ministry of Nairobi Metropolitan Development mainly to deal and manage the dynamic processes of urbanisation and related challenges of urban sprawl.

1.1 Basic General Data

Geography and Administration

Kenya is in East Africa, bordered by Ethiopia to the north, Somalia to the northeast, Tanzania to the south, Uganda to the west and Sudan to the northwest. Kenya has a total area of 224,961 square miles (582,646 km²), and has 8 administrative provinces. Nairobi is the capital city with a population of about 3 Million people.

Demography and Health

Kenya is a country of great ethnic diversity with a total of 42 tribes; Kikuyu 22%, Luhya 14%, Luo 13%, Kalenjin 12%, Kamba 11%, Kisii 6%, Meru 6%, other African 15%, non-African (Asian, European, and Arab) 1%. Both English and Swahili are official languages. Majority of Kenyans are Christians with 45% being Protestants and 33% Roman Catholics. Other faiths like Muslims (10%) also do exist. Kenya's population density is 49 persons per km². (CBS: 2009)

Table 1: Kenya's Population and distribution 1979- 1999 censuses.

Item		1979	1989	1999
Population		**15,327,061**	**21,443,636**	**28,686,607**
Male		7,607,113	10,628,368	14,205,589
Female		7,719,948	10,815,268	14,481,018
Life Expentancy		59.5	61.9	56.6
Total Fertility Rate			6.6	4.7
Infant Mortality Rate	Per 1000		66.0	77.3
Under 5 Mortality rate	Per 1000		113.0	116.0

Source: CBS (2008)

Table 2: Kenya Demography and Health (Projection)

Item	Item	2005	2006	2007	2008
Population	Million	35.1	36.1	37.2	38.3
Male	Million	17.1	17.5	18.1	18.7
Female	Million	18.0	18.6	19.1	19.6
Total Fertility Rate		4.9	4.9	4.9	4.9
Infant Mortality Rate	Per 1000	77	77	77	77
Under 5 Mortality rate	Per 1000	115	115	115	115

Source: CBS (2009)

Economy

Kenya is mainly an agricultural economy which employs nearly 75 percent of the country's 36 million people. Coffee, tea and horticultural produce are the main cash crops. Other key sectors include Tourism, Trade and Industry, and Energy sectors. Kenya's economy recorded impressive growth rate from 3.0% in 2003 to 7.0% in 2007 but the effects of December 2007 post election skirmishes led to a major decline in 2008 to 1.7%.

Table 3. Selected Key economic Indicators: Source GOK Economic survey, 2009

Indicator	2002	2003	2004	2005	2006	2007	2008
GDP Growth rates	0.6	3.0	4.9	5.9	6.3	7.1	1.7
GDP at Market Prices (Ksh billion)	1,022.2	1,136.3	1,274.3	1,415.7	1,622.4	1,826.0	2,099.8 ($ 27billion)
GDP per capita (constant 2001 prices) Ksh	32,549	32,845	33,764	33,441	34,570	36,000	35,611 ($458.2)
Average Forex rates(Ksh per US dollar)					69.40	62.68	77.71
Inflation Rate (% change in CPI)	2.0	9.8	11.6	10.3	14.5	9.8	26.2

1.2 Shelter Related Fact and Figures

Access to Shelter

Provision of shelter in Kenya is a huge challenge. Based on 1999 National Population and Housing Census, there are about 3million people in urban areas and 6million people in rural areas in urgent need of proper housing. There are about 750,000 households in urban areas and 1,500,000 households in rural areas that need to be housed. The Government National Housing Policy Sessional Paper 3 (2004) gave an ambitious plan by government to facilitate an annual output of 150,000 housing units in urban areas and 300,000 units in rural areas.

Housing stock and Housing deficit (quantitative and qualitative)

As per the 1999 Population and Housing Census, the total housing stock in Kenya stood at 10.4 million dwelling units- 19.5% of these were in urban areas and 81.5% in rural areas. From the estimated urban housing needs of 150,000 housing units per year against estimated supply of about 35,000, there is a shortfall of about 115,000 units per annum. This shortfall in housing is being met through proliferation of informal settlements. Presently, 60% of all urban dwellers live in informal housing occupying 5% of the urban land

Occupancy

Most of the informal settlements are very congested with very high occupancy rates of more than four people living in a single 3mx 3m room. The average number of rooms per dwelling unit at national level is 1.74. In terms of congestion; an average of 1.55 persons per room was reported at national level while the urban areas reported 1.72 persons per room according the 1999 Population and Housing Census. This indicates higher congestion in the urban areas.

Housing standards

The predominant type of construction in informal settlements is earth or mud floors and walls, corrugated iron sheets or plastic sheets and cartons for the roofs. Basic services such as sewer systems, water, roads and other social or recreational facilities are almost non existent dangerously exposing the residents to serious health and other social risks

Floor Area per person

The average household size in Kenya is 4.4. Using the average of 10 square meters for a habitable room and 1.72 persons per room in urban areas, the average floor area per person is therefore about 5.8m2

Tenure of households

Most households (74.9%) in urban areas are renters while most in rural areas (87.3%) own their dwellings. Most of the rental units (80.9%) are done by private entrepreneurs.
Most houses in informal settlements lack security of tenure and most operate in form of a temporary occupancy right from local Chief or "self proclaimed" village elders.

Housing affordability ratio and House price to income ratio

Only about 25.1% of urban residents own their houses. The rent charged varies based on location of the structure, construction material used and the basic services provided. This ranges from about Ksh 800 ($10) for a simple 3mx 3m shanty to Ksh 200,000 ($2500) per month for posh upmarket villas. This translates to about 30% of the monthly income for majority urban poor.

Land (formal/informal)

Most land leases in urban areas are 99years while rural agricultural leases are 999yrs.Informal settlers however lack security of tenure for their land. This means they cannot carry out meaningful development or access necessary finance to advance their lives.

Housing construction technology and Building materials

Materials and building technologies permitted by the current building code are beyond reach for majority of urban poor. These include the conventional stone walls, reinforced concrete slabs, iron sheets or tiles for the roof. Given no other legal option, the majority therefore resort to makeshift structures of mud floors, iron sheets or cartons for walls and old iron sheets for roof.

Access to and cost of Basic Services/Infrastructure

According to 1999 population census, only 30% of households nationally had access to clean water and 7.7% had access to main sewer for waste disposal. Urban areas were better off with 74.7% of households having access to piped water.

Access to and cost of Education

18% of the population had never attended formal according to 1999 population census. The government in 2003 introduced free compulsory primary education followed by further subsidy of tuition fees for all public secondary in January 2008 to make basic education accessible to all.

Table 4. Level of Literacy by Gender, Kenya 2006

Residence	Female	Male
Urban	88.5	93.7
Rural	75.2	86.2
Total	78.5	88.1

Source: KDHS 2003

1.3 Housing Policy

The first post independence housing policy for Kenya; *Housing Policy-Sessional Paper No*.5 was prepared in 1966/67. At that time the country's population was about 9million growing at a rate of 3% per annum. The current housing policy; National Housing Policy for Kenya-*Sessional Paper No.3* was formulated in 2004. Some of the key objectives of the policy are:

a) Facilitate realization of the right to **adequate housing** by all;
b) Promote the **development and ownership of housing** that is functional, healthy, aesthetically pleasant and environmentally friendly;
c) Improve the quality of **existing stock of houses**;
d) Contribute in the alleviation of poverty by creating employment among the poor through building material production and construction processes as well as **promote income generating activities** within the built environments.
e) To **provide and improve infrastructural facilities** in both the rural and urban areas so as to improve human settlements and living environments.
f) To streamline the **legal and institutional framework** to promote housing development.

1.4 Actors in Shelter Delivery and their Roles

Actors	**Key consideration/roles**
1 **Government Agencies** : Ministries, Local Authorities and State corporations	Policy formulation, Financial resources, Infrastructure and services provision, Land resource management and planning, Public/Social Housing programmes
2 **Private Sector** : Private Developers, Business community, banks etc	Supply of housing to meet market demands, supply of building materials, public- private partnerships (PPP) with government in shelter and infrastructure provision,
3 Non Governmental Organisations (NGOs) Self help groups, cooperatives etc	Public watchdogs ensuring good governance, inform and mobilize communities, encourage saving for housing, small scale building materials industries, etc
4 **Research Institutions** Universities and Colleges etc	Conduct research on appropriate technologies innovative building solutions and materials, provide research based advisory services to the government etc
5 **International Agencies and Development Partners** UN-HABITAT,UNEP, etc	Provide partnership, access to financial resources, training and capacity building, facilitate research and information dissemination

1.5 Shelter Design

Housing development in Kenya over the years has been constrained by various factors.

- **Physical planning and regulatory instruments**: Lack of proper planning for housing coupled with cumbersome bureaucracies has been a major impediment to sustainable housing development in Kenya.
- **Land use and infrastructure:** Most of the available land in urban areas is under the local authorities and lacks basic infrastructure like accessible roads, sewers, water and power, and is in most cases located far from work places.
- **Building materials**: Revised building by-laws that recognize use of low cost building materials and technologies have not been adopted by most local authorities The current cost of conventional building materials is comparatively high in the wake of dwindling reserves of most of these items like, stones, cement, timber and sand.
- **Institutional support**: There has been insufficient support from both local and foreign agencies and governments to encourage housing development especially for low and middle income class.

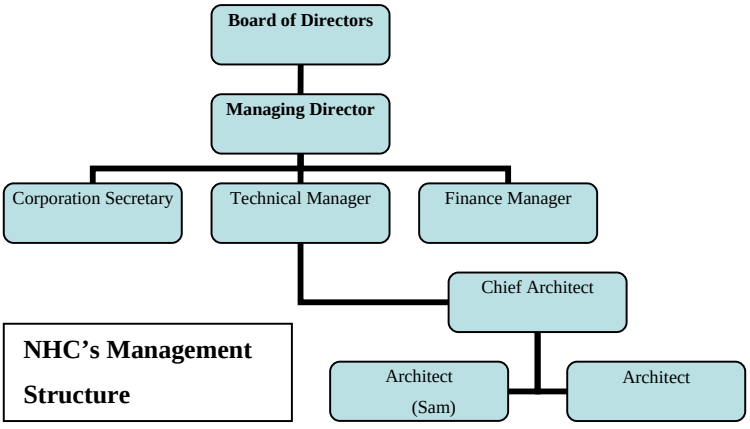
2.Organisation.

The National Housing Corporation (NHC)

NHC is a State Owned Enterprise under the Ministry of Housing that was established in 1967 through an Act of Parliament with a principal role of implementing the Government's housing policies and programmes.

Core functions:

- *Develop decent and affordable housing,*
- *Facilitate development of houses in rural/ peri-urban areas through affordable loans,*
- *Forge partnership with stakeholders in housing development,*
- *Mobilize capital for housing development,*
- *Undertake research and development in housing,*
- *Operate a housing finance institution.*



NHC's Management Structure

3. Shelter Problem

Unregulated land market:Plots for sale 50km from CBD

Reversing horizontal sprawl through densification of old city estates.

Nairobi Metro 2030 Strategy proposes an expansion of Nairobi Metropolitan area from a radius of 40 Kilometres to a radius of 100 Kilometres. With the population of the entire Nairobi Metropolitan Area expected to hit 18million by 2030 and the housing demand to 2.5million, innovative approach must be sought to deal with issues of optimum land use, ideal housing densities and infrastructural support to accommodate the growing population, prevent urban sprawl and pull people towards more compact, well serviced, well planned and cost effective neighbourhoods which are not only cheaper in the short term but also well sustainable within the context of limited land.

Current Scenario

a) **Horizontal raiding of agricultural suburbs:** Congestion in the core of Nairobi city has become a "push factor" and many city dwellers especially the middle income group have migrated to the less populated regions around the city. These include Mavoko, Thika, Kiambu, and Kajiado. Most of these areas that were previously agricultural and community ranches are currently splattered with semi-completed houses in lone compounds without basic infrastructure like water, electricity, roads or sewerage facilities.

   P.A Stone (Housing, Town Development, Land and Costs, 1963) calls this phenomenon, "overspill development" and argues that for it to be socially and economically successful it must carry within it more than housing. Commercial, social, industrial, public utility and infrastructural facilities must be provided as well, (Stone 1963: xii) which means considerable capital investment. The probability is that Kenya and indeed great majority of developing economies have limited capacity to raise such huge capital in the short term to accommodate the rate of sprawl.

b) **Informal settlements**: Multiple factors have over the years led to proliferation of informal settlements from colonial times where Africans were displaced by European settlers to present day socio-economic issues that have remained a challenge to all government agencies. Several programs to eradicate slums have been largely insufficient or failed all

together. In most instances, schemes ideally meant to benefit the slum dwellers end up benefiting the middle income who buys out the poor slum dweller.

c) **Housing decay:** Most of the schemes developed before independence to house the urban African workers are currently in a serious state of neglect and disrepair. Most are owned by Government Agencies and Departments:

- Nairobi City Council: include Low income Eastlands estates like Shauri Moyo, Kaloleni, Mbotela, Bahati etc.
- East Africa Railways(Formally Kenya Railways): include High income neighbourhoods in Kileleshwa, Kilimani, Upper Hill etc

All these colonial schemes occupy large parcels of prime land within 5 KM distance from the city centre. Apart from squandering very precious urban land, the deteriorated state of the houses surrounded by unkempt bushes and alleys provides very good hub for criminals and drug trafficking activities.These present excellent opportunity for redevelopment into cost effective high density housing developments.

d) **Natural densification:** Most middle income houses that were built or facilitated by government agencies through site and service schemes or funded by World bank loans after independence have gone through complete over haul to accommodate high population densities. Single storey structures in areas like Umoja and Buruburu have become multi-storey units and any left open space completely occupied. This natural densification though arising primarily from increase in demand and failed state controls depicts serious planning issues that need address to accommodate ever growing demand.

e) **Day light city:** Nairobi's inner city which enjoys high concentration of infrastructural services experiences high variations of densities with extremely high densities during the day and almost deserted at night. This daylight city means "high investment in infrastructure, roads, traffic management and energy supply are all underutilised" especially at night (Acioly. et. al. 1996:8). Majority of the city workers who cannot be accommodated within the inner city estates retreat to neighbouring satellite towns and suburbs which act as city's dormitories. Densification of old city estates will apart from ensuring optimum utilisation of existing infrastructure, also create multiple land uses within the city, thereby creating liveliness and security.

4. Proposal for Change and Improvement

To begin with, the main aim of my proposal is to reverse urban sprawl through development of more compact city neighbourhoods. Four strategies are of critical importance in our endeavour towards more compact city models:

1. Densification and redevelopment of old low density city estates.
2. Regulation of low density development.
3. Slum upgrading schemes.
4. Enabling strategies.

For purposes of further discussions, I will later on focus on densification and redevelopment of low density city estates with a pilot project in Kileleshwa redevelopment.

- **Densification and redevelopment of old low density city estates**: These will house significant mass of urban low and middle income population who usually walk to work in industrial area and CBD. This inner city development concept is economically viable and sustainable since upgrading of existing infrastructure is much less cheaper and manageable compared to provision of the same to unserviced areas. In Tunisia, for example, the Ninth Economic Development Plan currently being implemented has provisions aimed at redeveloping and restoring city centres to residential use to cope with the challenge of urban sprawl (Adapted from presentation at ARRU-Tunisia 2009).
- **Regulation of low density development**: Controls to discourage low density can be very successful within the framework of Land Policy and taxation. Large tracks of land particulary in Kajiado and Machakos where there is uncontrolled subdivision of unserviced agricultural land by private ranch owners require these kinds of interventions by the state. Incentives through tax breaks, waiver of rates, exclusive mortgage facilities for apartment developers or even denial of building permits for low density developers are just a few of the options. In the Tunisian densification policy, every plot owner has a right to build three storey house (Adapted from presentation at SNIT-Tunisia 2009). This is to encourage vertical development and limit outward expansion.
- **Slum upgrading schemes**: Land currently occupied by slums in Kibera, Mathare , Korogocho and so on can accommodate over three times the current population through high density upgrading schemes. Most importantly, providing some degree of security of tenure for informal settlers will most induce their participation and contribution towards uplifting their living environments. Most the slum dwellers have the ability and resources

to improve their house conditions but with insecure tenure and fear of eviction, there is little incentive to invest hard work or hard earned money into their house. (Tannerfeldt 2006:98)

- **Enabling strategies:** Government agencies through joint venture, Public Private Partnership (PPPs) or development partners should facilitate an enabling environment by upgrading the existing infrastructure to allow densification and verticalization of housing models. This will decrease significantly the per capita cost of infrastructure and promote compact inner city model.

4.1 FOCUS: Densification and redevelopment of low density city estates

Justifications:

a) **Infrastructural network:** The new metropolis generates significant infrastructure demands especially water, roads, waste disposal. The current infrastructural network of Nairobi cannot adequately support the expanded metropolis. Multisectoral approach to realise the huge investment necessary to provide the critical infrastructural services should be explored. Fortunately most of the old decaying city estates have very good infrastructural network, although capacity is inadequate. Too much pressure on existing services has led to non-functional drainage system, blockages of sewer lines, insufficient water, traffic jams and so on. The requisite capital to upgrade the existing infrastructure to serve compact high density population should be weighed against the cost of providing similar services to the new upcoming sparsely populated suburbs. Investment in these infrastructural services has huge multiplier effect and the resultant benefits in terms of quality of life, efficient transport and communication system (short trips), healthy and decently housed population are worth investing in. Stone however argues that given the limited standards of amenities for urban development, a point is reached where additional population can only be accommodated in multi-storey flats (Stone 1963: xiii)

b) **Efficient use of land:** As Acioly. et. al. (1996:18) describes, there is a decrease of per capita land available and therefore a need for more intensive utilization of land. More compact city model significantly reduces the per capita cost of land and guarantee high rates of return on investment. On the other hand, the high per capita costs of land and infrastructural services for the horizontal city are major setbacks to any meaningful development, and the

"environmental foot prints" as Tannerfeldt (2006:62) puts it, become difficult to manage. There is increasing need to protect valuable ecological, recreation and agricultural land, reduce distances travelled and green house gas emissions, and ensure land use patterns that promote cost-effective infrastructure provision according to Nairobi Metro 2030 (2008:41).

Most of the colonial city estates sit on relatively large pieces of precious land. In Kileleshwa, an upmarket neighbourhood 5KM from CBD for example, a typical plot of 14,253m2 (1.4ha) has five bungalows of approx. plinth area of 250m2. This translates to Plot Ratio/Ground Coverage of 8% and density of about 18 persons/ha

c) **High urban productivity:** Urban sprawl and the associated challenges of high transport and energy cost, loss of valuable working time, congested transport network, environmental pollution and the overall poor quality of life impact very negatively on the business environment, productivity and competitiveness of local production. High population density has huge impact on economic performance in terms of accessibility to markets, skilled and unskilled workforce, information and research/ innovations at low cost and within reasonable time. This leads to competitiveness, improved urban production and high economic growth.

d) **Safe and secure social environment:** Housing has significant social dimensions. Important socio-networks are centred on residential neighbourhoods and as such the environment so created should nurture and support natural social functions. Housing quality is not just a matter of physical solutions but also of social relationships, recreation and varied activities in space and time. (Adapted from Grundstrom's Lecture 2009).High density housing increases social contact and liveliness. The degree and success of the social planning will however also depend on how different functions are integrated in the overall design layout.

Also important is the assurance of a protected environment, free from physical violence and crime. Security concerns especially in the recent past have created this shift from low density to high density partly due to the perceived idea of "security in numbers" but also due to the fact that security services are readily available through close proximity and also cost sharing in hiring private security services. A case in point is migration of people from low density owner-occupied houses in Ngong, Kitengela and Kiambu surbubs in 2004-2007 to high density Nairobi inner city apartments.

4.2 ACTION AREA: KILELESHWA REDEVELOPMENT

Background:

The city of Nairobi was primarily established as a simple transit depot for the Kenya- Uganda railways in 1901. Back then the population was about 8,000 people occupying an area of about 3.84 Sq.Km. (Awalla 2007:8). Since then there has been progressive increase both in population and the physical boundary to its projected level of 3 million people in an administrative core area of about 696 Sq.Km. The entire Nairobi Metropolis is about 32,000 Sq.Km (Nairobi Metro 2030, 2008: XV).

When Nairobi was made the capital city of the then British Protectorate in 1905 replacing Mombasa, it attracted huge influx of British explorers and hunters due to its cool climate free from malaria mosquito. The British settlers moved to the most greeny areas of city to the West of Uhuru Highway. These include posh areas of Kilimani, Kileleshwa, Westlands and Loresho.The period between 1905 and 1950s witnessed major social stratification in Nairobi with the African moving to Eastlands, Asians to Central Nairobi while the Europeans moved to the Western suburbs characterised by very rich tropical vegetation, large plots and built large expansive single storey houses.

The Kenya Railways (KR) as the single most established employer at that time acquired a lot of land in these prime locations and built many houses for its expatriate managers. Most of these houses built during that period still dot the exclusive neighbourhoods of Kileleshwa, Kilimani, Spring valley and Upper hill occupying huge parcels of land ranging from one to five acres.

The under-utilised potential in this area is evident and validates the proposal for densification and regeneration as envisaged in the Nairobi Metro 2030 strategy (Nairobi Metro 2030, 2008:70).

Low-density bungalows in Kileleshwa area surrounded by high rise apartments

4.3 PROPOSED KILELESHWA REDEVELOPMENT PILOT PROJECT

Design brief

The proposed Kileleshwa redevelopment pilot project is located at Kileleshwa, one of Nairobi's greeny suburbs just ten minutes drive from the Central Business District. It is adjacent to Kileleshwa Police Station along Mandera Road.

Trunk services are all available i.e. Water, Sewerage, Electricity and Telephone Service

The area is being redeveloped from single bungalow homesteads to denser flats accommodation as can be seen below.

Views within the site

The land for the project initially belonged to the Kenya Railways Corporation but was later transferred to National Housing Corporation under debt settlement agreement. The entire parcel of land measures approximately 1.425Ha (14,253m2).The site currently has five old bungalows which are to be demolished to give way for modern high density apartments.

Planning concept: The overriding concept is based on maximising space while keeping in touch with modern concepts of neighbourhood design (see appendix A-C). The plan also takes cognisance of the on going developments in the area while pushing new barriers on building by-laws.

Typologies: We envisage densification from 5 single storey units to 105 multi storey apartments (see appendix D). This translates to density of 74 units per hectare from 3.5 units per hectare, an immense contribution to housing supply.

Description	Area per unit (M2)	No. of Units
Type A- Two bedrooms apartments	122	20
Type B- Three bedrooms apartments	170	50
Type C- Four bedrooms apartments	200	35
TOTAL		**105**

Ancillary facilities: These include:

- Swimming pool & Health fitness centre
- Standby generator,
- Water storage tanks & garbage cubicles,
- Car park
- Jogging track

PROPOSED PROJECT VIEWS

Considerations for better shelter design

- **Optimum density:** Discussions with Nairobi City Council are required regarding revision of existing regulations for the area to achieve high densities, and more open space for green cover and other amenities. Current limit for the area is Ground Coverage of 35%, Plot Ratio of 75% and maximum height of four storeys. It is however possible to achieve density of about 75 persons/ha by increasing PR to 150% with a Ground Coverage of 28%. This means 72 % of open space and community facilities.
- **Compatibility with neighbourhood trends**. Most of the neighbouring privately owned plots have developed 4 and 5 storey apartments. The natural demand and high land value are mainly to blame for this scenario which has forced the city council to start rethinking the issue of densities.

- **Social planning and inclusiveness:** Variety of social functions, recreation facilities, leisure and outdoor activities for all age groups are very important for quality social environment. These are well incorporated in the planning and design.
- **Affordability:** Kileleshwa redevelopment targets the middle income group, majority of who have been pushed to the suburbs. This strategy is aimed at reducing sprawl by acting as a pull factor since they provide attractive alternative given availability of inner city services and the accruing savings in terms of short trips to work and less energy use. In addition, this will reduce pressure on low cost houses by providing adequate supply of middle income houses. Varying housing types have been proposed to take care of the income levels and the different housing needs of the users.
- **Stakeholders involvement:**
    - **Nairobi City Council:** Necessary for development approvals, negotiated increase in density (Plot Ratio and Persons per hectare) as well as infrastructure upgrading in conjunction with central government.
    - **National Environment Management Authority (NEMA);** Environmental Impact Assessment and the development permits are part of the preliminary procedures for this development.
    - **Service providers:** Involvement of the service providers is also required. These include Water and Sewerage Company, electricity provider and contractors as well.
    - **Beneficiaries:** Appropriate methods to encourage user involvement and participation will significantly improve the success of the project.
- **Sustainability:** This entails strategies for continuous survival of the scheme as a sustainable development that fulfils the needs of today's generation without putting risks on the possibilities of future generation as defined by Maydl in UN Habitat Report of the Vienna Workshop,2000:217. Maydl argues that among the characteristics of products or services achieving goals of sustainability are those that yield maximum output with minimum consumption of natural resources, energy and space. The land use per unit service should be as low as possible, wastes and pollution effect minimised, use of ecologically sound materials and efficient site planning.
- **Climatic Responsiveness:** The design should be adaptable to local tropical climatic conditions. Our particular concern was to achieve thermal comfort through passive design that allows minimum solar heating, natural ventilation, light coloured and well

insulated roofs and provision of adequate semi-outdoor activities. (Adapted from Johansson's Lecture 2009).

- **Responsiveness to local economy:** Labour intensive strategies and appropriate use of local materials and technologies, as envisaged in the housing policy should be promoted (National Housing Policy 2004:3) This will create employment among the poor as well as promote local markets and small scale building materials enterprises.
- **Cultural and historical identity:** Proper trade- off between "New vs. Old" is required. Identification of elements for conservation from old housing stock and ensuring harmony of character that respects the old system will help create an urban environment that relates to the past as important part of our identity.

4.4 CHALLENGES

- **Overloaded infrastructure service lines:** These are evident in narrow roads, bursting sewer lines, dry pipes etc (see appendix E). Innovative approaches are required to inject required capital for infrastructure facelift. Given the fact that public infrastructure networks are used by all and cannot be bought or sold like other commodities, they need to be provided by public enterprises or private enterprises granted some public responsibilities(UNHabitat 1990:18).The public sector then needs to recover these costs from beneficiaries of increased land value either through user charges or infrastructure taxes.
- **Obsolete by-laws and bureaucratic inertia**. Negotiations with city council are required to get concessions.
- **Weak cooperatives for common area management**. Strengthening of Tenants/ Owners Associations is required by encouraging self management like the case of Holma, South Malmo(adapted from visit to Malmo and Astrand's lecture 2009).

4.5 CONCLUSION

These proposals and lessons from Kileleshwa pilot project can guide further redevelopment, densification and utilisation of Nairobi's inner city potential as envisaged in Nairobi's Metro 2030 strategy. It is however important to point out that the increasing housing demand in Nairobi is far beyond the capacity of the state or other sector players to satisfy in the short term. Given that 60% of urban population growth is through natural growth (Tannerfeldt 2006:27) perhaps more effort is required in education and promotion of family planning as well.

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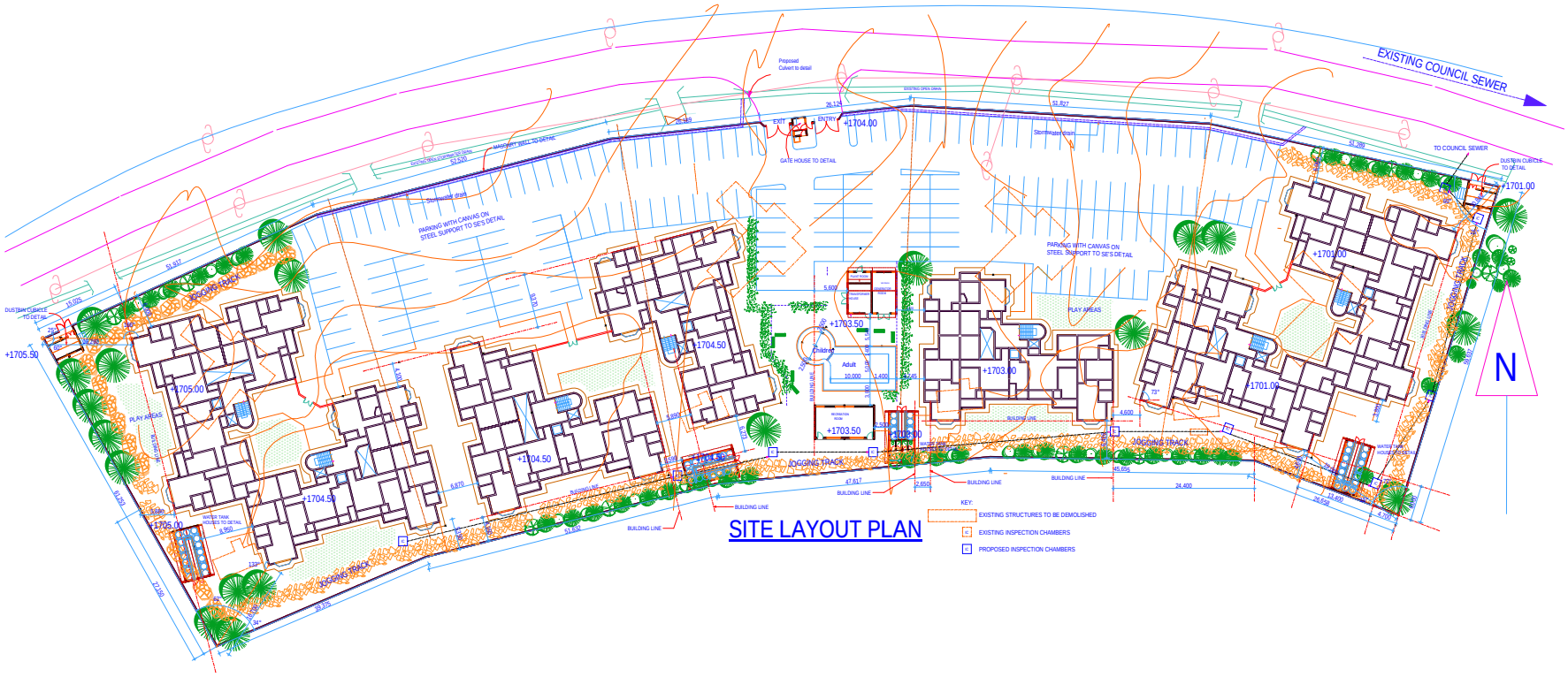
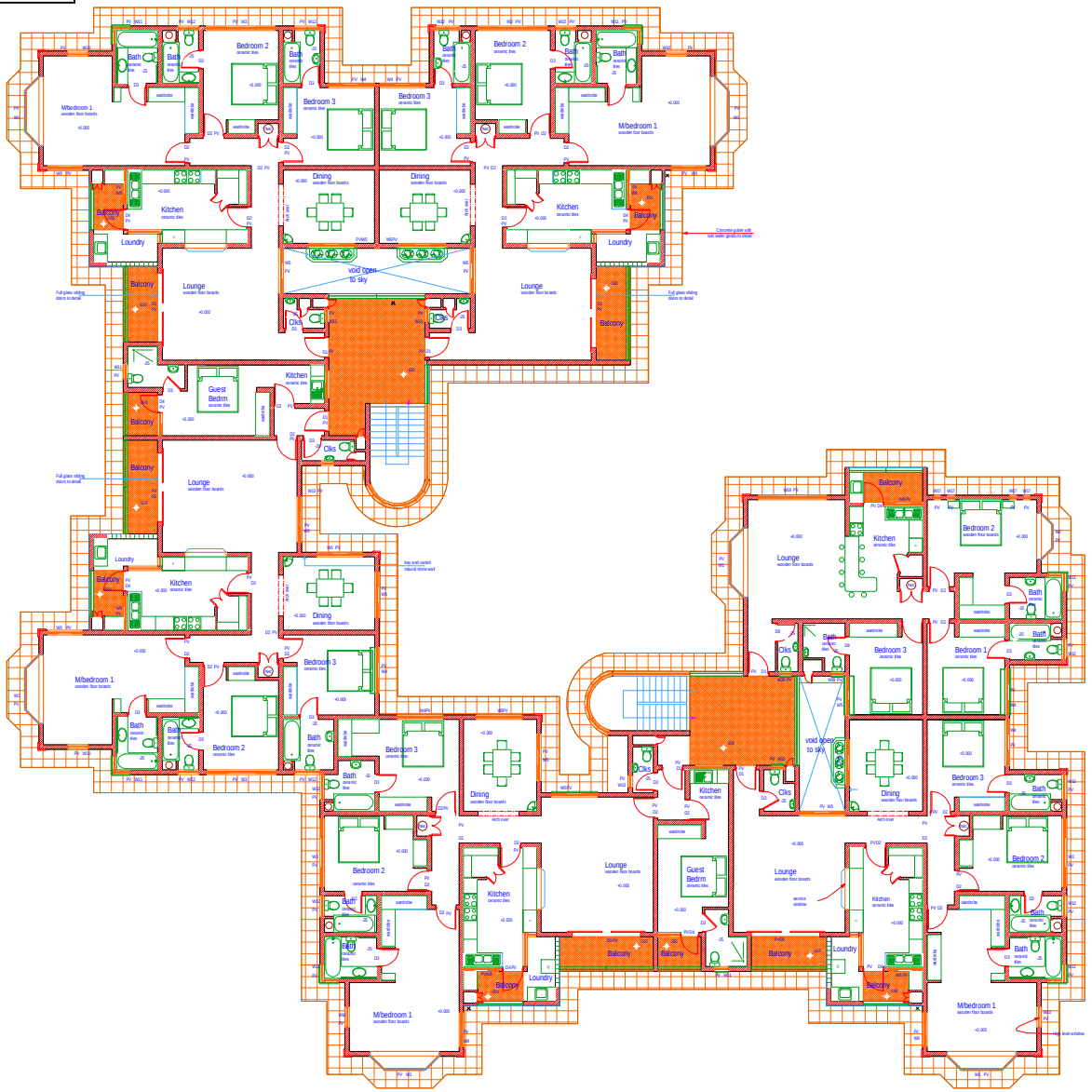
APPENDIX-A

DESIGN CONCEPT:



SITE LAYOUT PLAN

APPENDIX-B



TYPICAL FLOOR PLAN

APPENDIX-C

APPENDIX-D

Scheme	**DENSIFICATION OF KILELESHWA** **KILELESHWA -APARTMENTS**			
Particulars	**Description**			**Remarks**
APARTMENTS	**Plot No.** L.R. No 209/6491	**Proposed**	**Existing**	▪ Density increased from 3.5 to 74 units/ha ▪ Space for the extra external facilities like health club, car park, jogging tracks and outdoor recreation is adequately provided for. ▪ Housing for 100 more households created .
	Plot area	14,253m^2 (1.425Ha)	14,253m^2 (1.425Ha)	
	Ground Cover	**4,012.68m^2**	**1,250 m^2**	
	Total Built up Area	**20,063.4m^2**	**1,250 m^2**	
	Total no. of houses	**105**	**5**	
	Total no. of floors	**5 floors**	**1 floor**	
	Council provision	Proposed	Existing	
Plot ratio -P.R.	**75%**	**141%**	**9%**	
Ground Coverage-G.C	**35%**	**28%**	**9%**	
Housing Density	**35units/ha** (under review)	**74units/ha**	**3.5units/ha**	

APPENDIX-E

Scheme	DENSIFICATION OF KILELESHWA **SWOT ANALYSIS**		
Strengths	**Weaknesses**	**Opportunities**	**Threats**
▪ Project finance available ▪ Land already acquired ▪ Local authority approval granted ▪ NHC has good public confidence ▪ Highly skilled human resource.	▪ Inadequate capital for infrastructure upgrading. ▪ No capacity to carry out actual construction-rely on hired private contractors. ▪ High density may cause environmental degradation if not well managed. ▪ Weak cooperatives for common area management. ▪ Obsolete by-laws & regulations	▪ Very high demand. ▪ NCC already indicated willingness to review area densities. ▪ Project financer ready to commence work as a pilot scheme for possible replication. ▪ Government very supportive on review of building code currently ongoing.	▪ Price escalations/ high inflation-likely to affect end prices ▪ Political interference and instability. ▪ Possible opposition from neighbors/stakeholders.