Greenway Network for a Healthy and Sustainable City - Case of Nairobi Central Business District

Introduction

Cities are seen as engines of economic growth, hence, attracting people to its environment. Currently, world's population is at 6.8 billion with the urban population at 2.8 billion Vasconcelos (2006). This increasing population growth over the years is a threat to the urban environment. Cities currently are faced with challenges of lack of green spaces, air pollution, congestion, conflicts between human and traffic among others. Creation of quality spaces in these areas is inevitable if sustainable places are to be achieved. Building greenway networks can be used to improve urban sustainability.

A greenway is a linear open space established along either a natural corridor, such as a riverfront or stream valley or a landscaped course for pedestrians or bicycle passage, Bischoff (2001). It is an open space connector linking parks, natural reserves, cultural features and historic sites with each other and with populated areas. Greenways are corridors of protected open spaces managed for conservation and recreational purposes.

Different scholars have categorized greenways over the decades. In his book *Greenways for America* Charles E. Little classifies greenways into five different categories (1) urban riverside and waterfront greenways, usually created as part of a development along neglected, often rundown city waterfront, (2) recreational greenways, featuring paths and trails of various kind often of relative long distances, based on natural corridor as well as canals, abandoned rail beds and other public rights of way, (3) ecologically significant natural corridor, usually along rivers and streams to provide for wildlife migration and species interchange, nature study and hiking (4) scenic and historical routes usually along a road or highway (5) comprehensive greenway systems or networks usually based on natural landforms such as valleys and ridges. Landscape architect Phil Lewis has characterized greenways as environmental corridors, which he has dubbed "E-ways," for the main purposes of (1) environment, (2) ecology, (3) education, and (4) exercise (Grove, 1990).

The typical functions of greenways, as recognized by geographer Rutherford Platt, include water resource protection and pollution abatement, riparian habitat enhancement and biodiversity, flood hazard reduction, recreation, environmental education, noise attenuation, microclimate enhancement (for both cooling and pollution abatement), and the reduction of bank erosion and downstream sedimentation (1994).

Greenways and livability

Livability promotes sustainability in the urban environment; healthy urban life, easy mobility, aesthetically attractive, worthwhile, and safety (Hahlweg, 1997). In the livable cities both social and physical elements must collaborate for the well being and progress of the community, and

of the individual persons as members of the community (Hahlweg, 1997). In promoting liveability of cities imageability is promoted, and the vice versa is true.

Livability index

Livability index is a measure of livability in cities, various scholar have come up with criteria for calculating the livability index over the years, examples include; Monocle's criteria and Dom's Criteria among other criteria. In his analysis Dom characterize livable cities as walkable, vibrant, exciting, sociable, charming, acceptable human-scaled pedestrian experiences

Dom's Criteria of Livable cities

Table 1: Attributes of a Livable City

Sector	Attributes
Transportation	Traffic calmed Tree lined streets Adequate on street parking Slow moving traffic in the city centre Vibrant sidewalks Quality transit Quality bicycle and pedestrian facilities Non- pollution transport system
Recreational	High Quality public squares and public parks Quality urban life
Economical	locally owned cuisine some of which feature outdoor cafes found on a vibrant sidewalks vibrant economy diverse retail potentials
Historical and cultural heritage	Quality culture Magnificent Historic architecture

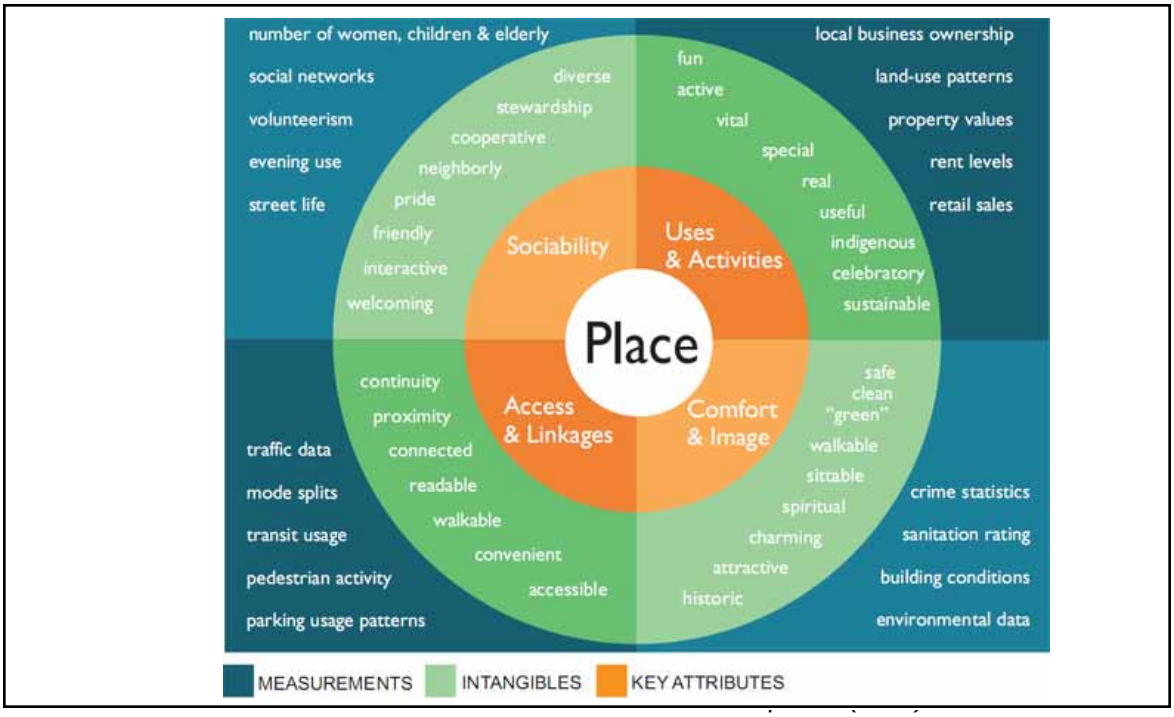
Source: livable city: livability criteria: Nozzi (2011)

Pedestrian Space; plazas, streets, sidewalks, pass, and alleys bring people together and bind communities. Need to note that movement in these spaces is crucial; the ease of movement for pedestrians is reinforced by considerations of connectivity and permeability. Movement in an urban community is enhanced by; roads, footpaths and public spaces connected into well-used routes, easy accessibility, direct routes that lead to where people want to go and choice of safe, and high quality routes. Other considerations include; Safety- street planning should relate to overall community planning and provide a safe and pleasant environment for residents, pedestrian, and bicyclists while facilitating mobility of all modes of transportation. (IBI, 2009). Urban community safety issues are considered in the design and location of facilities, Character - well designed streetscape provides an identity that is unique to each site and place and sets

the framework for future development to ensure a cohesive signature that will stand the test of time. This is reflected in the; gateways/public art/identity elements, and banners/signs (IBI, 2009), Multi-Modal Accessibility - there is a paradigm shift in the way we want to live our lives today. Transit-oriented development, downtown living, being a part of a community that promotes walkability, live-work environment are becoming more important than our dependence on the automobile. More focus should be given to create streetscape that supports alternative transportation modes.

Qualities of a Successful Public Place

Figure 1: Attributes of a Successful Public Space



Greenways and sustainability

Urban areas have been characterized by explosive growth with fundamental changes, not only to the physical landscape, but also to people's perceptions of land and environment. Vasconcelos (2006), says that the high concentration of population induces several problems, not only environmental (however important these are), but also economic and social. It also induces problems and has an impact on the three parts of urban sustainability. Greenways, because of their key characteristics such as spatial configuration and many aspects in use, bring to an urban area a wide range of benefits. Vasconcelos (2006), has analyzed and grouped these benefits by the three parts of (urban) sustainability: environmental, economic and social

Table 2: Greenway networks

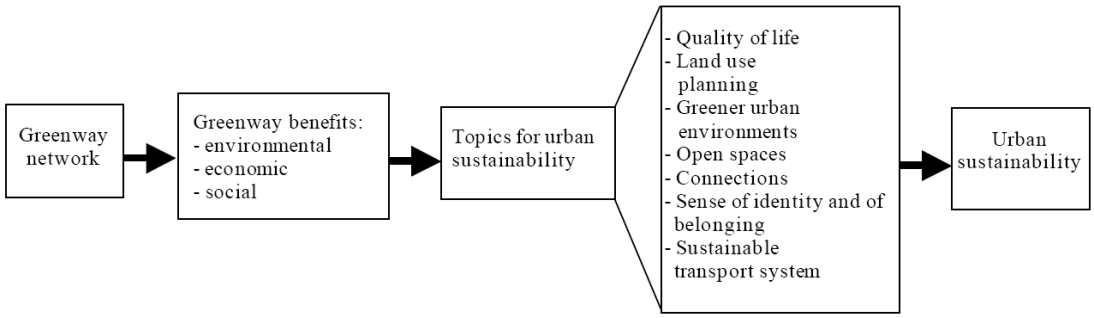
Environmental benefits	Economical benefits	Social benefits
Greenways:	Greenways:	Greenways:
Help to restore and protect the natural environments	Help inward investment, business retention and corporate relocation	Improve leisure time and sport facilities
Enhance environmental quality	Induce positive publicity for business	Can be a means of education
Contain different kinds of vegetation	Enhance the facilities for employees	Enable a better appreciation and awareness of nature and the environment
Support local plant and animal communities	Stimulate higher productivity	Are an alternative transport route
Provide wildlife corridors	Provide direct employment opportunities	Democratise the public mobility
Support biodiversity	Attract tourism	Enhance well-being through contact with nature
Protect areas, in which waterways exist, that must be kept unpolluted	Enable commercial opportunities	Are a visual relief, especially in urbanised areas
Help to reduce flood hazard and ameliorate the water fluxes across landscapes	Improve the overall appeal of a community to prospective new residents	Induce healthier lifestyles
Reduce problems of soil erosion and down-stream sedimentation	Are a low public investment and a low private expense	Provide access and linkage between natural and cultural sites
Help to reduce journeys to and pressures on the countryside	Increase real-estate property values	Help to preserve monuments and historical buildings
Induce a more efficient utilisation of land	Help create tax revenue	Enhance sense of community
Limit urban growth	Help to reduce public costs	Can be an anchor for revitalizing neighbourhoods and building healthy communities
Can be makers and shapers of the urban form	Stimulate expenditures by residents	Facilitate social equity and therefore, social cohesion
	Stimulate agency expenditures	Are an alternative to those who do not live near traditional parks
	Are a cost-effective strategy for providing outdoor recreation	Can serve as evacuation and emergency vehicle routes
	Decrease the car related family budget	Have a positive influence on human behaviour
	Reduce the need for a second car	Help to reduce crime
	Proportionate a win of money and time for parents	

Adapted from Vasconcelos (2006)

A greenway has all the benefits that an urban open space would have but also adds to linkage between areas. This adds to a multi dimensional use on a day to day activity in life.

Vasconcelos (2006) has summarized it into seven topics

Figure 2 Greenway network and urban sustainability



Source: Vasconcelos (2006)

1) Quality of life – its achievement for all urban citizens based on the basic environmental, social and economic elements. Examples for basic environmental elements are potable water, breathable air, spaces for movement, desirable habitat for living, recreation and working. Some basic social elements are physical and mental health, access to education and housing, and equity. The basic economic elements are for example reliable employment, incomes that sustain a fair quality of life, and economic opportunities and diversity.
2) Land use planning – this is related to the irreversible land use changes and the pace at which land, a finite resource, is being consumed by urban development and urban sprawl. A Street can have different uses from mobility to shopping thus affecting the abating activities it relates to.
3) Good connections – it is important to conserve connections from landscape to landscape, and space to space. Ahern (2004) argued that providing or maintaining connectivity in a landscape supports particular processes and functions that may not otherwise occur. If these processes are beneficial and valued by humans and are dependent on connectivity to some extent, then it can be argued that connectivity is an important characteristic of, or a prerequisite for, urban sustainability. Besides the ecological benefits, good connections have important social benefits, such as support of social cohesion and facilitate contact among people. (Vasconcelos 2006)
4) Sense of place, of identity and of belonging – urban areas through their design should support a dynamic urban cultural life and foster strong urban identities (Vasconcelos 2006). The sense of place and of identity can be enhanced in part by providing a distinctive character to an urban area, which in turn can be achieved through icons.
5) Development of a sustainable transport system – no urban area can offer good quality of life or achieve some level of urban sustainability without a sustainable transport system [Wadhwa, 2002]. Integrated with land use planning, for all forms of transportation should also enhance the

quality, liveability and character of communities and support revitalization with minimum displacement within urban areas.
6) Greener urban areas and 7) Open spaces – the creation, protection and maintenance of green/open spaces are crucial elements of urban sustainability, and healthy cities.

The concept place making

Sustainable ecological greenways require the user participation. This will ensure livability for the greenways will always meet the requirements of the users. The project for public spaces and metropolitan planning council gives the concept of place making (council, 2008). Place making is the art of creating "public places of the soul that uplifts and help us connect to each other" unlike a space which is a physical description of a piece of land, a place connotes an emotional attachment to the piece of land. A place is not necessarily a design (council, 2008). The sense of a place involves creative of economic activities and active uses. It is usually an act of looking at, listening to and asking questions of the people who live, work and play in a particular space to discover their needs and aspirations.

Observing space allows you to learn how the space is used. The sense of a place is also achieved by triangulation where elements relating to each other in a way that foster activity and are grouped together. Elements placed together have synergies. Place making is a dynamic human function (council, 2008). It is an act of liberation of staking claim and beautification and true human empowerment. Greenways will make a place great and create spaces where celebrations are held, social and economic exchange takes place, friends run into each other and culture mix (council, 2008). Street as places usually have variety of uses which ensure that spaces can be shared effectively, street width are appropriate to the function and how sustainable transports options can be supported and encouraged.

In green way concept Marcus (1998), suggests that most successful streets will have highly visible location, sunny during lunch hour, has food available, has a variety of seating locations, and offers a passing parade of pedestrians and traffic. Users seem to enjoy the combination of being both spectators and on display. The greenway should have abundant seating with casual nature of sitting. Crocker plaza and street is a successful area that have a casual seating arena and "people sit watching people watching people" Marcus (1998)

Through the qualities of public space on mobility, socialization, safety and health and land uses, it is possible to analyze a city's circulation networks and opportunities for greenways in enhancing circulation networks for sustainable city.

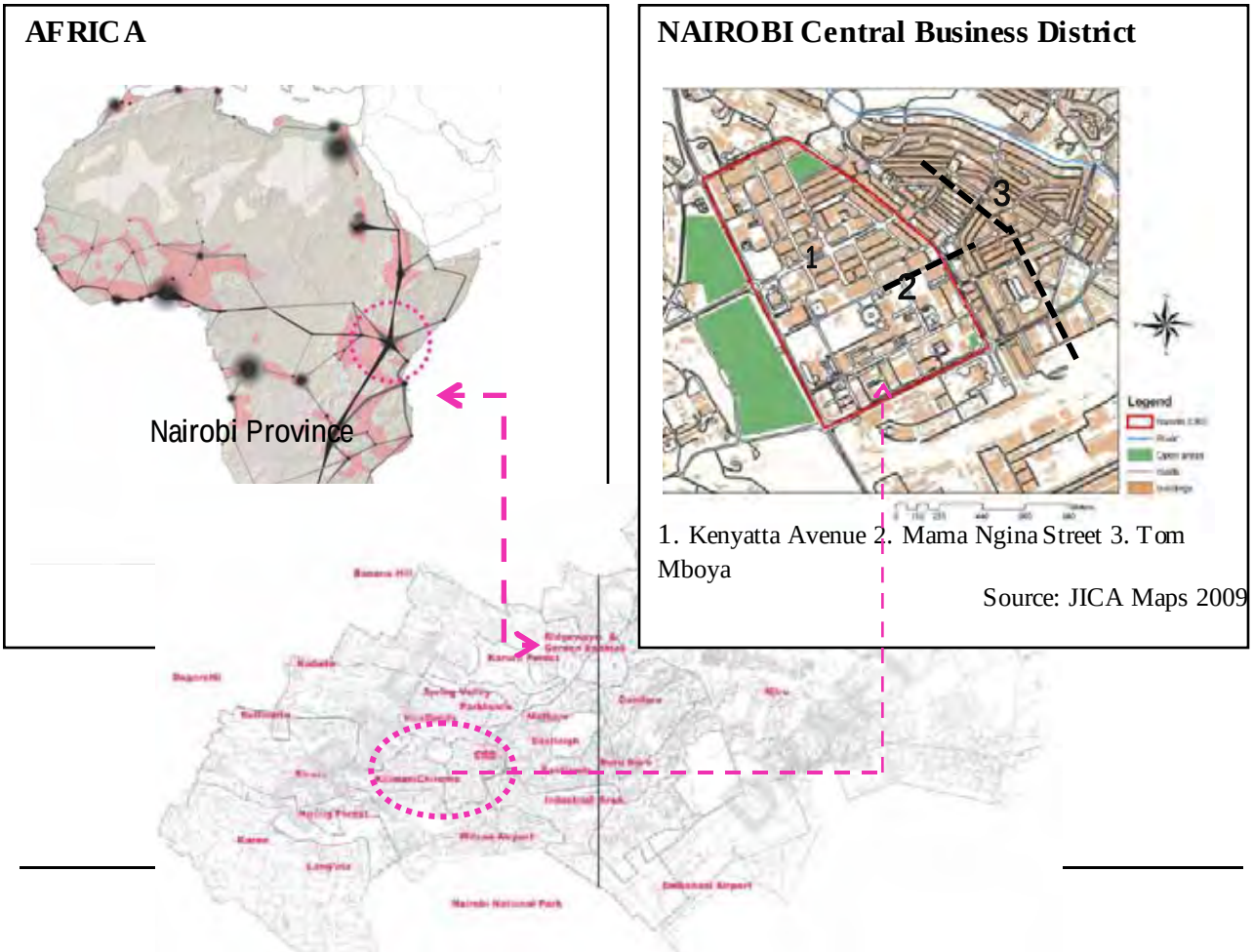
Marwa Samuel Mugo, **Meeting the Challenge Greenways Networks for a more Healthy and Sustainable City,** 47th ISOCARP Congress 2011

Nairobi central business District; Analysis of the opportunities of greenways for sustainability

The case study

The study was held in the city of Nairobi, by developing an evaluation in the circulation networks based on indicators (mobility, socialization, safety/health and land use) and also based on the historical evolution of the city. Nairobi is the capital city of Kenya. The city of Nairobi is situated at the southern end of Kenya's agricultural heartland, 1.19^0 South of Equator and 36.59^0 East of meridian 70. Its altitude varies between 1,600 and 1850 metres above sea level (Wikipedia, 2011). Spatially, the city's total area is approximately 694 square kilometers (Wikipedia, 2011). The central business district is defined by Haile Sallesse Avenue, Uhuru Highway, University way and Tom Mboya Street. The stretch of the study area comprises of the area sandwiched by Mama Ngina Street and the Nkrumah Road, including parts of Moi Avenue, City hall Way, Aga Khan Walk and Hilton Square (Public Square).

Nairobi: Location Map



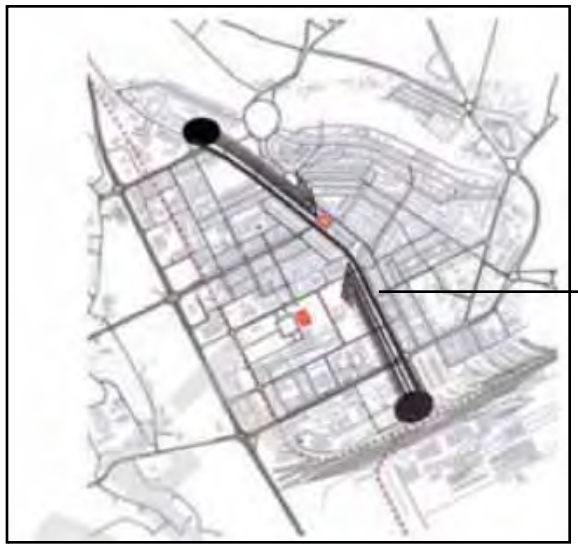
1. Kenyatta Avenue 2. Mama Ngina Street 3. Tom Mboya

Source: JICA Maps 2009

Historical Development of Nairobi

Located in Africa, East Africa, Nairobi owes its origin to the construction of the East Africa Railway (connecting Mombasa to Kisumu). The commitment of the British Company to the colonization of East Africa was marked by the decision to connect Uganda with the Kenyan Coast by rail (Mitullah, 2003). The site in which the city has grown was chosen from its suitability as a railway depot due to the geographical location roughly halfway between Mombasa and the final destination of the railway line at Port Florence (now Kisumu).

Nairobi in1905



Source: Nairobi - city without a master plan? ()

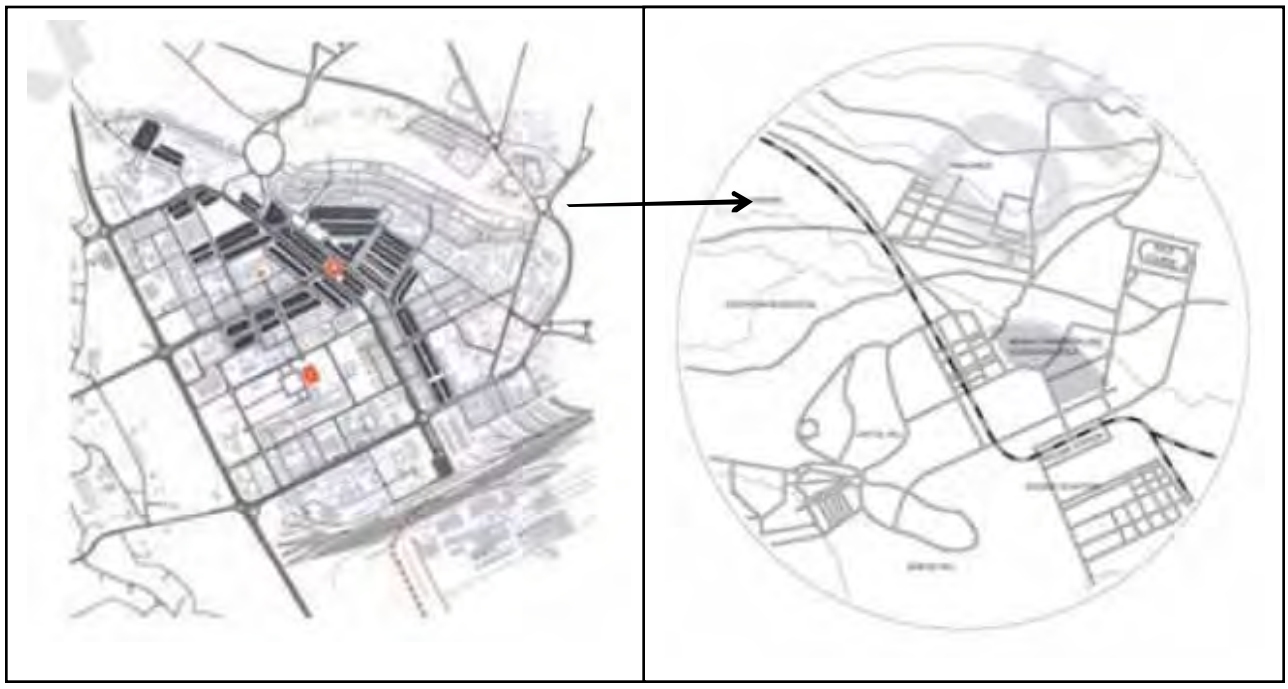
The development of the city was as a result of development of the railway

Railway authorities and train station as urban engine 1905:

Source: Nairobi - city without a master plan? (2000)

Nairobi in 1906 – 1910: A plan for a railway town

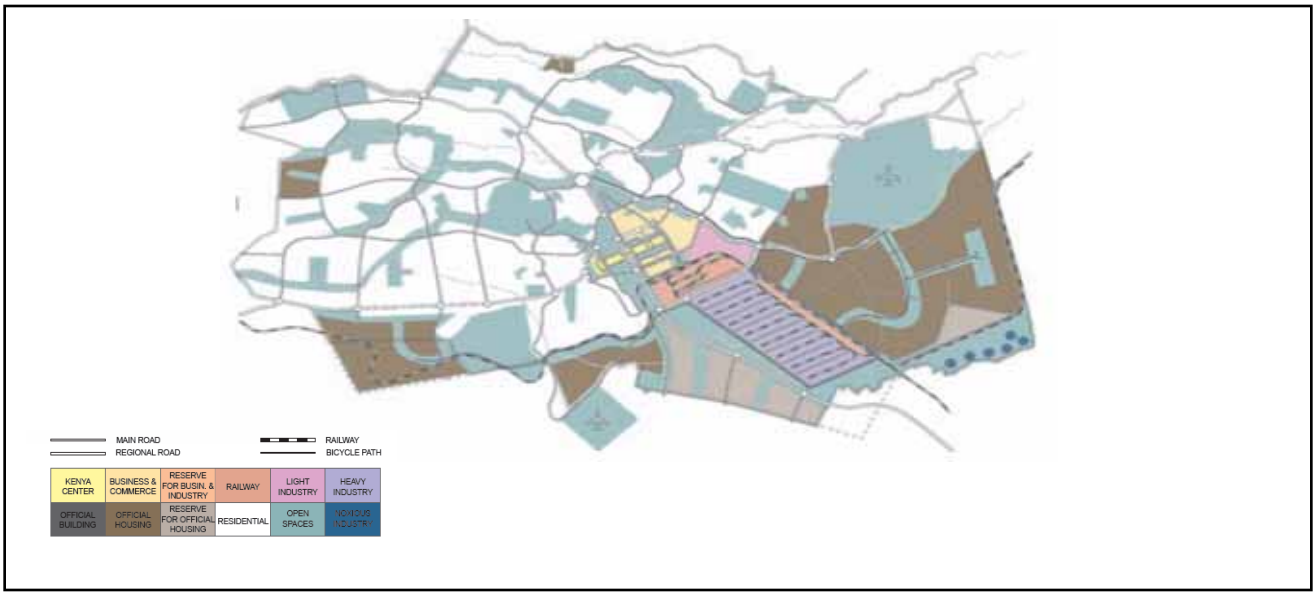
Before the railway reached the Nairobi, there was need to plan for a railway town. The topography of the area dictated the planning of the same. The maps below show the segregated neighborhoods for Europeans and Asians.



Nairobi in 1927 (Plan for a Settler Capital 1927)

Source: Nairobi - city without a master plan? (2000)

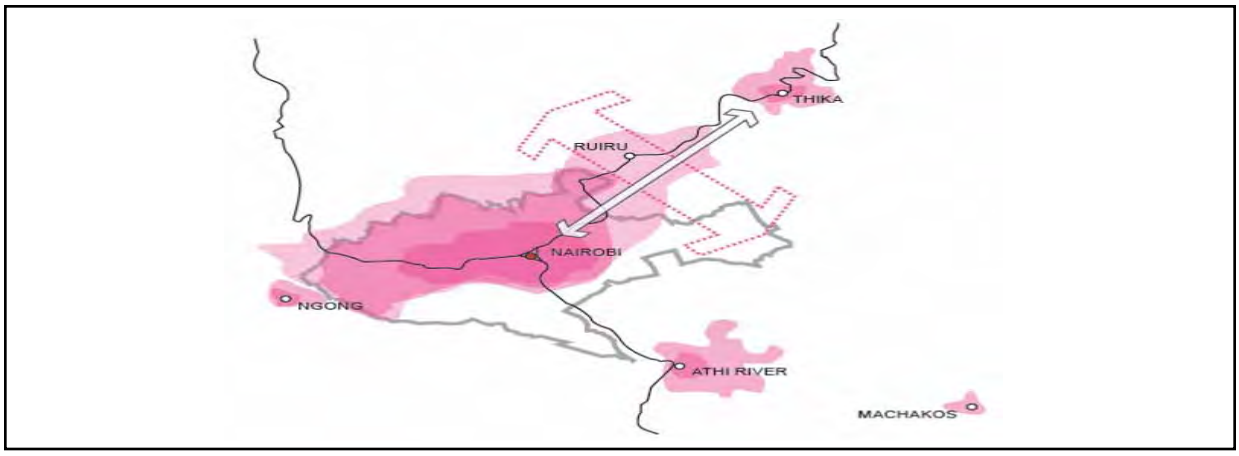
Nairobi in 1948 (Nairobi a Master Town)



Source: Nairobi Master Plan for 1948

Nairobi today

Rapid urbanization coupled with increasing population increase characterizes the city of Nairobi. Evidence of urban sprawl to the surrounding towns is evident.



Source: Nairobi - city without a master plan? (2000)

Planning the circulation networks; potentials for greenways

The study was directed to three streets in the city. The reason of the selection was because the areas had more land use activities, serving a high population of residents in the city, the streets also have possibilities for connectivity and would represent other areas in the city which are similar. The streets have undergone numerous changes from independence in term of land uses. The streets were also found to serve a number of users ranging from office workers to business persons in the city.

As noted in the historical development of the CBD, the development and evolution through time, it was important to note the changes that have occurred in the use of the streets. The analysis was through taking into account the indicators described

Attributes Street	Health and Safety	Land use	Mobility	Sociability
Kenyatta Avenue	Majority of the people felt that the space was adequate but much preference is made for the vehicular traffic It is dusty, with congested streets both human and vehicular especially parking. A lot of haphazard crossing of pedestrians on oncoming traffic	Presence of commercial activities namely; banks, shopping Malls, open spaces, plazas, and office blocks	Inadequate continuity along the street and especially on the junctions (Moi Avenue – Kenya Avenue, Uhuru Highway – Kenyatta Avenue)	Poor planning and design of elements inhibit socialization e.g. presence of monuments on Koinange street – Kenyatta Avenue Junction and along the avenue. There are streets along avenue that do not enhance the sociability of the street
Tom Mboya Street	Majority of those interviewed felt the street was too dusty The street is uncomfortable for walking due to the	Presence of commercial activities namely; shopping malls and stalls, supermarkets, and office blocks	Numerous bus stops along the street cause conflicts between human and vehicular transport	Lack of niches and nooks in the shopping areas deny people opportunities to socialize; stop, watch, shake

	lack of space Insecure possibilities of being mugged along the street Presence of bus stops were vehicles wait on running engines cause air pollution		Majority said the street was 'less walkable' due to the congestion existing green plants have been stumbled upon due poor planning and design considerations	hands and chat.
Mama Ngina Street	Majority of the people interviewed preferred the street for its adequate space to walk, sit and socialize. The street is well provided with trees, lighting and furniture Less polluted environment along the street Good cross ventilation	Presence of coffee shops, restaurants, exhibitions, and outdoor seating	Dominated by pedestrian walkways Minimal vehicular Well linked to Aga Khan Walk Poorly linked to Moi Avenue and Kenyatta Avenue	Adequate space along the street provides areas for socialization, outdoor seating Streets provide shade for seating Minimal pollution due to absence of vehicular traffic

Source: Author Construct 2011

Analyzing the use of circulation networks gave an obvious conclusion that there is an increase use of the motor vehicles in the city centre. The high population growth has increased the use of public transport in the CBD, hence, reducing spaces available for urban greenways. The vehicles have increased pollution through smoke and dust and high pedestrian – vehicular conflict. Areas with low vehicular transport performed highly in terms of health, safety, land uses, mobility and sociability.

The evolution over time has also led to decrease number green spaces both public and private. The CBD has become more urbanized with more hard spaces than green spaces. The existing green spaces seemed to be delinked from our daily uses as indicated in our indicators. The green urban spaces e.g. central Park, Uhuru Park, Jeevanjee & Nairobi River seem to be

delinked from each other within the CBD. The users felt they needed these spaces in their proximity; in areas where they shop and walk in the city.

Concerning the road structure, several changes have occurred in the circulation network, where the automobile are dominating and much preference given to them in terms of space. This leads to less space for the pedestrians who are the majority in the city. The adjacent spaces have been used as parking leaving less space for circulation and mobility. Kenyatta Avenue is characterized by numerous parking as identified earlier discussion

These facts led us to believe that, although there are changes in urban morphology and use the circulation spaces can suffer some changes so as to integrate the existing conditions that have occurred over time. We clarify the concept of greenway networks with in terms of its strengths and weaknesses in order to contribute for the planning and designing of greenway networks for healthy and sustainable city. It emerges that there are circulation networks though they have not been put in place in order of priority. The connections do not meet the measures of health, safety and comfort.

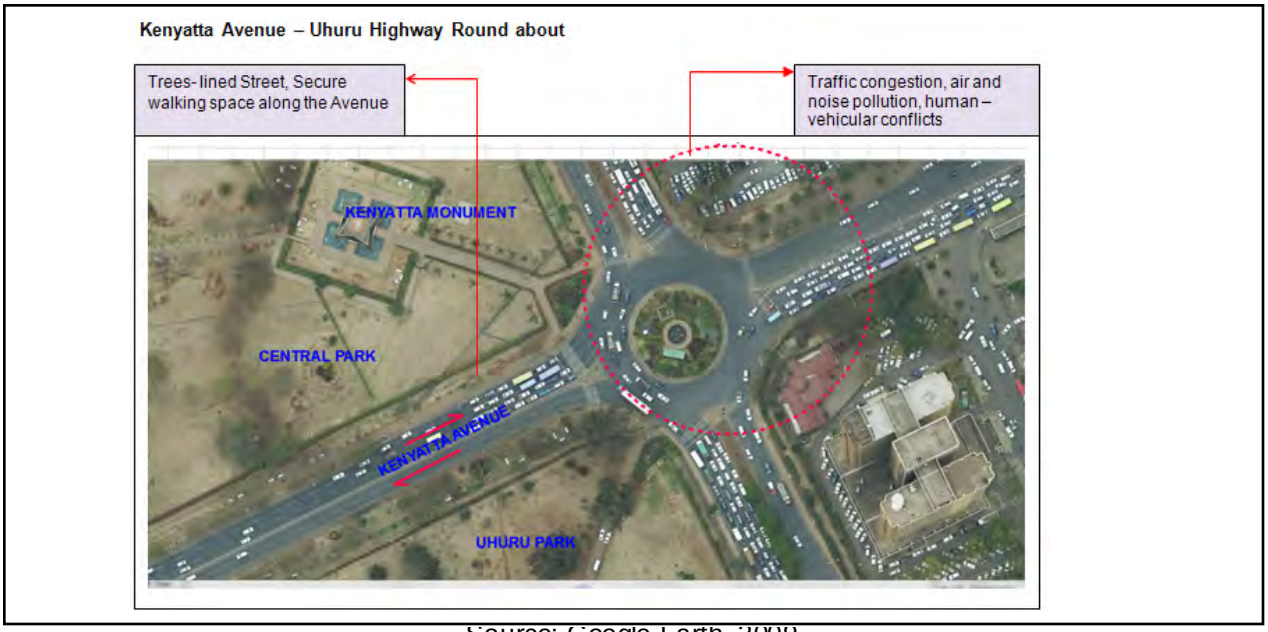
Land use and activities have not been enhanced by circulation networks, the networks do not offer multifunctional use e.g. stopping when purchasing items, crossing roads to activities that are on the other side of road, decision making points and resting spaces while handling activities for the day. Tom Mboya Street for example does not enhance any of the above.

Greenways would enhance integrated proximity giving the population an easy access to their daily activities.

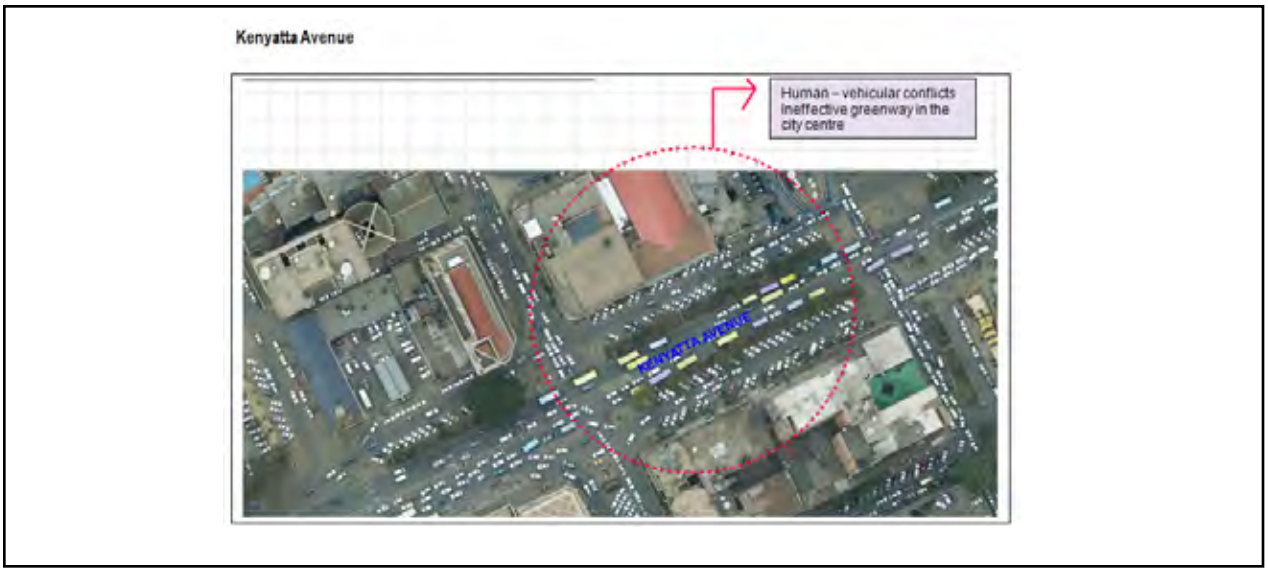
Sociability: The condition of access, land use and comfort can generate strong hierarchy in socialization. The design of green way networks will create niches, nooks and stopovers where people can meet, stop and continue with their journey. Places like Stanbank, Latema Street, the Sarova Stanley Hotel would work well if revitalized in the concept of greenway network. These points can also have a strong attribute in placemaking if well integrated with other urban elements like fountains and monuments

Presence of seating areas around the Hilton Square was found to be a reference point to most of the residents.

Lastly, it is important to create landmarks that make a circulation network peculiar and unique in enhancing a sense of mystery and continuity. It is important to also enhance other flows in circulation (pedestrian and cycling) as opposed to vehicular as it is the case today.



Source; Google Earth, 2009



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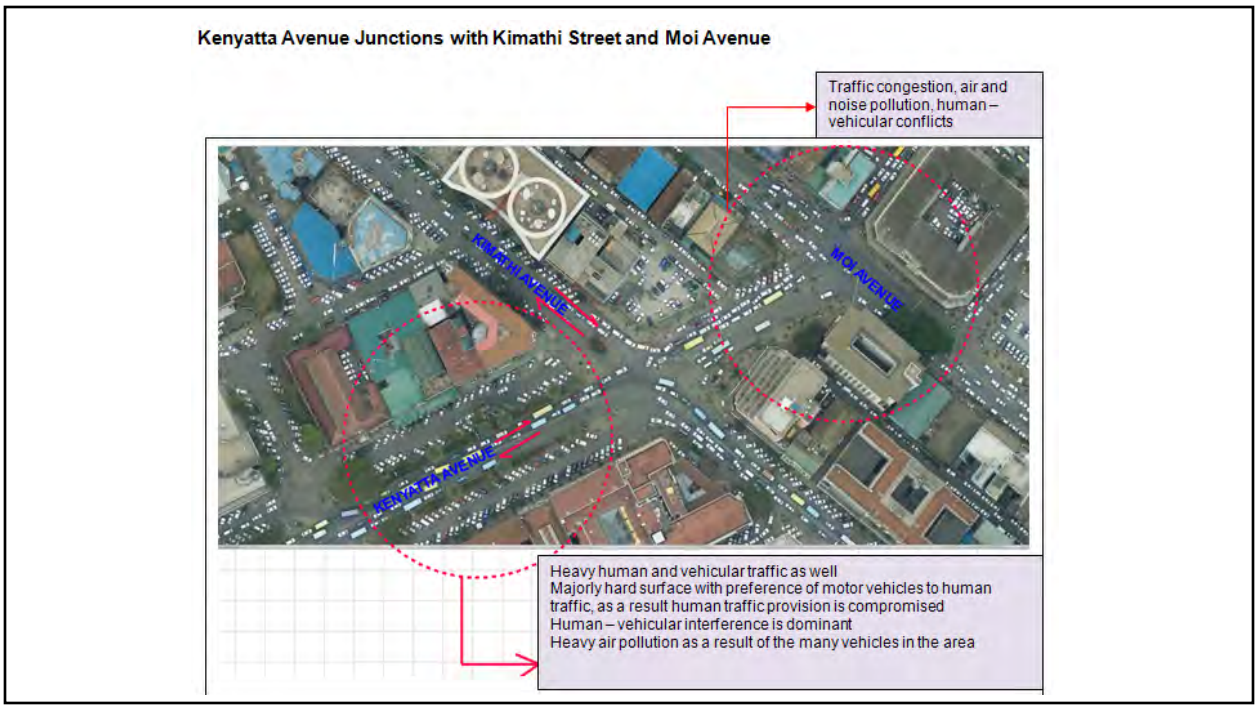

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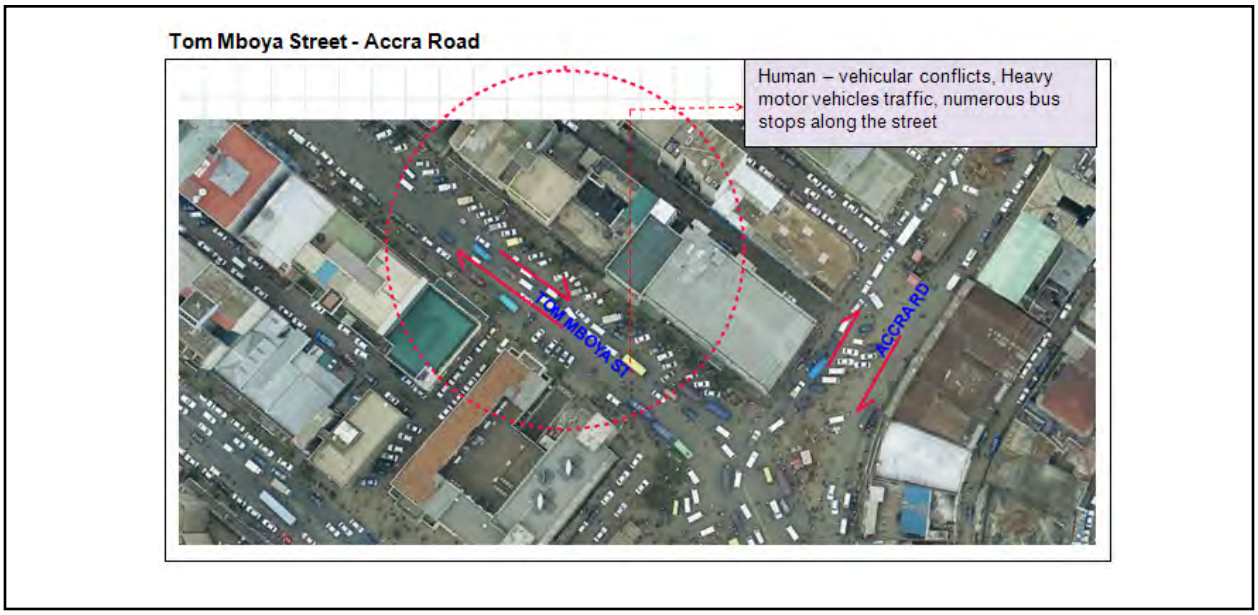

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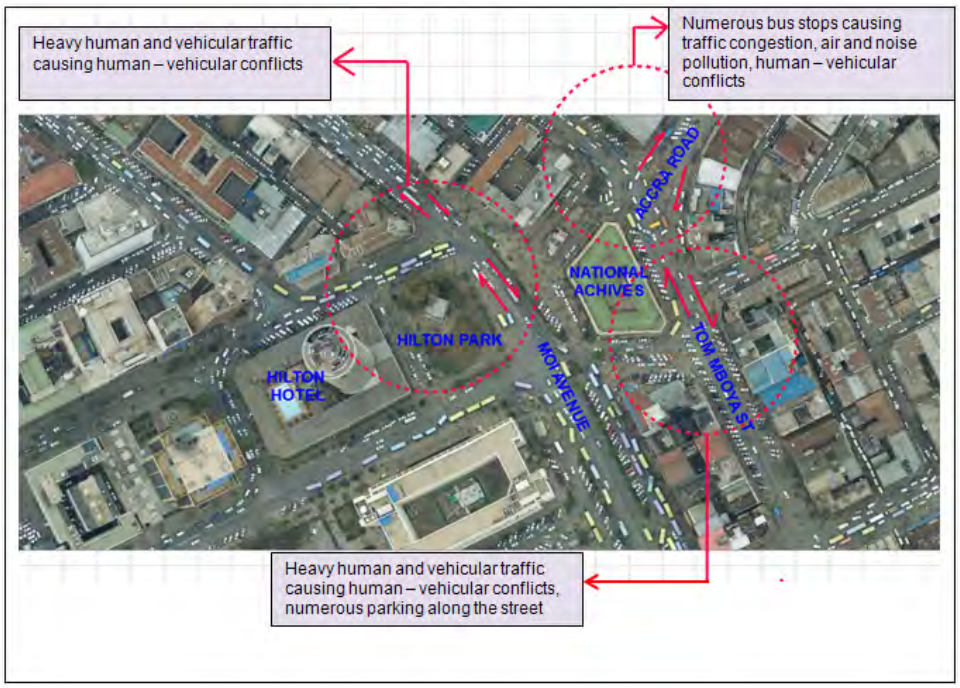

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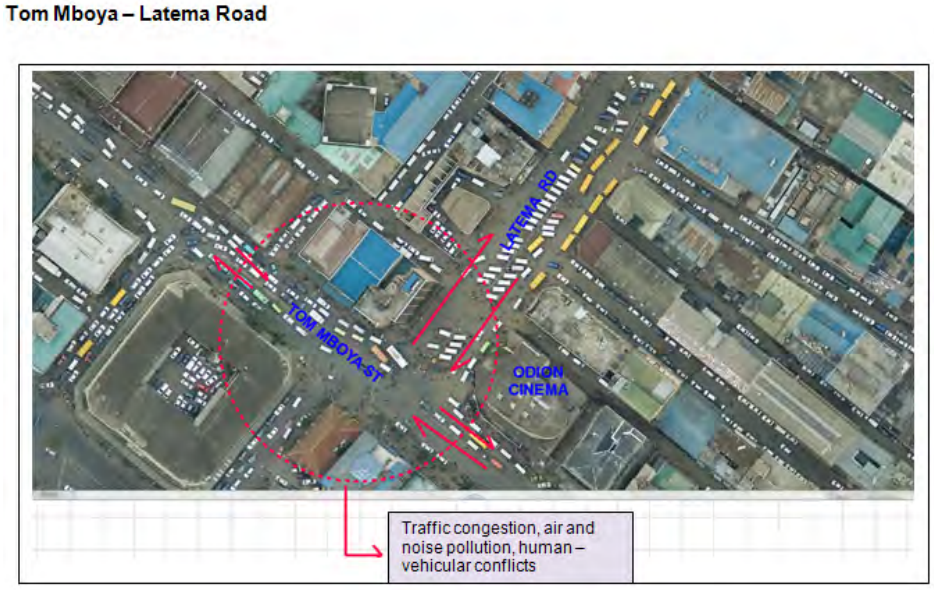
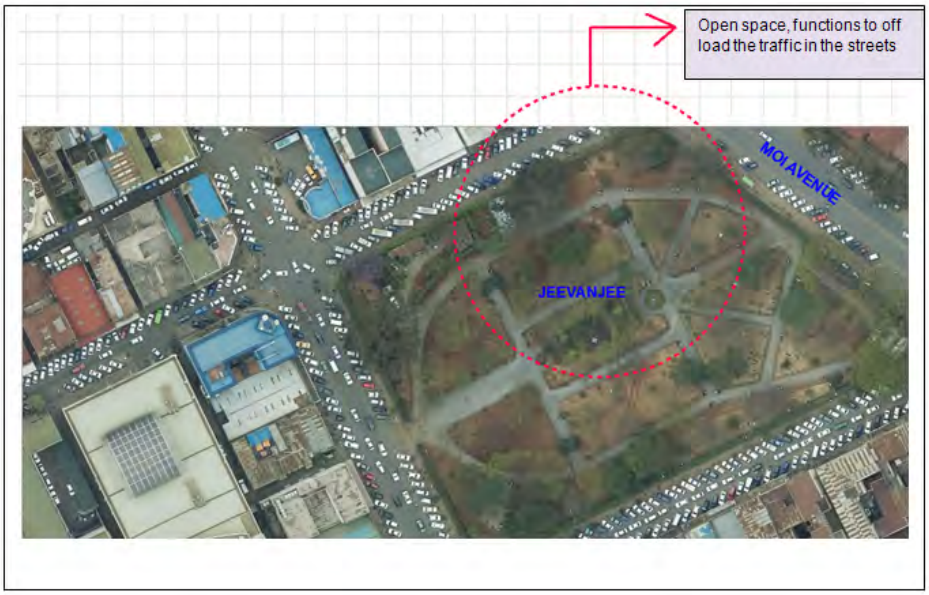
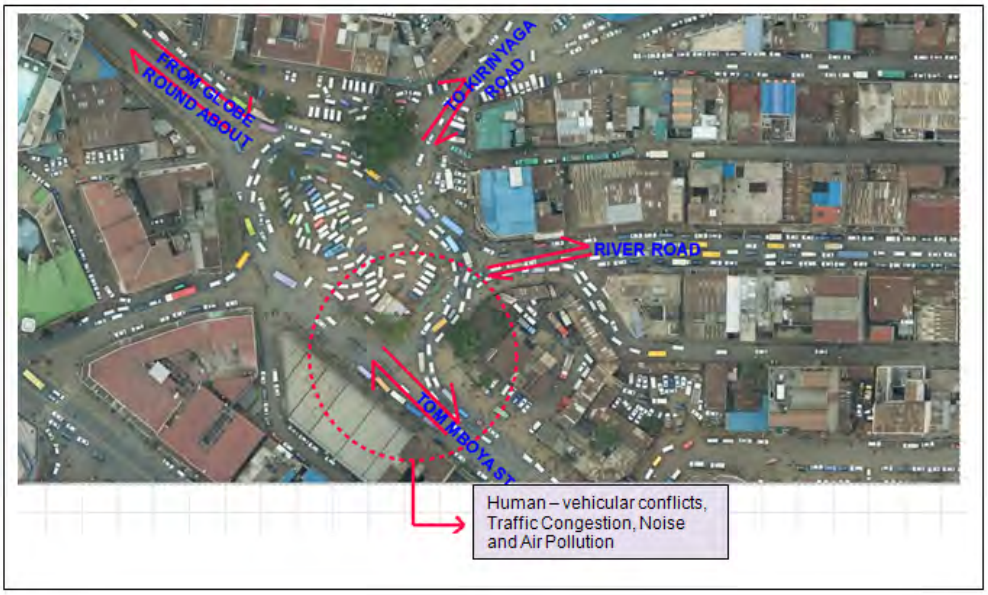


Source; Google Earth,2009

Jeevanjee Gardens



Fire Station Roundabout



Source; Google Earth (2009)

Conclusion

Through the development of this study it was possible to verify the role of greenway networks for a healthy and sustainable city in enhancing livable cities, meeting the challenge in the urbanizing world. The study shows that the Nairobi Central Business District will have a combination of mobility, land use, healthy, safety and sociability. These would evolve as a whole and not as independent entities creating a circulation network as an experience rather than a though fare connecting one point to another.

The integrated planning of greenway networks will have added advantage associated with sustainability and continuity so as to enhance a livable city.

In a sense it will: -

- Enhance the concept of place making and the users with own the city and grow with it.
- Have safe and healthy networks that will enhance their mental and physical wellbeing,
- Be able to carry out their daily activities with ease and satisfaction
- Enable generation of social dynamics that are able to contribute to the continuity of culture, spiritual and behavioral patterns.

Greenways will also promote the climate condition at both macro and micro level in the Central Business District.

Reference

city data. (n.d.). Retrieved January 15, 2011, from http://www.city-dara.com

Coopers, M. (1998). *People Places - Design Guidelines for Urban Open Spacces*. Newyork: John willy & Sons .

Council, P. f. (2008). *A Guide to Neighborhood Placemaking in Chicago*. Chicago.

IBI. (2009). *Streetscape Case Studies - Broadway Streetscape Improvement Project*. Urban Land, Facilities, Transportation and Systems. , United States.

Mitullah. (2003). Urban Slums Report: The case of Nairobi, Kenya.

Wikipedia. (2011). *Nairobi city*. Retrieved January 15, 2011, from http://www.wikipedianairobicity.com

Bibliography

Ahern, J., 1995. Greenways as a planning strategy. *In:* Fabos, J. and Ahern, J. eds.*Greenways: the beginning of an international movement*. Elsevier ,Amsterdam, 131-155.

Ahern, J., 1999. Spatial concepts, planning strategies and future scenarios: a framework method for integrating landscape ecology and landscape planning.*In:* Klopatek, J.M. and Gardner, R.H. eds. *Landscape ecological analysis: issues and applications*.Springer, New York, 175-201.

Ahern, J. 2004 – Greenways in the USA: theory, trends and prospects. In Jongman, R.; Pungetti, G. (Editors) 2004 –Ecological Networks and Greenways – Concept, Design, Implementation. Cambridge University Press. Cambridge

Bechtel, Robert B., Robert W. Marans, and William Michelson, eds.1987. *Methods in environmental and behavioral research*. New York: van Nostrand Reinhold.

Becker, Franklin D. 1974. Design for living: *The residents' view of multifamily housing*. Ithaka, NY: Center for Urban Development and Research, Cornell University.

Cooper, Clare C. 1975. Easter Hill Village*: Some social implications of designs*. New York: Free Press.

Davudi, Simin (2005) Understanding Territorial Cohesion; in Planning Practice and Research; Regional Studies Association, Vol. 20, no., 4 London: Routlege

Faludi, Andreas; From European spatial development to territorial cohesion policy, Regional Studies, Vol. 40, no., 6, London: Routlege

Hersperger, A.M., 1994. Landscape ecology and its potential application to planning. *Journal of Planning Literature,* 9 (1), 14-29.

Hole, Vere. 1966. *Children`s play on housing estates*. National Building Studies research paper n. 39. London: Her Majesty`s Stationery Office

MfE (Ministry for the Environment) 2003 – Urban Sustainability in New Zealand: An Information Resource for Urban Practitioners. MfE, Wellington.

Nairobi city council, 1971, Nairobi- a city without master plan, government press, Nairobi.

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