



The ecology of Kenyan municipal centers: a case study of Nairobi

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Abstract

In any forum to debate sustainable human settlement development, ecology features as one of the prime environmental issues. Contemporary ecological statements on the delicate equilibrium between human and biophysical environments signify a great threat to the latter, which constitute a life support ecosystem for the former. Viewed globally, the problem is in the inadequate adaptation of human societies to their surroundings as they chart their course of development. The uniqueness of Kenyan urban ecological landscape is amongst others, as a result of the 'dualism of abodes' phenomenon as well as the contradictions of an uncontrolled urbanization process. This paper evaluates how unsustainable the urban development programs of Nairobi are. Attempts are made to explain the apparent apathy of the indigenous population to the urban entity. Objective evaluation of the system of open spaces within the built environment, as they have been transformed through history, is made. Thus a progressive approach for a culturally compatible, ecological urbanism is suggested.

1 Introduction

Collins' English dictionary defines ecology as the study of the relationships between living organisms and their environment. Urban ecology is therefore invaluable for, amongst others, urban and landscape planning and architectural developments. These are subject areas, which, in conjunction with archaeology tell us much about the various forms of the town as it has developed through history. Thus information about the past forms of human co-existence as well as the relationships between man and his environment reach us [12] almost in its authentic form. In reality, there is a link between the spatial order of vegetation and social and ecological urban models. A similar link can also be traced between the present day communities and the pre-industrial agro-based settlement [12]. This study of the Kenyan capital was carried

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out with the above points in view, al-be-it with effect from the period just before the advent of foreign settlers. In so doing, urban vegetation is narrowed down to trees and their species and analyzed to underscore their ecological, cultural and 'architectural' attributes.

In Africa south of the Sahara, over 95% of the urban landscape has become drastically impacted in recent times as a result of human activities related to colonialism and later urbanization phenomenon in the last 150 years. Of a major ecological concern are the disruptions in the pristine patterns of flora, arboriculture and natural sites. The human impact is known to be more pronounced in the municipal centers, where indigenous plant species are invaded and displaced by the exotic species. In early times of settlement development, unwritten green and sustainable policies guided planning and spatial organization. Community built forms practically 'grew' out of the natural environment, communicating meaningfully to the indigenous folks. Our position therefore is that, although in traditional Kenyan settlements, biocoenosis was not the institutionalized norm, man-nature harmonious co-existence with a special attachment to trees defined the bases for human settlement development. For example, 'barazzas', commercial activities – all took place in nature under tree canopies and make shift shelters. For them trees defined the spaces for spiritual worship and ceremonial functions, in addition to their symbolic and medicinal qualities. It is therefore evident that trees occupied a strategic niche in the life of the indigenes. A case example is the Kikuyus whose attachment to the mugumo tree remains spiritual and symbolic: it is taboo to use the wood for fuel. Located in the family homestead, the mugumo tree symbolized permanency of abode while defining the space(s) for outdoor activities. Unfortunately, as the cankerworms of hi-tech craze erode cultural frontiers, these legacies are swept aside without the option for evolutionary refinement. Their replacement developmental programmes are both ecologically destructive and culturally incompatible. For instance, as a consequence of the egocentric development policies of the settler cultures and the near total destruction of familiar native floras in the cities, the indigenous 'wananchi' soon developed pathy for the urban territory, which they referred to as 'government' area.

Nairobi which in Maasai means 'the place of cold water' was founded in 1899 as a railway camp initially populated by European and Indian settlers. It grew rapidly and soon became a center of communication, commerce and administration. By 1964, the city had expanded in size from 90 to 690 sq. km. following the influx of people from up-country in search of greener pastures (Fig. 1). By 1993, Nairobi had attained the two million people count [8]. Meanwhile, the mushrooming of informal settlements, especially on the outskirts soon led to the inundation of the 'shamba' areas of Kiambu, Kajiado, etc.

The city had its turn of turbulent planning and development history. Founded on an ad-hoc basis, the first attempt at a planned development was in 1926. And only in 1948 was its Master Plan ready for implementation. In 1973 the Nairobi Metropolitan Growth Strategy (NMGS) was created to ensure a planned development of the city till the year 2000. But the numerous ideals of the plan were never followed. The over concentration of employment activities in the city center led to serious traffic congestion, rising environmental pollution, denatured vision. Today, the once 'Green City in the Sun' is a city in crises – socio-culturally, environmentally, aesthetically – and for many urban dwellers, who though were born in the city and with only

lingering emotional and social ties to the rural towns, it soon became habitual to refer to Nairobi as 'our house' as opposed to 'our home' or 'nyalungu'.

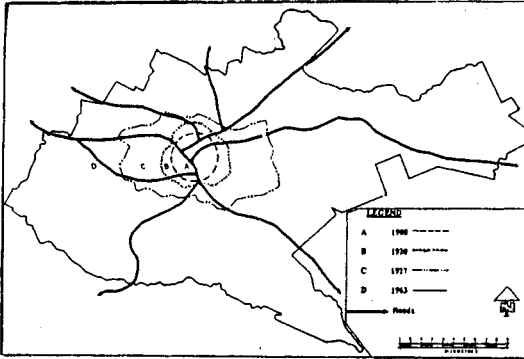


Fig. 1: Nairobi - Boundary Changes 1900 - 1963.

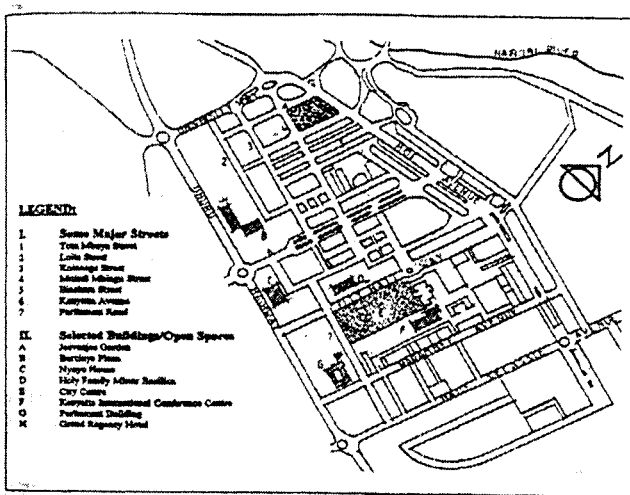


Fig. 2: Nairobi CBD - (Kenya, 1995).

For the purpose of the study scope, tree species are the perennial trees, excluding shrubs and the herbaceous ornamental plants; the urban environment includes the developed and undeveloped areas within the urban zone typology designated as the Central Business District (CBD). The paper focuses on the tree stock grown through normal arboricultural practice. Potted trees in the interior of a building and miniature ornamental plants of the fashionable Bonsai art are not considered. It therefore



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assumes a direct variable relationship between urban tree stock and the system of open spaces. The survey covers the following categories of open spaces: gardens, parks, plazas, streets and squares, compounds and courtyards. The largest of them all are Jeevanjee Gardens and the City Center Square. They are located in the north-west and south-east respectively of the CBD, and harbor the largest tree population (Fig. 2). The choice of territorial scope is informed by two inductive realities: that of the CBD being the zone most prone to the impacts of human activities. This is further supported in Kowarik's position [9] that alien plants including archaeophytes and neophytes, are encouraged in sites, subjected to high disturbance levels; and that big city centers act as havens for species immigration and better adaptation of aliens to man-made perturbations [14]. Secondly, it is to take cognizance of the apparent limitations of study time and fund.

2 **Tree morphology and urban aesthetics**

The whole concept of the native tree is not to suggest the recreation of the outmoded rural ethos. It is about the extraction and application of traditional symbols and values attributable to indigenous trees for enhancing the communities' appreciation of, and loyalty to the urban built environment. Arguably, one of the most symbolic bio-entity which traditional communities easily understands and gets attached to, is the tree. Therefore the said apathy to the city by the Kenyans is a consequence of the negative impact of the egocentric development policies of colonialism.

Hitchmough in [6] stressed some important landscape design characteristics of trees. He posits that by virtue of the leaf morphology and stem features, plants provide valuable structural forms to enrich urban aesthetics. Decorative foliage naturally produces design lines in vertical, horizontal or even arched forms, which can be useful as elements of composition. In addition, the formal attributes of trees, including the color, texture of the stem and other body parts can be employed for the desired contrast with the horizontal, oval shaped, low and high features of the urban built forms. We therefore opine that, apart from the ecological aspects of the study, trees have much more to offer designers interested in the development of a paradigm for regional urban expression. In this regards, architects in particular, and the citizenry in general, must learn to visualize and experience architecture beyond the realms of the physical building, tree communities beyond the biological essence and both as interdependent and contextually complementary elements of the ecosystem.

The acacia species for example is a familiar, naturalized ornamental tree, whose artful utilization in the urban environment can inspire a lively imagery, which the indigenous population can easily relate to and appreciate – hence the image making roles of trees. Surely, ours is neither a discovery nor an unpopular concept. The ancient Egyptian architects, for example, applied the form and shape of the papyrus leaves in the development of their system of architectural orders. In developing his concept of asymmetry and flowing curvilinear forms, Gaudi drew inspiration from patterns in nature, which he posits must be adhered to if man-made structures are to blend well with the natural setting. Similar arguments are advanced by Hundertswasser [7], the controversial Dutch architect, who believe that no elements of a building should be identical. For him, the building should appear to 'grow out of the landscape.

3 Study findings and discussions

The Nairobi CBD is estimated to cover a land area of 455.5 acres. According to our findings, one thousand five hundred and sixty four trees of differing ages, trunk sizes, foliage and canopies, ornamental qualities and physical conditions were found in the area. This translates to a population density of 3.4 trees/acre. It portrays a dismally low level of urban trees stock within the CBD. Conjecturally, it shows gross inadequacy of open spaces in the study area.

For our study convenience, two historical periods are chosen, with 1970 as the time reference point. The choice of the year 1970 is informed by empirical exigencies. Although the year of independence is 1963, it is obvious that the hand-over of political power and municipal governance to the Kenyan people was not instantaneous. And assuming that was the case, it would be unrealistic to ignore the political dynamics and the unrelenting influence of some individual actors in the outgoing administration vis-a-vis the new policies of the inchoate indigenous administration. Specifically, the acquired traditional momentum of tree planting and urban wild life policy would be expected to have taken its toll of influence for some time, even inside the independence period before gradually subsiding by the assumed year, 1970. Thus we are able to associate a given tree with the policies of either the settler regime and their agents or the government of the independence era. It was found that over 67% of trees in Nairobi CBD were planted during the pre-1970 period by the settler communities, and the colonial administration (Table 1). Logically, the number ought to be higher because of the fact, that some of the trees would have been felled to give way for development activities, while some others may have died naturally over the years.

Analysis reveals that even in post colonial period, over 80% of trees are exotic. This is because the indigenous elite who took over urban administration after independence appeared at ease with the inherited green legacy. Such legacy was established on the colonial principle of cultural subjugation, following which native plants were termed 'bush' and therefore not suitable for the urban environment [14]. Hence the foreign settlers and multi-nationals revolutionized the traditional arboricultural practice. Typical reference cases include: the garden of Kenindia Assurance Company Ltd. and the adjoining areas along Utalii Street; the Grand Regency Hotel compound where the exotic *Terminalia mantaly* trees dominate (Figs. 3 & 4). A statistical analysis revealed the following curious facts: that if X is the number of tree species planted before 1970 but which did not occur in the arboriculture practice of the period after 1970, and Y, those grown after 1970, but which were not planted during the colonial period (Table 1), then: $X = 16$ and $Y = 17$. Also $X_n = 177$ and $Y_n = 170$ where X_n and Y_n represent the actual quantities of trees respectively in each group species. Thus for practical purposes, we deduce that $X = Y$ and $X_n = Y_n$.

This is an indication that deliberate tree felling and natural death are factors which must be considered for a more accurate determination of the number of planted tree species and the actual number in place. Thus we infer as follows that:

- ◆ Contrary to expectations, there has been no discernible improvement in the overall tree population density in Nairobi CBD since 1970. This is despite the apparent unregulated increase in the surface area of mass concrete structures in the same area, as a result of property development.



Table 1. Percentage distribution of tree species along two distinctive periods

S/n	Name	Frequency	<1970 (I)	>1970 (II)
1	<i>Jacaranda mimosifolia</i>	239	228	11
2	<i>Tipuana tipu</i>	163	139	24
3	<i>Roystonea regia</i>	115	53	62
4	<i>Cassia spectabilis</i>	107	60	47
5	<i>Ficus benjamina</i>	88	81	7
6	<i>Juniperus procera</i>	68	* 0	68
7	<i>Eugenia myrtifolia</i>	64	59	5
8	<i>Eucalyptus saligna</i>	59	28	31
9	<i>Terminalia mantaly</i>	49	12	37
10	<i>Phoenix canariensis</i>	48	45	3
11	<i>Washingtonia filifera</i>	46	37	9
12	<i>Acacia xanthofolea</i>	43	43	• 0
13	<i>Chorisia speciosa</i>	36	36	• 0
14	<i>Filicum decipiens</i>	32	* 0	32
15	<i>Syagrus romanzoffianum</i>	31	20	11
16	<i>Ficus lutea</i>	29	29	• 0
17	<i>Phoenix reclinata</i>	25	18	7
18	<i>Brachylaena huillensis</i>	21	21	• 0
19	<i>Callistemon citrinus</i>	20	15	5
20	<i>Spathodea nilotica</i>	19	7	12
21	<i>Aloe bainesii</i>	18	18	• 0
22	<i>Schinus molle</i>	16	12	4
23	<i>Schinus terebinthifolius</i>	16	11	5
24	<i>Thevetia peruviana</i>	15	* 0	15
25	<i>Calodendrum capense</i>	14	4	10
26	<i>Bahinia variegata</i>	14	2	12
27	<i>Acacia seyal</i>	12	9	3
28	<i>Terminalia brownii</i>	11	* 0	11
29	<i>Araucaria angustifolia</i>	11	9	2
30	<i>Borassus aethopum</i>	10	* 0	10
31	<i>Brachychiton acerifolium</i>	10	* 0	10
32	<i>Syzygium cuminii</i>	10	5	5
33	<i>Grevillia robusta</i>	10	10	• 0
34	<i>Cupressus sempervirens</i>	8	3	5
35	<i>Croton megalocarpus</i>	8	2	6
36	<i>Dracaena steudneri</i>	6	2	4
37	<i>Markhamia lutea</i>	5	3	2
38	<i>Euphorbia candelabrum</i>	5	4	1
39	<i>Acrocarpus fraxinifolius</i>	5	2	3
40	<i>Euphorbia cotinifolia</i>	4	* 0	4
41	<i>Tecoma stans</i>	4	4	• 0
42	<i>Delonix regia</i>	4	4	• 0
43	<i>Persea americana</i>	3	1	2
44	<i>Ficus elastica</i>	3	* 0	3
45	<i>Cupressus lusitanica</i>	3	* 0	3
46	<i>Chrysalidocarpus lutescens</i>	3	* 0	3
47	<i>Milletia dura</i>	2	2	• 0
48	<i>Acacia mearnsii</i>	2	* 0	2
49	<i>Mangifera indica</i>	2	* 0	2
50	<i>Araucaria heterophylla</i>	2	* 0	2
51	<i>Ochna ovata</i>	2	2	• 0
52	<i>Erythrina abyssinica</i>	2	1	1
53	<i>Acacia tortilis</i>	2	2	• 0
54	<i>Eugenia jambos</i>	2	* 0	2
55	<i>Terminalia catappa</i>	2	2	• 0
56	<i>Cupressus toralosa</i>	1	1	• 0
57	<i>Ficus thomningii</i>	1	* 0	1
58	<i>Acacia albida</i>	1	1	• 0
59	<i>Ficus sycamoros</i>	1	1	• 0
60	<i>Casuarina cunninghamiana</i>	1	1	• 0
61	<i>Psidium guajava</i>	1	* 0	1
62	<i>Eriobotrya japonica</i>	1	* 0	1
Grand Total		1,555	1,049 (67%)	506 (33%)

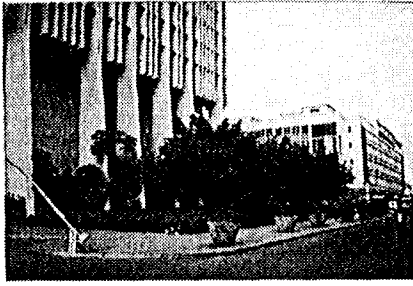


Fig. 3: The premises of Kenindia Assurance Company Ltd.

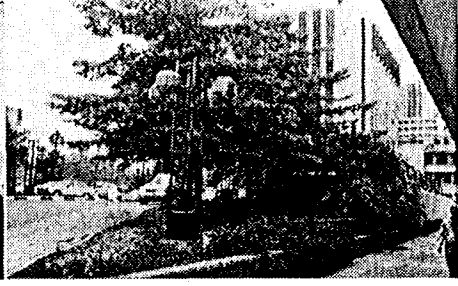


Fig. 4: The Grand Regency Hotel entrance.

- ◆ The native tree species planted by the settler regime (50%) far outnumber those planted since independence (30%).

Certainly, in the first inference we have evidence to explain why the status quo has taken the form of a denatured environment, with a profile that is a mere mirage of once the 'green city in the sun'. On the other hand, the second is, mildly put paradoxical. It exposes the contradictions in the whole essence of a people's proclaimed self-rule and cultural identity within the context of rapid urbanization trends and global 'rat-race' technology. In both cases we visualize a food for thought for all: environmentalists, policy makers, architects, the general citizenry.

We are equally able to explain the root causes of the depletion of indigenous tree stock within the city even during the post colonial periods. Thus we should be able to stem the trend and reverse the current indigene's apathy for the native urban entity. Indeed one sees the indiscriminate introduction of alien tree species together with the machine aesthetics as premeditated instruments of cultural pluralism. As a consequence, the indigenous urban dweller develops the attitude of indifference in the affairs of the municipality. This is further enhanced by the traditional phenomenon of dualism of abodes whereby the urban dweller, with his/her primary abode in the rural area is perpetually 'mobile' and 'in transit'. We opine that this scenario fuels anti-developmental sentiments in the 'transit' urban dweller. For him, the city belongs to the 'government' and his (temporary) abode could be pitched anywhere within its confines, with absolute indifference to the negative impacts of his ramshackle structure. It disproves the claim by many that the proliferation of informal settlements in Third World Urban centers is necessarily as a result of the financial incapacity of the developers to meet the demands of the building standards. Notably, some change in attitude is discernible in recent times as a result of the gradual erosion of the traditional bases of the dualism of abodes phenomenon. This is especially true of the so-called 'rootless generation', born after 1963.

Our study of Kenyatta Avenue, the widest and most prominent communication link in Nairobi CBD, present an undesirable vista epitomized by the urban stressed, and haggard looking, exotic trees. Out of the 13 species lining the street, the most frequent is the *Jacaranda momosifolia* followed by *Phoenix relinanta*. Viewed against the background of western architecture, the language of expression, like in most other parts of the city, remains incomprehensible for the indigenous urban dweller and more so for the folk from up-country.



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Our survey of the Parliament Building premises reveals an encouraging impression in contrast with the Kenyatta Avenue scenario. Out of the 17 No. tree species within the premises, the native *Syagrus ramanzofianum* is the most frequent (20 No.), followed by *Roystonea regia* (15 No.) Apparently in accordance with the design philosophy of the Parliament Building, a symbol of self-rule and national identity, the architect's intention was to articulate the landscape as a mirror through which one can reflect the various indigenous Kenyan flora. It borrows from Le Corbusier's concept of symbiosis between man, nature and the built form as exemplified in the Parliament Building of Punjab in Chandigarh, India. Here, Le Corb exploits the attributes of nature as an agent of regeneration of mankind, capable of rekindling human values lost to the industrial society. In Kenyan case, such values include the cultural symbols and mythology, normally associated with native ornamental trees. In terms of aesthetics 52% of the trees ranked "good" while 45% were "average". The criteria for classification include shape, stature and the harmonious proportion of the tree parts. These are form/shape of crown/canopy, stature and color shades of the stem, pattern of branches and leaf arrangement. For example, *Acacia xanthophloea* is seen as a large, shallow-rooted, graceful tree growing up to 25m tall. Its yellow-green bark, hairy, cracked when older, makes it easily recognizable. The white straight thorns become less conspicuous with age. It is an indigenous ornamental tree and rated good in terms of its aesthetic quality and potentials for urban morphology. Such exotic trees as *Cassia spectabilis*, *Ficus benjamina*, *Terminalia mantaly*, *Phoenix reclinata*, etc., which, if grown in their natural habitat should have been seen as highly ornamental, were found to be of the "average" status. We therefore conclude that such exotic species are less suited for Nairobi urban environment and therefore recommend that they be replaced with the more resilient native trees. Similarly, such native trees as *Caloden capense*, *Acacia tortilis*, etc., which are in the "average" category should either be replaced or subjected to intensive management to enhance their capacity for resistance to urban stress.

4 Summary

Indeed Nairobi is not alone with regards to the problems of ecology and denatured and culturally meaningless urban milieu. The scenario is typical of most, if not all, colonial urban centers of Kenya, especially those originally planned and developed by foreign settler groups.

While we may tend to abhor the acquired taste for exotic trees in traditional urban environment, we are equally obliged to recognize the tangible contributions to urban greening. Viewed in isolation, the premises of the multinationals represent a symbiosis between the hi-tech of the late 20th century and the growing ecological concern of recent times. Surely, they are typical of the ideal paradigm for arboriculture, given a western society (Fig. 5). The contrary is however true of the premises and public open spaces directly under the jurisdiction of the local authorities. Such cases include: Jeevanjee Gardens (once famous for its garden architecture, strategic location and symbolism), Aga Khan Walk, Taifa Road, High Court Car Park, etc.

Concerning the means to a regional architectural identity, the progress has not been tangible because of the lean data resource base. Besides, our efforts lack

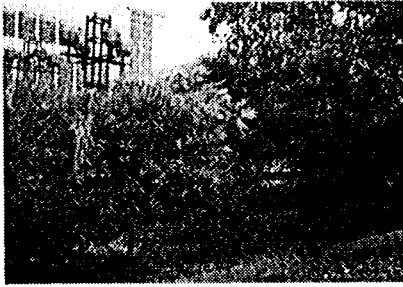
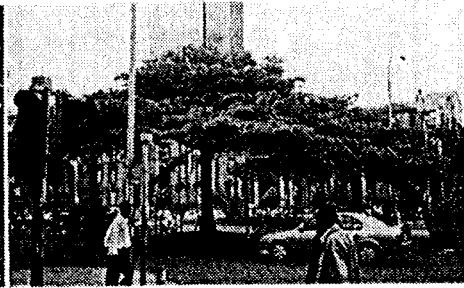


Fig. 5: Multinational case example

Fig. 6: Ornamental native acacia tree,
Kenyatta Av.

absolute empiricism. Even the advocates of earthen materials, etc. in many aspects still fail to advance convincing arguments to the stakeholders. The artful exploitation of the ornamental attributes of native and naturalized tree species may open a new window in the search for expressive metaphors for the fast growing urban settlements. Just as plants naturally act as useful foil to the formal aspects of the urban panorama, so also they provide the ornamental base for regional symbolic expression (Fig. 6).

It is pertinent here to assert, that while many studies tend to limit ornamental issues to smell, beauty and gaiety of flowers, ours transcends such scope of inquiry to delve into the largely unexplored, albeit potent formal attributes of trees inherent in such elements as the foliage, branch skeletal system, canopy, stem and color and texture of bark. This no doubt will require a multi-disciplinary approach which though not yet fully explored, may enable the development of design metaphors to provide our regional architectural genre with 'more teeth'. Hitherto, efforts have been limited to the domains of material science and technology in combination with superficial geometrical patterns/murals and constructs.

Though outside Nairobi CBD, the United Nations Headquarters' complex, Gigiri, is another good example of articulate landscaping, in which carefully selected, primary indigenous plants and other local natural resources were employed, to achieve an ecological sustainable development. The Nairobi municipal authorities as well as the other stake-holders in the city building process stand to benefit immensely from this exemplary project. Unfortunately, it would appear that the city administration underestimates the necessity for a symbiosis of nature and the man-made urban fabric and hence, regard trees and other plants as a mere makeweight. In consequence therefore, the urban population is unjustly deprived, not only of the benefits of the ornamental qualities and the symbolic values of native trees, but also, of the powerful sensation of tranquillity strength and protection. And according to the Vales [16], the "denial of any natural environment within the city is as alienating as any closed environment in science fiction".

From the survey findings, we deduce further that the open spaces in Nairobi CBD are grossly inadequate and lack equity in their spatial organization. Worse still, even the few open spaces trapped within the dense concrete masses of built urban blocks are fast falling prey to land grabbers through dubious allocations for commercial and other developments [8]. If this trend is left unchecked, there is bound to be the excessive build up of the constraints on tree stock and the urban biodiversity in general, hence the denuding of the urban environment of the natural buffers, which



help to reduce the pressures cities normally place on the social systems. In-order to avert this, facilitate increased tree population density, and enhance ideal ecological balance within the urban set-up, the currently dormant open spaces planning policies should be reactivated and redirected towards the achievement of the ultimate goal of the “green city in the sun”.

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