

1. Background to Nairobi City

1-1. Location

Nairobi is the capital city of Kenya, in East Africa. The city is located 1 ° 16'South and, 36 ° 48' East, 140 kilometers (87 miles) south of the Equator. The city is at altitude 1,680 meters (5,512 feet) above sea level. It has an area of 689 sq km (266 sq mi). Map 1-1 show the position of Nairobi and Kenya in the regional context.



1-2. Climatic Conditions

Nairobi enjoys a warm tropical highland climate. The average daily temperatures range from 29° C in the dry season to 24° C during the rest of the year. The mean annual temperature is 17° C and mean daily maximum and minimum are 23° C and 12° C respectively. The average annual rainfall is 875mm, with variation range 500-1500mm.

1-3. Population Growth

1-3.1 Past Trends

Like many other cities in developing countries, Nairobi has experienced very rapid population growth in the last 30-40 years. Table 1-1 illustrates this trend in population growth. At a population growth rate of 4.7-4.8% annually, the population of Nairobi grew from about 0.8 million in 1979, to 2.1 million in 1999 and 3.1 million in 2009. This is indeed a very high rate of population growth rate compared to an average of 3.4% annually for cities in developing countries and 1.8% for the world urban growth rate.

The city has a population density of 3,080 persons per sq. km compared to 50 persons per sq. km. countrywide.

Table 1-3: Population Trends for Kenya and Nairobi

Year	1969	1979	1989	1999	2009
Kenya	10, 942, 705	15, 327, 061	21, 445, 636	28, 686, 607	38, 610, 097
Nairobi	509, 286	827, 775	1, 324, 570	2, 143, 254	3, 138, 369

Source: various population census reports, 1969, 1979, 1989, 1999, 2009

1-3.2 Population Projection

The population projection for the Nairobi city is given in Table 1-2. The city population is projected to hit 5 million people in 2020 and 6 million people in 2025.

Table 1-2: Nairobi City Population Projection

Year	2000	2010	2020	2025
Population Size	2, 233, 000	3, 363, 000	4, 881, 000	5, 871, 000

Source: www.unhabitat.org

1-4. Housing and Demographic Characteristics

Over 50-60% city population live in low income and informal settlements. The monthly household income among Nairobi's urban poor ranges from US\$ 65 to US\$ 78 with a disposable income of \$4 to \$17 (Cities Alliance, 2002). The level of income is indeed low considering the per capita poverty line of 1 US\$ per day.

2. Transportation Condition

2-1. Overview

What is the transport condition in Nairobi? Some of the major transport problems and challenges in the city include –

- inadequate integration of city development planning
- poor integration of the transportation network system,
- inadequate public transport system to meet the rising travel demand,
- long commuter distance and travel time,
- high cost of transport compared to low level of income,
- inadequate development of non-motorised infrastructure network,
- poor safety and high incidence of motor traffic accidents,
- increased pollution and deterioration of the urban environment.

2-2. Inadequate Integration of City Development Planning

The city of Nairobi has not received adequate attention in respect to having a long term plan or master plan. The last master plan for Nairobi was prepared in 1948. Considering the massive growth in the population and spatial size of the city, the development of the city has not been effectively planned and integrated.

In 1973, the city council prepared a city study report. This study report was partially adopted but never led to effective planned development. This means that the city transport system has not been well planned and integrated into the overall city growth and development structure.

Efforts to prepare updated long term plans and/or master plan for the city has not borne fruit. At the moment the city council has made attempts to prepare short term plans for only certain pocket areas of the city.

The result is that today the city development and growth is not integrated with the city transport system. The city experiences transport challenges in respect to poor network, inadequate car parking, congestion, high cost of transport, pollution etc.

2-3. Inadequate Public Transport Service

The city population in 2011 is estimated at 3 million people. At a travel demand rate of 2.5 trips/person/day (King'ori, 2007), the total travel demand in Nairobi is 7.5 million trips/person/day.

A look at the transport modal split shows that majority of the trips in the city are on foot – Table 2-1. This is because public transport service is expensive and inadequate to meet the demand.

Table 2-1: Transport All Purpose Modal Split in Nairobi

Transport Mode	Walking	Cycling	Private Car	Matatu/ Mini-bus	Bus	Train	Institution bus	others
Modal Split (%)	47	1.2	15.3	29	3.7	0.4	3.2	0.2

Source: King'ori, 2007

The main public transport service in Nairobi is by mini-bus (matatu) and other private bus operators. The capacity of commuter train service is low and limited to only a few areas. The public transport system is totally inadequate to meet the rising demand. This is evident from the common heavy congestion and long delays in the public transport system.

2-4. Long Commuter Distance and Travel Time

The city of Nairobi has experienced rapid urban sprawl. In 1970, the average commuter distance was 0.8km and this increased to 25 km in 1998. The present commuter distance is over 30-40 km.

The long commuter distances and heavy traffic congestion on the road has led to long travel time. It takes about 2 hours to cover 30 – 40 km commuting distance. In the 5 – 10 km central area, travel time is about 1 -2 hours long because of the heavy traffic congestion.

2-5. High Cost of Transport

The cost of transport in the city is very high compared to the average per capita income. In the 0 – 10 km, 10 – 20 km central area, the average bus fare is Ksh 50 and Ksh 100 respectively, at peak hour. This cost of public transport is indeed very high considering that the minimum employee wage is Ksh. 7, 334 (GOK, 2011) per month – about Ksh. 200 – 300 per day.

The story is not any better for the motorists. The cost of motor vehicle fuel in Nairobi is quite high at Ksh. 116 per litre of petrol (Kenya National Bureau of Statistics, 2011).

2-6. Inadequate Infrastructure for Non-Motorized Transport

A large portion of the city population walks to work, to school and other destinations covering distances of about 7–15 km (CCN, 2007). This is because of low income earnings compared to the high cost of transport. Cycling is attractive but only a few people cycle to work or school. This is due to high incidence of road accidents affecting cyclists.

Unfortunately, infrastructure for pedestrians and cyclists is not well developed. There is little provision for footpaths, footbridges, zebra crossings, and cycle tracks. Even where provided, the same are poorly designed, poorly maintained, and are not secure.

2-7. Traffic Accidents and Poor Safety Record

Kenya and Nairobi have a poor road accidents and safety record in the region. Kenya has a high cost of accidents at 5% of the Gross National Product (GNP).

In 2003 it was estimated that 3,000 people were killed annually on Kenyan roads. Pedestrians and passengers were most vulnerable accounting for 80% of the deaths. Currently the rate of death crashes is at 2000 for every 10,000. The pedestrians and children are worst hit.

2-8. Increasing Motor Vehicle Population

Kenya and Nairobi are registering rapid growth in motor vehicle population and ownership. The country had about 600, 000 No. vehicle units in 2000, 950,000 in 2008 but this has risen to about 1.2 million in 2010/11. Nairobi is estimated to accommodate 30% of the national total vehicle population - Table 2-2.

A large private car ownership compared to smaller public transport traffic is not good for the city. The high use of the car is not an efficient and effective way to meeting the city traffic demand. Indeed high use of the car leads to heavy traffic congestion, high cost of transport, air pollution etc.

Table 2-2 Private Car Population Projection for Nairobi

Year	2004	2010	2015	2025
Number of private cars	207,339	327,366	486,207	716,138

Source :(Adopted) Study on Master Plan for Urban Transport in the Nairobi Metropolitan Area, 2006

2-9. Inadequate Integrated Transportation Network System

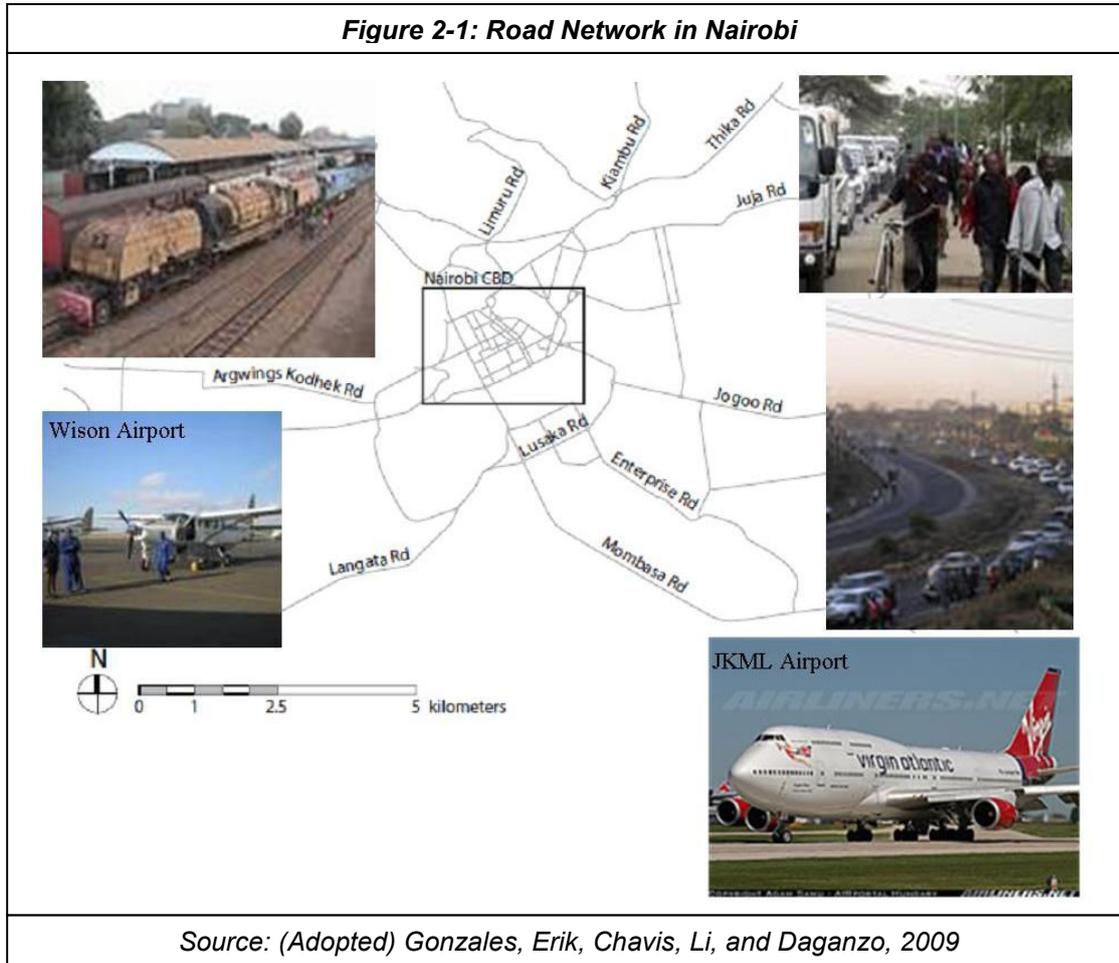
Nairobi is served by road, railway and air transport system – Figure 2-1. The city has a dense local road network and 3 No. main national/regional highways – Mombasa (A1), Nakuru/Uganda (A1), and Thika road (A2)

The city is also served by the railway. The local commuter train service has low capacity and limited to only two routes – Dagoretti and Ruiru. There are 3 No. regional/national lines serving Mombasa, Kisumu/Uganda and Nanyuki – Figure 2-2.

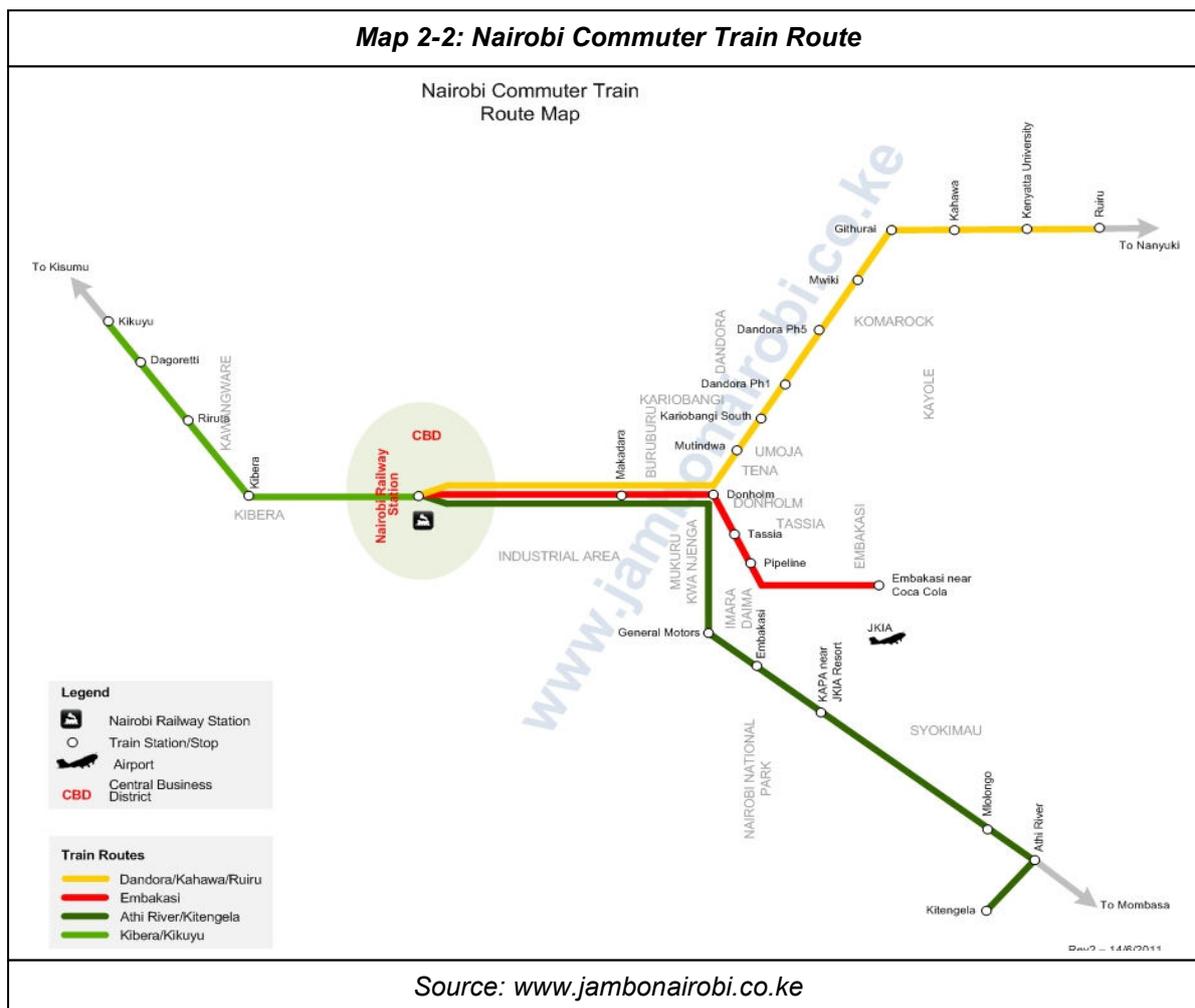
The city is served by 2 No. airports – Jomo Kenyatta International airport and Wilson airport.

The 3 No. transport systems are however not well integrated. The intermodal interchange system is not well developed.

Figure 2-1: Road Network in Nairobi



Source: (Adopted) Gonzales, Erik, Chavis, Li, and Daganzo, 2009



2-10. Pollution and Environmental Degradation

The city of Nairobi is affected by high level of air pollution and environmental degradation caused by the poor transport system. Available statistics show that air pollution in Nairobi is high with mean daytime concentrations of fine particles ranging from $10.7\mu\text{g}/\text{m}^3$ at the rural edge of the city to $98.1\mu\text{g}/\text{m}^3$ on a sidewalk in the CBD. This implies that there are very high levels of suspended particulate matter within the inhalable range.

Air quality studies indicates that there is a strong correlation between fine particulates and motor vehicles ($r = 0.93$), indicating that vehicular exhaust is the main source of fine particles in the air (Odhiambo, Kinyua, Gatebe, Awange 2010) This has led to the deterioration of the quality of urban health and environment. Indeed, most of the leading disease complaints in Nairobi relate to vehicle exhaust fumes.

3. Improving Transportation Network

3-1. Overview

How can the transport network in Nairobi be improved to support sustainable city development and growth? Broad policy framework include-

- better planning and development of infrastructure to help reduce unnecessary commuter reliance on private vehicle use
- Providing residents with efficient, viable alternatives through public transport and non-motorized transport facilities
- Lowering vehicle emissions through the promotion of cleaner fuels coupled with cleaner technology,
- Promote policies and incentives to move people out of cars and onto mass transit.

3-2. Integrated City Development Plan

The foundation to sustained growth and development is the preparation and implementation of integrated long term development plan for Nairobi. The development plan will ensure that all city growth and development activities including the transportation system are all integrated. The development plan will ensure that the various modes of transport are integrated and complement one another. The development plan will check and control unsustainable urban sprawl.

In this regard present government efforts to prepare the Nairobi metropolitan spatial plan deserve support (Kenya Vision 2030, Nairobi Metro 2030)

3-3. Integrated Transportation System

It is important that all modes of transport in the city are integrated and complement one another. The city council of Nairobi should prepare and implement a transportation master plan that integrates road, railway and air transport system.

Currently, there are planned massive road, railway and airport expansion projects in Nairobi. It is important that the same are part of a well integrated transport master plan and part of integrated city development plan. It is unfortunate that the current transport infrastructure works are neither derived from a development transport master plan nor based on long term master plan for the city.

3-4. Improved Non-Motorized Transport (NMT) Infrastructure

The city is advised to develop a comprehensive infrastructure network for non-motorized transport – footpaths, footbridges, zebra crossings, and cycle tracks etc. indeed, NMT infrastructure must be incorporated as part and parcel of any city transport system.

This will considerably reduce motor traffic volume and reduce the overall cost of transport in the city. The same will lead to improved traffic safety, and reduced air pollution, and enhanced and the health of the urban environment.

3-5. Road Safety

A nationwide and city wide program and policy campaign needs to be developed to urgently address the high death toll on city roads. The number of accidents and deaths on the roads must be brought down. This calls for city wide public education campaign on improved road safety measures. The traffic police and the city council need to firmly enforce the traffic code on road safety. Traffic offences on over speeding, overloading, and un-roadworthy vehicles must be severely punished.

3-6. Better Public Transport System

The public transport system in the city is totally inadequate to meet the demands of a major city like Nairobi. The public transport system must be planned and managed well as an essential public service.

The national and city governments must move in and regulate the public transport service. At the moment, public transport system has been left to free market forces and not well planned or regulated. This has led to a chaotic public transport system. A good public transport system should have regulated route and time schedule. The city and national government must also provide subsidy to the city public transport system in order to guarantee a sustainable public transport system.

4. Conclusion

The city of Nairobi is experiencing massive city growth and development. The same is not accompanied by effective transportation system. This has led to very poor quality of transport service in the city.

The preparation of a comprehensive and integrated development plan will assist the city tackle the transport problem. The city also needs to develop a comprehensive transport master plan.

A number of policy measures have been proposed. The time to act is now.

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