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Tracing Vulnerability: An Assessment of the Impact of Interventions in Housing and Road Infrastructures in Nairobi, Kenya.

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ABSTRACT

African cities are constructed as collections of double-sided images. On one hand settlement, linkages and order in these cities are represented as the subjects of formal discourse driven by existing adverse urban conditions and an aspiration towards modern ideals but, in fact, often removed from the imperatives of the everyday life of the urban majorities. Simultaneously, everyday conditions on city streets, informal markets, squares and overlain networks defy utopian conceptions and reshape the city as a container of vibrant life. It is this schizophrenic complexity of African cities that fundamentally grounds enquiries about vulnerabilities: Given the complexities of the African city how can vulnerabilities be understood? How are current formal and informal interventions impacting vulnerabilities inherent in Africa's cities? How can a consideration of vulnerabilities in Africa's settlements, linkages and order, then, be harnessed to create a resilient urbanism? This paper traces vulnerability by discussing the conception of the African city as a double-sided image: the image of the city as a dreamscape and the image of the city as lived experience. Both sides of this image are unravelled by systematically analysing case studies of ongoing formal and informal development in tenement housing and road infrastructure in Nairobi. A comparison is made of planning policy and government intentions as provided in official documents and promotional project material to the life pulses and patterns of activities in urban space as well as the opinions of city dwellers. A discussion then is presented of how Nairobi's dual-image urbanism affects definitions of vulnerabilities both as a way of considering the city and as a springboard for intervention. In conclusion, the paper proposes that existing formal interventions, contrary to their own expected planning outcomes, make Nairobi more rather than less vulnerable. The paper makes two recommendations; first, that interventions whether formal or informal, with respect to the vulnerabilities approach, should match the resources, aspirations and everyday life experiences of city dwellers rather than pander to a vain global image and second, that increased involvement of formal agencies in the provision of communal amenities for poor urban majorities is key to reconciling lived experiences to resilient urban space design.

Key words: African, Nairobi, Image, Tenement, Housing, and Roads.

INTRODUCTION: VULNERABILITIES OF AFRICAN CITIES

Vulnerability, as an offshoot of sustainable urbanism, is understood as the likelihood of cities or their parts to be adversely affected by occurrences of natural hazards occasioned by hastening climatic change. Cities are considered to be vulnerable (or resilient) to climatic disasters such as flooding, tsunamis, droughts, desertification, heatwaves, and sea level rise among others (Gasparini, Di Ruocco, & Bruyas, 2010; Pauliet et al., 2015). However, a review of existing work shows that, this discussion is limited in two ways: first, man is ontologically separate from and in a hopeless fight against nature so that in order for man to survive nature must win. Secondly, informality is ignored in the belief that the form, processes and products of contemporary formal activity whose salient manifestation is urbanism are at the heart of environmental exploitation and destruction. The shortcomings subsumed in those approaches affect the understanding of vulnerability in the context of the African cities. Cities in sub-Saharan Africa, for example, are characterized by a 'schizophrenic urbanism'. This urbanism has been described variously: *urban informality* (Pauliet et al., 2015), *dualism* (Okello, 2009), and *diverse informality* (Anyamba, 2006). Essentially, there is a scholastic recognition that crises of identity and function continue to problematize the formal understanding of African urbanism and to defy resort to clear prescriptions. This is evident in the shifting approach to vulnerability: Kidokoro et al (2008), for instance argue that all cities are vulnerable because they contain economically, socially and institutionally vulnerable space: In the developing world vulnerable urban space is, typically, *substandard informal settlements such as slums or areas occupied by squatters*. According to this school of thought, while these spaces are vulnerable to natural disasters due to their location on sites exposed to hazardous natural conditions, their immanent human condition—poverty, marginality, precariousness, squalidity, congestion, and social problems—reveals a connection between economic, social and institutional forces. The approach to vulnerable urban space then is a building of resilience—the ability of cities and their parts to resist the effects of or come back from adverse conditions due to the occurrence of natural disasters. According to the UNISDR (2012) a resilient city, then, is one that:

- (1) has proper organization and coordination in place to understand and reduce disaster risk, based on the participation of citizen groups and civil societies,
- (2) allocates a budget for disaster risk reduction,
- (3) keeps updated data on hazards and vulnerabilities and uses risk assessment to make urban development decisions;
- (4) invests in and maintains critical infrastructure for risk amelioration and reduction;
- (5) checks the safety of schools and health facilities towards risks;
- (6) applies and enforces building standards and land use planning principles;
- (7) cares for education and training related to disaster risk reduction in schools and local communities;
- (8) conserves ecosystems and natural buffers;
- (9) provides for early warning systems and emergency management capacities;
- (10) places the needs of its population at the centre of reconstruction and response after a disaster.

METHODS OF ENQUIRY

As evidenced in the introduction herein, prevailing theory and discourse on urban vulnerabilities are enriched by perspectives from fields and debates including urbanism, urban planning and management, planning history, social, political and environmental sciences,

development studies, civil engineering, urban geography, landscape ecology, risk assessment and climate change activism. In respect of the interdisciplinary/transdisciplinary lens that casts its view over urban vulnerabilities this paper synthesizes a diversity views and uses information obtained through a variety of methods. A summarized archival study of current material on vulnerabilities and attendant urban processes in the Global South is presented and filtered through selected field studies and case studies in Nairobi mapping and describing everyday life on highways, streets and buildings. Logic and argumentation are used to weave the thread that ties together the cornucopia of field-specific knowledges into a balanced yet coherent stance on urban vulnerabilities.

NAIROBI'S URBAN PROCESSES AND VULNERABILITIES

Nairobi's urban process is driven by both global and local imperatives (Anyamba, 2006; Okello, 2014, 2017). On the one hand, formal agencies such as governmental departments, firms of architects and engineers, developers and planners see development projects in the city as a function of Nairobi's position in Africa: that the shopping malls, gated estates, high rise apartment and commercial blocks, Standard Gauge Railway, expanded highways and so forth raise the profile of the city of Nairobi and the nation of Kenya because they are in some ways 'unique' and 'advanced' relative to others in Africa. Such promotion is rife in representations of Nairobi as a dreamscape (see figure 1). These formal agencies also see through a panoptic lens: that the order of the city can and should be determined from above it rather than through its everyday experiences (Scott, 1998). Such formalistic views of Nairobi are betrayed by recent real estate development trends. For instance, the construction of high-rise office and apartment buildings in such neighbourhoods as Kilimani, Upper Hill, Community, Kileleshwa and Lavington has continued, with newer developments being larger and glitzier than those before that are reeling from a downturn in the property market.



The Vision and Dream

Figure 1: A perspective image of Nairobi revealing formal perception of the city as a dreamscape. (Source: Nairobi Metro 2030. A World Class African Metropolis. Building a Safe, Secure and Prosperous Metropolitan (2008))

Development occurs in defiance to research that shows that the demand for these buildings reached a glut in the last quarter of 2015 following the downsizing of operations by multinationals and governmental agencies based in Nairobi. The Knight Frank Kenya Property

Index Report released on 19 April, 2016 covering performance of Nairobi's real estate ranging from office, residential, shopping mall, hotel and undeveloped land and the Kenya Bankers Association's House Price Index released during the second quarter of 2016 show slumps in property prices due to oversupply and weakening demand. The unprecedented March 2017 media announcement of the breaking of the ground on a site in Upper Hill for the Hass Tower, (elsewhere referred to as The Pinnacle) a glitzy monolith 60 floors high said to take over the title 'tallest building in Africa' after its completion, marked the turn where formal development in Nairobi is no longer about making business sense or a considered response to the needs of city residents (see, for example, the article by Danson Kagai in the Construction Business Review, "*Construction of Africa's tallest tower gets underway in Nairobi.*" posted on 10 March, 2017 at <http://www.constructionkenya.com/4029/africa-tallest-building-nairobi-kenya/> (accessed on 26 August, 2017) and the article by Kieron Monks in CNN Style, "*Work begins on the tallest skyscraper in Africa*" posted on 26 June, 2017 at <http://edition.cnn.com/2017/06/23/africa/pinnacle-nairobi/index.html> (accessed on 26 August, 2017). Rather, it is about competition for corporate prestige and regional attention. This peculiarity in real estate development can be extrapolated to describe the official backing for Nairobi's other infrastructure projects (including the Standard Gauge Railway and the expansion of various roads) which, because they do not conform to advice in official feasibility reports and in fact worsen the very conditions they were meant to solve, (Various studies on Nairobi's road transportation infrastructure have shown that expanded highways have not been successful at alleviating traffic congestion. See (Teipelke, 2014)) are not about viability but an overwhelming desire to catch up with the developed world's standards of infrastructure and so 'look developed'.

On the other hand adaptations to the formal developments in the city at various scales ranging from the structural scale to the architectural scale and multiple characteristics of daily life as it is lived on streets and in communities reconfigure space to match local conditions (Okello, 2017; Ondieki, 2016). In terms of infrastructure for instance, recent studies on Nairobi's highways have shown how space is read and reframed by various activities after it is enframed by the formal processes of design and construction and the legal framework that defines behaviour in road space. After practical completion of the new highways the reconfiguration(s) of road space continue to elicit a variety of contingent local reactions in the metropolitan region as manifested by the manner of appropriation of space on these highways. Three types of response to road infrastructure transformations have been observed (Okello, 2017):

- (1) Displacement and relocation occurs where activities and linkages were transformed by demolitions, ground modelling, rebuilding and/or new barrier erection. The positions of activities and their linkages are consequently moved to other locations.
- (2) Displacement, reinvasion and adaptation occurs where demolitions, ground modelling, and rebuilding and/or barrier erection transformed activities and linkages. The positions of activities and their linkages moved, but only for the period of construction. After construction the activities and their linkages moved back to their original positions but with adaptations to new configurations of the highway.
- (3) Partial displacement and adaptation occur where activities and linkages were transformed by partial demolitions alone. Only the positions of activities in demolition zones and their linkages moved. Adaptations to the new configurations of space inscribed new interface

relationships between buildings, networks and open spaces. Permanent structures were incrementally adapted to emergent interface relationships.

These adaptations matter because everyday life at the street and building scale is a palpable indicator of the urban processes occurring in cities. Castells (1979: 379) argues that,

“What people perceive in everyday life, that is, *the urban process*, is produced through the interaction of elements of urban structure and the variations of urban politics.”

Congestion, animation, squalor, blight, sprawl, and poverty (or their converse) in cities confront us most profoundly at the street and building scales (Certeau, 1984; Dewar, Uytendogaardt, Hutton-Squire, Levy, & Menidis, 1977; Jacobs, 1961; Scott, 1998). Various urban studies show that urban qualities mutually reinforce each other at various scales (Anyamba, 2006; Dewar et al., 1977; Silva, 2012). Since the transformations of road transportation infrastructure traverses the Nairobi Metropolitan Region, the informal responses to these transformations and the changing everyday lives of road users can be considered as connoting the way in which the concurrent urban process is shifting at every scale from the street and building scale to the metropolitan scale. Nairobi, thus, seems to be at a crossroads of urban development and this disposition affects how the vulnerabilities of the city are defined.

The next section describes the discrepancy between the city of Nairobi seen as a city of regional salience and the city of Nairobi seen as a lived experience in terms of specific urban vulnerabilities. The characteristics of tenement housing are concisely described and a discussion of how formal city management and planning have continued to contribute to increased urban vulnerability ensues. A description is then made of the urban processes behind expanded metropolitan roads and a subsequent discussion of how the interface between everyday life and formal development impacts on city vulnerability precedes a concluding section.

TENEMENT HOUSING IN NAIROBI

Housing, in whatever context, is exposed to some level of vulnerability and will differ depending on the physical form, geographical and environmental setting and its social, economic and institutional context. Informal housing is, in particular, prone to greater vulnerability because it has greater deviation from UNISDR (2012) criterion. In Nairobi's informal settlements, vulnerabilities associated with outbreaks and rapid spread of diseases, dysfunctional families and physical and social harm among others can be attributed to the socioeconomic status and the physical context of settlement. Between 2014 and 2017, for example, Nairobi experienced intermittent cholera epidemics attributed mainly to the lack of clean water and proper sanitation as well as intensifying congestion in informal settlements. A review of the settlements of Nairobi and specifically the low-income category of settlements which accommodates about 70% of the city residents shows that they are characterized by squalid living conditions that are deficient of the basic requirements for decent living and human survival (Amis, 1987; Anyamba, 2006; Mitullah, 2003). Several scholarly studies on the conditions and status of the slums of Nairobi have been conducted since Kenya's independence, thus the characteristics of slums are well elucidated (Amis, 1987; Huchzermeyer, 2006, 2011; Payne, 1989; Shihembetsa, 1989; UN-HABITAT, 2003;

Wells, 2007). However, studies on tenement settlements are few: tenements are, in relative terms, a contemporary phenomenon. In Nairobi today the demand for tenements is rising because a section of the low income population consider it as superior accommodation to that built of temporary materials such as the housing in Mukuru and Kibera (Ondieki, 2016). Nairobi's populous tenement settlement from which insightful lessons can be drawn include Huruma, Mathare North, Dandora, Kayole and Lucky Summer. The next section delves further into the characteristics of tenements and reveal the vulnerabilities this housing typology presents in terms of social, psychological threats to human wellbeing and adversities to the physical environment.

The characteristics of the tenement settlements

Tenement expansion is taking place in three ways: First is through the gradual transformation of former site and service schemes that are being replaced with high-rise housing in the form of tenements. Second is through the encroachment happening in popular informal settlements where tenements that began at the peripheries of those settlements are gradually replacing impermanent low-rise housing. And third is on greenfield sites that were zoned for medium density housing but have been illegally converted into high-density housing sites (Ondieki, 2016).

Tenement settlements bear certain common characteristics despite being located in different locations within the city. They are multi-level concrete and stone housing blocks that are an overdevelopment on any given land parcel. They accommodate many people comparative to the space they occupy and are therefore crowded. They are huge commercial hubs because the population they accommodate provides the requisite market for both services and goods. Infrastructure and social amenities are poor and overused, and finally, the morphology of tenements, including design and construction, bears many similarities.

DEVELOPMENT DENSITY

The development density in tenement settlements is very high and surpasses that envisioned in urban planning guidelines, which recommend a development density 133 units per hectare for multiple family dwellings (Republic of Kenya, 2009). The optimum proposed dwelling is estimated to have a build-up and circulation area of 75m². This is the guideline for the highest density in urban housing. Using these guidelines to evaluate the housing density in some tenement settlements established that planning laws and the reality of housing development are in contradiction. For example in Lucky Summer, which covers 19 hectares, a dwelling units density projection of 3385 rooms constituting 25 times more than is provided for in planning laws (Ondieki, 2016) and in Huruma with 1632 dwelling units per hectare constituting 12 times more (Huchzermeyer, 2011). While the basis of that planning regulation could be questioned, and indeed, it should, in light of the reality of urban population densities in Kenya, it should not escape notice that the density variance is enormous and requires redress. One way to achieve that is through a policy review of urban residential densities. The medium-density development presupposed in the plot subdivisions under the planning regulations has since been superseded and the area has become a high-density tenement settlement. There is no provision for public amenities such as public schools, formal markets, health centres, open spaces and play fields, among other facilities. The Physical Planning Act

2010(Republic of Kenya, 2010b)makes provisions for these facilities based on development zone density but this is not adhered to in tenement settlements.

The official guide on development ordinances and zones for Nairobi does not give planning guidelines for populous settlements. It is limited to formal settlements, and commercial and industrial areas. Moreover, the failure to implement the Nairobi Master Plan of 1973 provided a leeway for the private sector to determine how to develop urban land that they had acquired and such discretion can be attributed to the developments of most tenement settlements. Physical infrastructure such as roads, sewers and drainage, and services such as schools, health facilities, markets and others, cannot be provided because they are not backed by an urban plan, moreover, the government does not own land in the settlement area because whatever the developers had set aside for social amenities has since been grabbed. This explains why tenement settlements lack basic facilities that are the preserve of the state. It could also explain the reluctance of the former city council and the current county government and the central government to get involved in the development of the settlement.

LAYOUT OF TENEMENTS

Tenements are multi-storey residential blocks, some as high as nine floors commonly consisting of single-room dwellings with shared facilities. They are constructed of concrete and stone but are not provided with elevators; vertical movement is via a staircase. In a number of tenements, the staircases are narrow, dark and poorly constructed and often with uneven risers and treads. Narrow stairs in tenements present a challenge while carrying furniture upstairs, forcing residents to hoist it over the balcony railing using a rope in an intricate balancing process that is not only dangerous but sometimes leads to damage.

Maximizing on space to achieve as many dwelling rooms as possible is one of the most conspicuous characteristics of tenements. Room sizes range from seven to fourteen square metres (Huchzermeyer, 2011) and the layout does not provide for natural lighting and cross ventilation. Almost all rooms, with the exception of those fronting the street, do not receive sunlight and instead use artificial lighting throughout. Households share communal facilities in tenements. Several households share the few showers and water closets provided on each floor. It is common practice to have as many as 10 households sharing a water closet and a shower such as in Mathare North and up to 14 households sharing two water closets and a shower in Lucky Summer (see figure 2 and figure 3). The clotheslines that are fixed on the front balconies and light-wells are also shared amongst the households that dwell on each floor.

The design of tenements does not conform to planning and design principles established by the professional disciplines and normative practices of the built environment. Apart from the minuscule size of dwelling space comparable to the requirements of most households, the layout of dwelling rooms in relation to other spaces in the tenement, such as other dwelling rooms, corridors and wet core, accords little privacy. Further, the layout does not allow the rooms to benefit from natural environmental factors such as daylighting and air circulation, thus limiting physiological comfort and presenting an environment threat conducive to the spread of respiratory and infectious diseases. The National Housing Policy of Kenya (Republic of Kenya, 2004) recommends 36m² as the optimum area for a household dwelling. The criteria used is however contentious because it is not based on any established

understanding of the performance or sentimental requirements of residential space. This minimum residential space recommendation was contradicted by the government itself in 2008 when it issued a gazette notice (Legal Notice number 115) which proposed a tax relief offer to developers who built low-income housing with dwellings measuring a minimum of 30m². That notwithstanding, most households in tenement settlements live in singular rooms measuring about 10m² to 12m², approximately one third of what the policy prescribes.

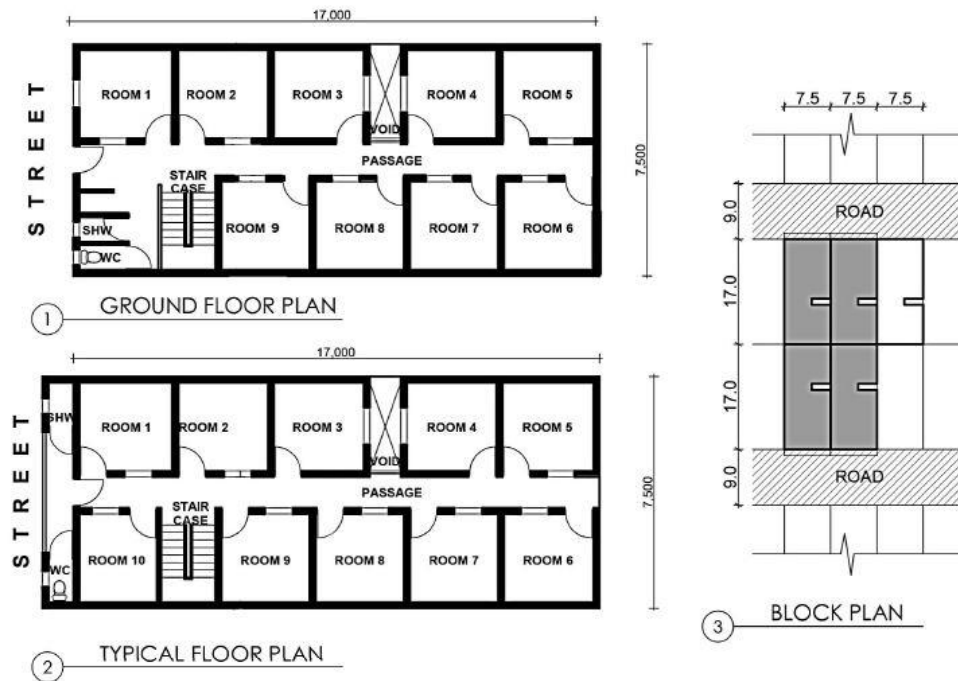


Figure 2: Plans of a tenement in Mathare North. (Source: Ondieki E. O.)

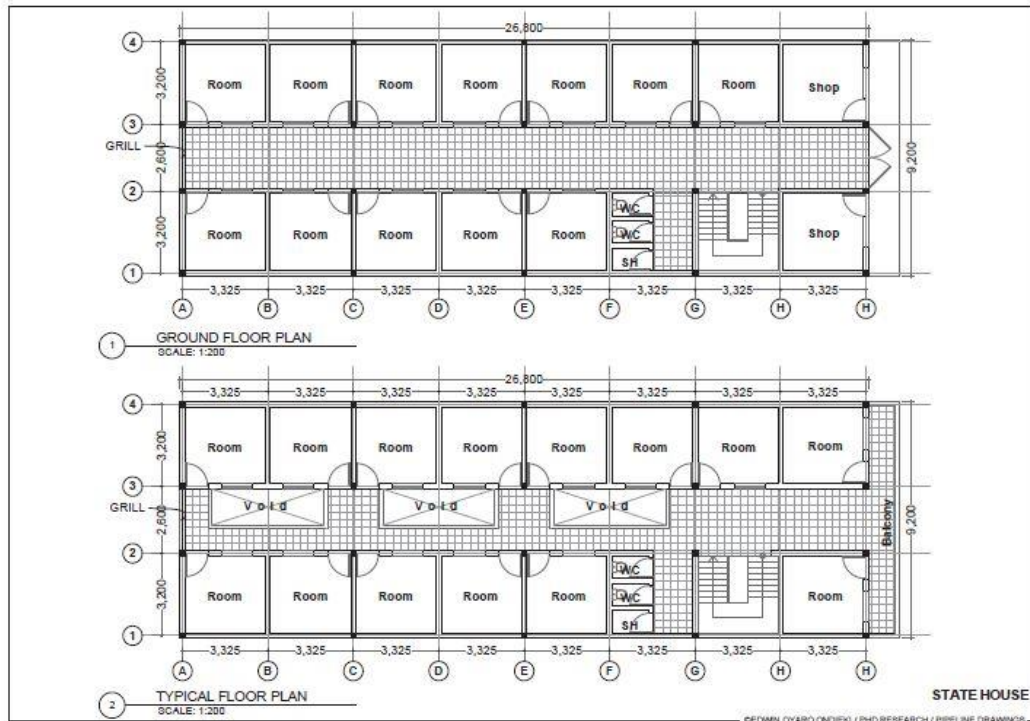


Figure 3: Plans of a tenement in Lucky Summer. (Source: Ondieki E. O.)

This should be an issue of concern particularly to households of more than one person, as it does not constitute adequate housing as provided for under the Bill of Rights in the Kenya constitution (Republic of Kenya, 2010a).

Further, construction methods used in building tenements are not in accordance with established technical specifications. In Lucky Summer, for example, the structural systems of tenements can neither be described as framed constructions nor load bearing wall constructions. Their structural supports consist of reinforced concrete columns and beams integrated with stone masonry walling to form a monolithic structure. The walls share the load bearing function of the columns and beams; walls cannot be relocated or removed without risk of total structural failure. Observations of the building process in Lucky Summer show that the cross-section sizes of columns and beams together with the sizes of steel reinforcement are undersized when visually compared to other structures of similar magnitude that are built to statutory approval within the greater Embakasi neighbourhood (Ondieki, 2016). Equally, the dimension stone for walling is untested for structural strength thus its bearing capacity as a structural wall is unknown. This raises concerns about the structural integrity of the tenements and frequent reports of collapsing tenements, in fact, attests to it. Various findings on the structural status of buildings in the city provide alarming statistics: A comprehensive documentary carried in *The Standard Newspaper* on 28 January, 2015 entitled “*On collapsing of building in Nairobi*”, gave a chronology of buildings that have collapsed in Nairobi from about 2006 totalling about 35. Approximately 81% of these were tenements in the low-income sections of the city. Casualties reported between the years 2006 and 2015 of these collapses totalled 99 fatalities and 346 injuries. Further, factors of tenement design and construction methods have a direct bearing on the physiological comfort and health of households. For example in Lucky Summer, measurements of temperature and relative humidity of dwelling rooms showed that it is beyond acceptable limits while natural lighting and air circulation is inadequately

because of the poor design of the floor layout (Ondieki, 2016). Local health care givers in Lucky Summer settlement noted that the inadequacy in design was responsible for many occurrences of respiratory diseases, which was reported as the most common ailment in the tenements—an assertion affirmed by tenants themselves (Ondieki, 2016).

CROWDING

The majority of tenements offer single-room accommodation; a few offer more options. They are an overdevelopment on plots, some of which were planned to accommodate single to a few family dwellings. The plot coverage and development ratios have been exceeded many times over. The streets in the tenement districts such as Lucky Summer, Huruma, Mathare North and Dandora appear to be very narrow because of a number of factors. One, the breadth of the roads was premised on a specific development density, but this has been exceeded many times over due to an increased numbers of dwellings, creating congestion. Two, the tenements have not observed the building setback requirement; the frontage abuts the plot boundary, with balconies extending towards the road. Third, the rooms fronting the road are mainly used as business premises, thus making the road a commercial street. Fourth, there are many businesses carried out on makeshift stands, or spread out on the walkways, forcing the pedestrians to walk on the road where they jostle for spaces with cars, handcarts and motorcycles (see figure 4 and figure 5).



Figure 4: A street scene in Lucky Summer on 13 September, 2016. (Source: Ondieki E. O.)



Figure 5: An aerial view of Mathare North, Nairobi, on 13 September 2016. (Source: Ondieki E. O.)

The overcrowding that finds expression in the streets extends to individual tenements. As noted, the tenements are overdeveloped; the many rooms per floor mean that they accommodate many households, thus creating high levels of crowding. According to the population and housing census of 2009, household size for Huruma and its neighbourhood stood at 3.2 persons (Kenya National Bureau of Statistics, 2010) while study finding for Lucky Summer in 2014 estimated the household size of 2.4 (Ondieki, 2016). This gave a population density of approximately 5242 per hectare in Huruma (Huchzermeyer, 2011) and 6000 people for Lucky Summer. This is a large number of people living on very little space without the benefit of the requisite social amenities and therefore posing a threat to their social and physical wellbeing.

Research shows that living in such a small space raises health concerns and has serious socio-cultural consequences, especially for households with children. Adults and children sharing a single room is an affront on social norms and may have lifelong consequences on children. Children that grow up in such contexts learnt bad habits from adults and could later in life engaged in antisocial activities such as prostitution and drug peddling or abuse and robbery among other social mischiefs. The nature of housing in which children are raised has a profound impact on their character. Various studies by sociologists, anthropologists and psychologists have pointed out these facts. Saegert (1982), Altman and Werner (1985), and Moore (2002) among others, enumerate several examples. Studies across Europe and America are replete with examples that show how housing projects for low-income households, conceived without much thought to their social impact, failed and were either demolished or deserted. Discussions on these are found in the writings of Jacobs (1961), Jencks (1977), Castells (1979), Bristol (1991), and others. One of the reasons given for the

failure of settlements, or what the western world refers to as 'neighbourhoods' is that they attracted antisocial behaviour and many households intent on raising good families moved out. Over time, such scenarios could be replicated in these tenement settlements. Already, older tenement settlements like Kayole and Dandora have started to experience extreme antisocial behaviour (Ondieki, 2016). For example, some youths have formed gangs that are involved in criminal activities ranging from robbery to rape, prostitution and extortion. These negative externalities are a consequence of concentrated poverty arising from low incomes and consequently poor quality housing (Ondieki, 2016).

GENERAL HYGIENE IN TENEMENT SETTLEMENTS

High levels of hygiene in a settlement drastically reduce level of vulnerability of residents that could be caused by infectious diseases. The issues of food preparation and cooking, and public utilities and services including water supply and waste management are central components to the health and wellbeing of the residents of tenement settlements.

Food preparation and cooking

Many types of foods consumed in the tenement settlement are prepared and cooked by vendors who operate make shift kitchens and open-air kiosks along the main arterial roads. These vendors sell ready-made food and pre-prepared raw food that they package in polythene bags. Some of the food is consumed either on the spot or take-away. Households who were interviewed in Lucky Summer noted that some types of ready-made foods such as stews and *githeri* (a popular boiled admixture of maize and beans) and some pre-prepared ones, such as vegetable were easy to prepare for household consumption. According to them, it had become a norm to purchase food in that manner because it was cost effective as it saved on fuel costs and time. This method of selling food has been observed in other popular settlements (Musembi & Scott-Villiers, 2014). The findings show that food preparation and consumption habits are changing in the low-income settlements. This is happening because of changes in economic and social circumstances. The shift from preparing meals in the dwelling to purchasing cooked food from vendors in the streets is a pragmatic response to these circumstances. This shift in food preparation and consumption within low-income settlements requires a rethinking of how the cooking space and its organization should be transformed to improve hygiene as it conform to this new reality. The low levels of hygiene on the streets pose the danger of food contamination: indeed recent media reports of the spread of cholera in Nairobi are a case in point. Food vendors rely on water vendors for water supply and such water could be contaminated. Moreover, preparation and cooking is carried out in context of much dust from the roads making the spread of disease a perpetual threat. Further, in the tenements, the emissions from cooking within rooms that are poorly ventilated and where other domestic activities are carried out, like in Lucky Summer, pose serious public health concerns that need to be addressed as a matter of urgency. The question that housing professionals and developers need to answer is how this will be incorporated in the layouts of space within the dwellings or tenements to create food preparation and cooking spaces that will enhance the quality of living. There are certainly no easy answers to this question, more so in the 'informal' framework that defines tenement housing like Lucky Summer, but its significance needs to be pointed out nonetheless.

Services

Service provision is a responsibility of governments. Installation of services, especially technical ones such as sewer systems, water reticulation, surface drainage and roads are services of government. They require heavy capital investment and cannot be directly catered for by a taxpaying public. Being in charge of the provision of essential services provides the state, through various agencies, the opportunity to direct, manage and monitor urban development.

Tenement settlements have poor standards of services in terms of infrastructure and social amenities. Even when the government provides these, they are not properly maintained. Garbage is not regularly collected, roads are poorly maintained and the drainage is clogged because residents dump waste in it. Water supply is irregular, forcing residents to rely on water vendors whose water quality cannot be guaranteed.

As noted earlier, tenement settlements have developed in three distinct ways and provision of public services to the three categories of tenements differ greatly. However, what is common is that these services are stretched to the limit where they were initially installed because of overuse as a result of extreme densification of the settlements. Upgrading of services has not been carried out to match settlement expansion. While in settlements where these are not officially provided, they are poorly developed through the efforts of landlords. In Lucky Summer for example, most services have been put up by the landlords' association and due to challenges of undertaking such complex and cost intensive works, they are poorly executed. Because of low construction standards for civil works, the structures are not able to sustain heavy usage; the roads and surface drainage channels are damaged frequently and require frequent repairs.

Water supply

Water supply throughout the city of Nairobi is erratic. Water is regularly rationed (Okello, 2009; Ondieki, 2016). This water supply situation is far worse in informal settlements when the water supply company often disregards the water rationing schedule sometimes for weeks making supply even less unreliable. Nairobi Water and Sewerage Company (NWSC), has indeed, confirmed that there are problems of water shortage and water delivery (Okello, 2009). Findings from some of the settlements indicate that on the days water is supplied, the supply lines do not have sufficient pressure to ensure the water reaches the entire settlement (Ondieki, 2016). As a result, residents regularly purchase water from vendors located at strategic intersections in the settlement. Walkabouts in informal settlements quickly make visible the water supply challenges. The high number of water laden handcarts being pulled up and down the main arterial road or waiting by the roadsides to be loaded with jerry cans of water are a potent giveaway of this problem. Deficits of water exacerbate the already poor sanitation and present a concurrent danger of the spread of infectious diseases. It appears that reasonable standards of hygiene will be elusive as long as a regular water supply regime is not established. That noted, it is important to state that one way to ameliorate water shortages in informal settlements is to seal loopholes in the water supply chain. Water vendors, who operate in a cartel-like way and draw water from the systems and then sell it in jerry cans or water bowsers to city residents, should be curtailed to limit artificial water shortages (Huchzermeyer, 2006). Water supplies from private and public boreholes within the city require regulation to ensure its sustainable utilization. Other water sources, including

recycling of waste water and rainwater harvesting, need to be explored to boost the supply of water. Otherwise, Nairobi will continue to experience insufficient water supply (Eckart, 2012).

Waste management

Tenement settlements are highly populated (Ondieki, 2016). So, garbage production is very high. Garbage collection across all tenements is irregular and sometimes takes months long to be carted away. It, therefore, is often strewn from open and overfilled garbage receptacles into the physical environment in the neighbourhood: drainage channels, streets, fields, alleys and other open spaces. Garbage is scattered by the wind, by an array of stray domestic animals that forage in the receptacles and by some careless residents. Poor waste management requires urgent redress. Otherwise, it continues to pose serious environmental challenges. The politics of garbage collection and disposal cannot be understated: it is a contentious city issue that requires better planning, better management and effective consensus building with the local communities to be effectively tackled.

HIGHWAY EXPANSION AND THE REFRAMING OF NAIROBI

The Planning and Policy Frameworks

In order to understand urban vulnerabilities as exhibited in the planning and design of highways it is compelling to discuss how transportation planning works in the City County of Nairobi. Planning in general is fragmented. Urban planning and transportation planning are distinctly separate with functionally compartmentalised institutions responsible for the planning, design, implementation and management of different types of roads. Even within the domain of transport planning itself, the working of departments is uncoordinated (Wasike, 2001).

First, fragmentation originates in the way the roads are classified in Kenya. The Constitution recognises two categories of roads: national trunk roads and county roads with a clear separation between the functions of the National and County Governments (Okello, 2017). Second, fragmentation of planning can be seen as a result of the shifts and transience of planning bodies with reference to political cycles. Depending on prevailing politics, planning responsibilities have been shifted to the Ministry of Devolution and Planning, the Ministry of Transport and Infrastructure, and, the Ministry of Lands, Housing and Urban Development (Nippon Koei Company Limited, I.D.C.J. Incorporated, & E.J.E.C. Incorporated, 2014). These government ministries often have not only new executive heads, but also departments with new relationships and different inter-relationships from their predecessors (Okello, 2017). Third, transportation planning is fragmented by time. The current urban plan, the Nairobi Integrated Urban Development Master Plan 2013, has little relationship with the transport corridors that have been constructed in Nairobi since 2006. The transport corridors that have been transformed were envisioned in 1973 long before they were implemented. Their approval and implementation have ostensibly been superseded by the growth of the city and by the evolution of contemporary theories of urban growth and traffic management (Emig & Ismail, 1980). While literature from the Global North on the unsuitability of the freeway as the transportation solution for increased vehicular traffic exists (Cervero, 2003; Downs, 2004; Duany, Speck, & Plater-Zyberk, 2000; Noland & Cowart, 2000; Youn, Gastner, & Jeong, 2008), a disregard for professional advice, token public participation and technical clumsiness

have characterised the implementation of highway expansion projects (Okello, 2017; Teipelke, 2014).

But how are highway expansion projects justified within this fragmented planning regime? Highway transformations such as that of the Thika Superhighway are often preceded by the logic of road transportation economics presented in the form of financial appraisals. The common thread that ties financial appraisals is the argument that investment in large infrastructure projects causes positive social and economic transformations within the regions that these projects, ostensibly, serve. This is exactly what happened in the case of the Kenya National Urban Transport Improvement Project (KNUTIP) of which the Kenya-Northern Corridor Transport Improvement Project is a key component, as well as the Thika Highway Improvement Project (THIP) (for this, see the public versions of the appraisal reports for the Kenya-Northern Corridor Transport Improvement Project at http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2012/07/16/000333037_20120716234539/Rendered/PDF/673500PAD0P12600900IDA0R20120018801.pdf (accessed on 28th March, 2016), and the appraisal report for the Thika Highway Improvement Project at http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Kenya_-_Nairobi-Thika_Highway_Improvement_Project_-_Appraisal_Report.PDF (accessed on 28th March, 2016). A recurrent goal spelt out in both the appraisal reports of the KNUTIP and the THIP is that highway expansion would reduce travel costs and, simultaneously, increase transport efficiency making the peripheral areas of the Nairobi Metropolitan Region more accessible. This would then result in a decrease in the cost of doing business in Nairobi, encourage business and raise the National Gross Domestic Product. Conspicuously missing in these appraisal reports is the consideration that the construction of highways and the opening up of hitherto locked potentials of land and natural resources within the Nairobi Metropolitan Region (NMR) immanently causes rises in the costs of land within the city region. This effect is already shown to occur along many transport corridors (Boarnet & Chalermpong, 2001; Carlson, Billen, University of Washington, & Institute for Public Policy Management, 1996; T. Moore, Sanchez, Oregon Department of Transportation Research Group, Portland State University Center for Urban Studies, & ECONorthwest, 2001). Consideration is also not made of how highway construction fits within other social and economic sector reforms intended to encourage business growth for a wide range of business sizes and models or how the accruing economic benefits will be distributed primarily among the communities displaced or traversed by the completed large highway projects (Teipelke, 2014). The point on how the distribution of economic benefits from the highway is to be achieved is particularly important given the assertion by Calderon and Servén (2008), that, *“infrastructure development (...) has a positive impact on long-run growth and a negative impact on income inequality.”* Consequently, for Kenya, a country suffering gross social and economic inequalities since independence, (Anyamba, 2006; Emig & Ismail, 1980; Gakuru & Mathenge, 2011) and with an income Gini coefficient of 47.7 in 2013 which, apparently, is getting worse (Gakuru & Mathenge, 2011) (for a report on Kenya's Gini coefficient see <http://hdr.undp.org/en/content/income-gini-coefficient> (accessed on 31st March, 2015)), highway expansion programmes are the worst possible projects for addressing income inequalities and promoting positive social transformation. Conspicuously missing also from the economic justifications for highway expansion are the social and environmental cost of the externalities of additional highway construction: air pollution, fatal crashes, traffic noise, the loss of flora and fauna, the loss of social and community ties and so forth. Most telling is the manner in which economic calculations ignore evidence from multiple studies that

suggest that highway expansion does not necessarily solve traffic congestion problems or increase efficiency of movement in the long term (Cervero, 2003; Hansen, 1995; Mumford, 1963). In fact, “to increase the number of cars, to enable motorists to go longer distances, to more places, at higher speeds [should not] become an end in itself”(Mumford, 1963). So what should the end or purpose of a transportation system be?

Mumford admits that economic growth does not make up the “essential purpose of transportation.” He (1963: 236) contends that,

“The purpose of transportation is to bring people or goods to places where they are needed, and to concentrate the greatest variety of people and goods within a limited area, in order to widen the possibility of choice without making it necessary to travel. A good transportation system minimizes unnecessary transportation; and in any event, it offers a change of speed and mode to fit a diversity of human purposes.”

Given these considerations, then, how might highways in the Nairobi Metropolitan Region be made suitable for their purpose?

Some debates directly relevant to road transportation infrastructure in the Global South explore how cities should be ordered and how this ordering of the city within its geography both reflects and results into just social relations. The concept of the ordering of cities with consideration to just social relations is broadly defined to as spatial justice (Soja, 2010). The primary questions in these debates are what spatial justice constitutes and why spatial justice deserves consideration in the planning and design of city infrastructure (J. Williams, 2013; Young, 1990). Soja, 2010, hypothesises that the ordering of the spatial world influences the fair ordering of human relations. In other words, spatial justice emphasises the role of space in producing justice or injustice. An instance of unfair ordering of space occurs when highways fragment the city landscape, prohibiting certain kinds of movement (such as pedestrian movement) and enabling others (the automobile) (Paterson, 2007; J. Williams, 2013). But what exactly is spatial justice?

The ordering of the material world reflects power and politics, but simultaneously is made of power and politics (Soja, 1996; R. Williams, 2008). In the production of social relations, spatial relations concurrently produce justice relationships. Highways, for example, not only reflect power and politics (the effects of certain political decisions), they synchronously impose a certain social order (increased dependence on the car) and political hegemony (the prioritisation of car infrastructure that benefits car owners). Space, then, is more than a container of social process inscribed with man’s workings (Williams, 2013): it is the dynamic interactions between material, social and ideological relationships (Harvey, 1996; Lefebvre, 1991) a quintessentially tripartite conjuncture. Because space is a process, that is to say, it is made of the relations of things that continually shift, Lefebvre (1991) calls for a movement from products to production, from commodities to the processes that give spaces their form. Social relationships constitute an important part of this spatiality (J. Williams, 2013). The implication then is that since justice describes a social relationship, and social relationships are spatially produced, then the relations of justice are spatially produced. Again because the relationships that define space are dynamic, then it can also be argued that justice (as a social relationship) produces space and deploys a knowledge of space (J. Williams, 2013). Justice, however, is a theoretically contested concept.

One definition defines justice as the equality of basic human liberties and the distribution of all social inequalities so as to accord the greatest benefit to the least advantaged (Rawls & Kelly, 2001). This prescription of social justice, its proponents claim, can be measured spatially in two ways: first, by establishing the distribution of social goods in space. One example, for instance, can be worked out by asking the basic question, “Does the transportation system cater for all forms of movement?” If that is the case then the demands of distributive justice are met. Another example touching on social inequalities can be evaluated by asking, “Are pollutants distributed so as to disadvantage the economically poor in society?” If this is the case then the space is unjust because it does not meet the criteria for distributive justice (J. Williams, 2013). Secondly, social justice may be measured by the content(s) of distributed social goods which are immanent in certain sensory qualities of space (Rawls & Kelly, 2001; J. Williams, 2013) for instance green, daylight penetration, and passive ventilation. Building or construction codes and regulations that require that the design and construction of buildings, highways, railways and other forms of infrastructure guarantee users and occupants access to such qualities as light, green, air circulation and so forth, are set in order to distribute space with certain aesthetic content(s) or sensory qualities. Public space falls in this category of spatial justice because it may be distributed so as to lessen social inequality and simultaneously improve access to amenities. On the other hand, spatial justice is described as a function of lived experience (J. Williams, 2013; Young, 1990). This view of spatial justice, as a critique of the flaws of distributive justice, questions the conception of society by exponents of distributive justice as homogenous, as a white patriarchy. Spatial justice as lived experience, instead calls for a more inclusive participatory framework (Young, 1990) including a consideration for the division of labour in society, the characteristics of decision-making, and the nuances of cultural expression. By taking into account such social group differences spatial justice as lived experience allows for the inclusion of marginal and excluded groups of people. Spatial justice then, becomes a form for non-oppression (J. Williams, 2013; Young, 1990). Advocates of this view regard the city rather than the countryside as the locus of spatial justice as history shows that urbanity is forged dynamically (in multiple political ways) by the conglomeration of the social relationships of socially and culturally diverse groups (Young, 1990). The city, on the other hand, exerts its influence over socially and culturally diverse groups by defining their relationships in space (J. Williams, 2013). Young, 1990, argues that it is only through the affirming of social group differences that group-based oppression can be understood and addressed.

Taking account of these discussions of social justice with respect to road transportation infrastructure projects in the Global South requires two considerations. First, what essential social goods do these roads distribute and how are they distributed in space? Then, second, how inclusive or participatory are the process of planning, design and implementation with regard to the culturally diverse and marginalised social groups in the metropolitan region they serve? It is notable that the appraisals of the transportation corridor improvement projects in Kenya do not specify any social goods that the envisioned expansive road infrastructure projects distribute to communities or road users. References are made to the contributions of road infrastructure improvements to the future economic growth of the country and to the enhancement of traffic flow in the project appraisal documents. But how this will achieve distributive justice with regard to both the context and content of social goods is unclear. Everyday life on highways and streets may offer clues as to how highways are suited for their purpose and how they could possibly impact on urban vulnerabilities in a broad sense. The

next section discusses how everyday adaptations highway transformations have impacted a township in the Nairobi Metropolitan region and what this means for the urban process.

Reframing of transformed highway infrastructure

The case of Mlolongo, a township to the south of Nairobi, illustrates how a highway can be affected by local historical economy but also how communities exhibit local initiative and creativity in using their own means to deal with the erasure of parts of their space by road transportation infrastructure. This creativity as a result of erasure is evident at the architectural scale. Buildings whose fronts were demolished to make way for the expansion of the Mombasa Highway because they were within the road reserve have been retrofitted with new facades. Indoor rooms and interior elements, such as staircases, were exposed to the exterior. These accidental spaces have been converted into storage space, display space and social space while some have been hidden in glass curtain walls. The building/street interface is variable: it is composed by projections and niches adapted for display, street watching and negotiation. This organic character actively shapes the social space in the street. These retrofitted facades, though generated by accident, serve more functions than they were designed for originally -such as storage space and balconies. They work satisfactorily for the building owners and their tenants and contribute to the visual variety and liveliness of the street. It is ironic that after some commercial buildings were demolished, for being within the road reserve, to make way for the highway the County Government of Machakos built public restrooms within this space at a location that is not directly in the pedestrian circulation paths in Mlolongo Township.

In Mlolongo, space is negotiated between many different actors: formal and informal. An example is the stretch of the road where rollerblading takes place on weekends (see figure 6). Truck drivers and rollerblading instructors have an understanding on how the space is used. Truck drivers do not park at this stretch of the highway on weekends when the weighbridge is closed. They clear it temporarily for the rollerbladers to use. In this way the space rather than being a static redundant space, used merely for parking and waiting, is transformed into performative street space. The community gets to socialise, learn, share, be physically active, unwind from the tedium of their workweek routines and earn a livelihood from training rollerblading to teens and children, all at the same time.



Figure 6: Rollerblading at a new highway in Mlolongo on 24 July, 2016. (Source: Noel Okello)

The new configuration of the highway has also generated new activity social patterns. Here also groups are organised around the tackling of specific problems and the expression of local interests: handcart owners groups, water supplier groups, *matatu* tout groups, and informal traders groups who negotiated their terms of working and their licensing fees with county officers. Here, too, certain communal concerns, such as security, parking and storage, were organised between businesses. For instance a filling station and the hardware next to it and bus and *matatu* operators would arrange parking and security for the buses and matatus in the evenings collectively while the bus owners would have their vehicles serviced and filled at the filling station. Activities along the highway were ordered in similar complex spatial relationships. Again, handcart pushers, *tuktuk* (motorised rickshaw) and *bodaboda* (motorcycle) transportation was located in unmarked parking lots close to hardware stores, furniture stores and supermarkets. Collaboration between furniture makers, filling stations, spare parts shops and garage owners was common: they could borrow tools from one another or collaborate on projects requiring multiple skills and offering mutual benefit.

However, not all highway space is without dispute. Some spaces are contested among uses and between road users and other road users and also between road users and authorities or their agents. Business owners in some cases negotiate space with truck drivers and pedestrians with conflicts sometimes emerging on who uses spaces on the highway, when they ought to use them and how they should use them. Though some businesses owners find that pedestrian paths interfere with their businesses, in reality business activities depend a great deal on pedestrian circulation and on the linkages between complementary uses generated by this circulation. For instance conflicts sometimes occur between council officers and *matatu* and bus crews about stopping at undesigned locations along the highway.

However, these undesignated locations are directly in the path of pedestrians rather than at the more isolated positions where the bus stops are actually located in the design of the highway. There are several other examples of conflicts between more formalised ways of using the highway as was designed, and is supposed to be enforced, and the informal activities happening on the highway. The County Government of Machakos, the traffic police and the Kenya Revenue Authority officers attempt to block sand trucks from evading load measurement and concomitant taxation at the weighbridge. In spite of their dogged efforts, recalcitrant sand traders and their creative (or rogue) drivers still find new routes and ways to evade the weighbridge. The effects of these contestations and fights over control of spaces spill out onto the highway showing itself in the form of rudimentary barriers and barricades of various kinds: rocks, ditches, warning signs, culverts and speed bumps. Finding way through these strange obstacles are bewildering to motorists (as evidenced by cars bouncing up speed bumps or crashing into barriers) and visitors unfamiliar with the township area.



Figure 7: People spending the afternoon of 24 July, 2016 at the Mlolongo footbridge gazing at the panorama of the Kitengela Plains. (Source: Noel Okello)

Faults and omissions in the design of the highway are ameliorated by the initiative of local communities. Where bus stops are missing, public transit buses stop in the median to pick up passengers so they do not have to cross the highway. Where access roads into the residential areas, where people actually live, are in poor physical condition, *tuktuk* (motorised rickshaw) and *bodaboda* (motorcycle) transport awaits passengers by the highway to transport them to their homes and businesses located as far away as 5 kilometres into the sprawling heterogeneous residential catchments of the highways at Syokimau. The highway serves as an important social space in the absence of parks. The community put to more uses the elements that have been constructed at the highway. The most outstanding example is that of the

Mlolongo footbridge. The design of this footbridge differs from the design of the footbridges on the Thika Superhighway: because the landscape rises on both sides of the Mombasa Highway where the footbridge is constructed, it is woven into the landscape and conforms to the contours and direction of the pedestrian path. It is open to the sky and to the panoramic view of the Lukenya Hills and the Kitengela Plains. As a result the footbridge serves both as crossing and as public park (see figure 7). The lack of public space and the consequential phenomenon of infrastructure as public space is beginning to affect a few other African cities. Vltchek(2013) writes that, *“There are also almost no public spaces in other African capitals (...) like Kampala, Kigali, Addis Ababa and Cairo, although, in the latter, at least, people are able to gather on the city’s bridges.”*(In an investigative report on Harare in 2013 Andre Vltchek compared the living and physical conditions in various eastern and western cities with those in Africa’s cities in order to repudiate reports in western media that claim that Harare is among the worst cities on earth to live in: see this article in <http://www.counterpunch.org/2013/03/15/harare-is-it-really-the-worst-city-on-earth/> (accessed on 11th April, 2016)).

Conclusions and recommendations: Understanding the vulnerabilities of the dual city

In the previous section the urban process in tenement housing and ongoing highway expansion projects as a reflection of the wider urban process impacting on vulnerabilities of Nairobi’s urbanism was considered. This concluding section tackles some of the questions on vulnerabilities as a product of the dual character of Nairobi, that is to say, the more formal and less formal city.

A theorization of vulnerabilities must be grounded in certain understandings of city governance, society and urban space: First, consideration should be made that government’s both county and national levels as the formally mandated crucible of representative power, has critical roles to play in addressing urban vulnerabilities. As established in prior discussion herein of the urban process of the city, decisions taken by government both through active intervention and benign neglect have contributed to a worsening of vulnerabilities. It is therefore of great social and political significance that the government take action to remedy the mistakes of commission and omission that have resulted into the increasing vulnerabilities of the city.

Second, is the assumption that the government is representative of people and is driven by this constitution as well as utmost good faith to promote and uphold public good in its decisions. As such, decisions that pit the parochial interests of a few individuals against the needs of the urban majority should be determined through transparent and truly participatory processes. This, then, should impart a distribution of social goods and services, social benefits and environmental protection in a manner that takes account of the representation of the urban population.

Third, is that the fundamental quality of the drive to maintain the public good is the consideration of the resources and ways of life of the people the government represents in policy formulation and the making of laws and regulations. Laws should be made for the people’s participation rather than as wont to happen to the indigenous population during Kenya’s colonization laws prescribed without the participation of the people. This would pre-empt situations where laws are made from abstract or alien aspirations and imposed. In the subsequent discussion of the urban process, account is taken of the creativity and

motivation of city residents living and working in some of the most deprived conditions to make the city function for them. In this regard then, the people form the social capital of the city. They should not be viewed as passive victims in the evolution of the city. They must be considered as active participants in the continual endeavour of city making.

So, having grounded an understanding of vulnerabilities in relevant theory, how could questions about settlement, linkages and order and how they impact the vulnerabilities of Nairobi be answered? Here are possible approaches:

(1) Given the complexities of the African city how can vulnerabilities be understood?

Vulnerabilities are clearly a construct of the dualisms that characterise the way the city is conceptualised and subsequently constructed: formal and informal, power and powerlessness, man and nature. On one hand, tenement settlements and the environmental conditions they foster, unhealthy living conditions, inadequate sanitation and the potential for structural failure, for instance, are a response to the accrued official neglect of the requirements of segments constituting urban majorities and their interests: the unemployed, casual workers, truck drivers, low-cadre civil servants, students and prostitutes. On the other hand, the reframing of expanded highway infrastructure by everyday life accompanied by various externalities including increasing vulnerability to accidents and modal conflicts, environmental pollution, and a melange of social problems display formal development's nonchalant treatment of otherwise compelling local site contexts. In both cases the widening gaps and sharper juxtapositions of formal city versus informal city are increasing vulnerabilities by relocating the activities of the majority to 'other space' that is, space left over after planning's resulting in a less regulated urbanism and more fragile physical order. The ensuing vulnerabilities, therefore, can be understood as requiring, first, a recognition of this fragile physical order, and second, approaches that go beyond formalistic approaches into more functional, more inclusive and more equitable collaborations between formal and informal actors. The filling in of the existing gaps in urban development and planning by a diversity of informalities is itself an indicator of the creativity and willingness of the marginalised majority to engage in the making of the city.

(2) How are current formal and informal interventions impacting vulnerabilities inherent in Africa's cities?

In an ideal situation where officially sanctioned and publicly supported laws would be possible to effectively direct urban processes and the urban development they produce. For example, in order to formally address the adverse conditions in tenement settlements the authorities might review physical planning laws subsumed in the Physical Planning Act 2010 (Republic of Kenya, 2010b) to take into account increased development densities. This review would allow land amalgamation in order to create adequate land in areas zoned for high density settlements. Such intervention may allow comprehensive housing development schemes, possibly of high-rise housing, in order to deliver needful high-density housing. The current reality in which high-rise multiple dwelling units are erected on small plots cannot fulfill the criteria set out in planning and building law and may not even be sufficient to provide enough housing units for the increasing urban population in informal settlements. The state bureaucracy, either within the existing land administration framework or through new legislation may also make a commitment to enforce land administration laws and stop further

construction of tenements of the present typology and provide alternative and effective house delivery mechanisms. While demolition of existing tenements is not currently a viable option because of the enormity of the housing crisis it could cause, Kenya's Physical Planning Act 2010 (Republic of Kenya, 2010b) has provisions that empower the Director of Planning to decree existing tenement settlements as *special planned areas* for a specified duration. Such a decree would determine the nature of and/or proscribe unapproved development of tenements. Lastly, to increase housing access to the low-income urban population some form of official social support is necessary, the weak economic base of the country notwithstanding. The government has a number of instruments at its disposal such as subsidies that can spur housing development. Such interventions can take the form of subsidized rent through a social welfare system or monetary policy that supports housing investment in the low-income sector. One example is through initiatives outlined in the Public Private Partnerships (PPP) Act (Republic of Kenya, 2015). Further, the government could support the development of infrastructure and social services in low-income neighbourhoods, which could drastically cut down on the cost housing.

However, the reality is that the aspirational gap between formal and informal development in Nairobi is filled in by less regulation and more irregularity. Therefore the approach towards sorting out the question of tenement settlements has to recognize the contributions of communities towards improving their neighbourhoods. This will require adherence to the 2010 Constitution of Kenya which specifies the participation of the public in decisions that affect them.

(3) *How can a consideration of vulnerabilities in Africa's settlements, linkages and order, then, be harnessed to create a resilient urbanism?*

Since a submission is made that government exists for the public good then the thinking behind development must shift to take into account urban realities. For instance, those public projects that purport to transform social, economic and political conditions for the majority must begin from first principles: this is to say that their logic must be worked from the conditions and resources of the poor and the vulnerable rather than from some abstract notion about what development constitutes. In this regard new social contracts must be struck about questions such as, 'What do the people actually need?' 'How can the public goods be distributed to benefit a larger proportion of the population?' 'What resources can people contribute to the development effort apart from taxes?' Beyond the provisions of the constitution real effort is necessary to make the process of this nascent social contract dialectical and transparent in order to result in the kind of resilient urbanism specified by UNISDR (2012).

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