

THE PROBLEM OF PEDESTRIAN
MOVEMENTS IN THE CENTRAL
AREA OF NAIROBI /

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A B S T R A C T

Planning for safety of pedestrians and pedestrian facilities has been a longstanding problem in some countries. Urban traffic congestion is not peculiar to any particular geographical location or historical period for it appears in a variety of forms and its universality suggests underlying aspects that are only partially related to modes of transportation. The main causes of urban traffic congestion appear to be overcrowding of population and economic activity into small areas of land with land uses that have maximised transport requirements. The great bulk and density of urban buildings plus the concentration of employment in the central areas of many cities have created a volume of people and goods movement that has become increasingly difficult to accommodate effectively.

On average, pedestrian transport accounts for 15 to 35 per cent of urban travel in developed countries and from 30 to as high 70 per cent in cities of developing countries. Despite this fact, an examination of urban transport development during the past few years reveal that little attention has been given to pedestrian mode of travel and other non-motorised forms of transport be it in the transport planning process or in reality itself.

Walking trips for all purposes in Nairobi dominates all the other modes of travel such as public and private transport and cycling. Thus, this simple act of walking plays an integral part in the transport system of any centre and yet little is known, especially in the developing countries,

about the movements of pedestrians and the problem they encounter with, in terms of safety and inconvenience, in their daily trips. We are all aware of the conflict between the pedestrian and the automobiles, but most of our studies on this conflict has tended to concentrate more on the automobiles rather than the pedestrians or both.

This thesis attempts to examine the problem of pedestrian movements of Nairobi. This is done without the use of detailed quantitative analysis, but rather by the use of descriptive method which concentrates on exposing the major problems so as to come up with viable and implementable solution to the problem.

Within the study, efforts have been made to illustrate, as an action plan, how the problem of pedestrian movements can be solved in certain areas in the Central Area of Nairobi. Finally an attempt is made to set out a policy for pedestrian movements in the Central Area of Nairobi.

The problem of pedestrian movements in the Central Area of Nairobi clearly shows that the pedestrian mode of travel has not been fully incorporated into the transportation planning process used by the planners and other authorities in Nairobi City Council. As such it appears evident that rather major alterations and modification of the present planning methodology and techniques are necessary to deal with the pedestrian mode of travel which claims the biggest percentage over the other modes of transport such as private and public transport and cycling in Nairobi.

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INTRODUCTION

The simple act of walking plays an intergral part in the transport system of any centre, be it in the rural or urban areas, and yet little is known, especially in the developing countries, about the movements of pedestrians and the problems they encounter, in terms of safety, comfort and convenience, in their daily trips.

We are aware of the conflict between the pedestrian and the motor vehicles, but most of our studies, unfortunately, on this conflict has been biased and have thus concentrated on vehicles rather than the pedestrians. Thus a great deal of our time and research has been spent and done in coming into grips with vehicles, without considering what this means from the point of view of the pedestrian.

It therefore appears that the human problems of safety, comfort and convenience that the pedestrians face in their daily movements in cities are given secondary importance to the convenience of the motor vehicles.

1.1 - STATEMENT OF THE PROBLEM

Walking trips for all purposes, according to the findings of the Nairobi Urban Study Group, 1970, emerges as the predominant mode of travel over all the other modes of transport. Figure 1 shows the distribution of total daily trips by different modes, to all purposes in Nairobi in 1970.

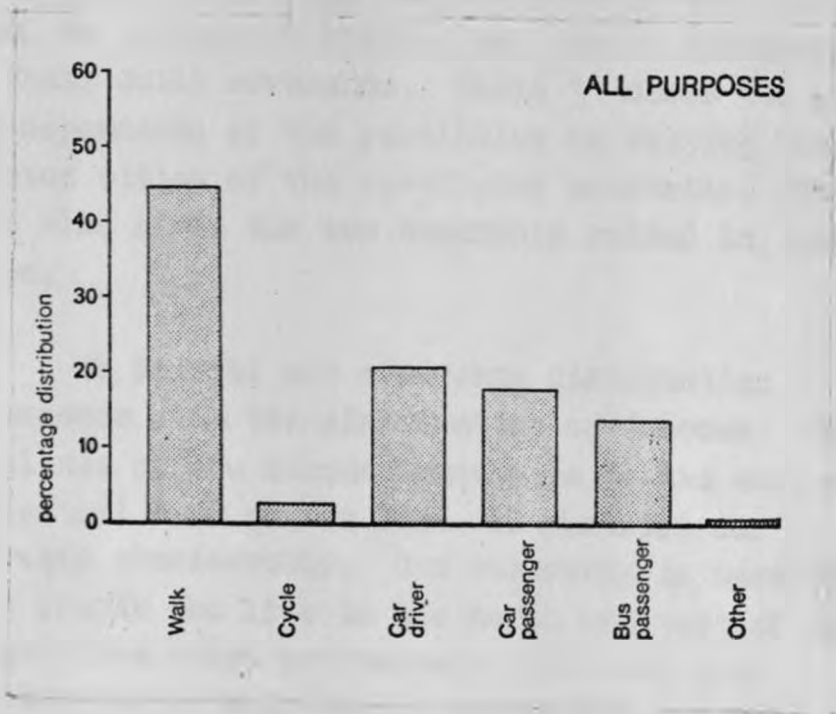


FIGURE 1 Nairobi:1970 trip distribution by mode

source: NUSG

The case of Nairobi is not unique, for it is also common with most of the other developing countries. In developing countries there are evident car ownership disparities and as such only the very affluent section of the population can afford to own and operate a car. The largest part of the population depend on walking, bicycling and public transport for all their daily movements. Table 1 shows the very high dependence of the population on walking in selected cities of the developing countries. The table also gives the car ownership ratios in these cities.

In Nairobi car ownership distribution corresponds with the distribution of incomes. The prevalence of low income households to the east of the Central Area can be seen to restrict car ownership considerably. Car ownership is more common among people who live to the north and west of the Central Area which corresponds both with the distribution of high income population and with private transport trip distribution. There are however, a number of areas which are comprised largely of higher income residential development appear to have relatively low car ownership rates. The reason for this anomaly is that in addition to the high income households there exist an equal number of low income domestic and ancillary employees in these areas who lower the rate of car ownership. Map 1 shows the 1970 car ownership distribution in Nairobi while Table 2 shows car ownership probabilities.

TABLE 1

Walking and motorized transport
in selected cities: 1968.- 1972

CITIES (STUDIES 1968-1972)	MODAL SPLIT				CAR OWNERSHIP (AUTO/1000 P.O.)	
	Walking (%)	Public Transport (%) (1)	Private Transport (%)	Total (%)	Urban	Nation.
DAR-ES-SALAAM, TANZANIA	67	N.A.	N.A.	100	33	7
KINSHASA, ZAIRE	63	N.A.	N.A.	100	N.A.	3
TAIPEI, TAIWAN	48	38	14	100	10	N.A.
NAIROBI, KENYA	46	17	37	100	53	12
SINGAPORE (2)	39(3)	24	37	100	68	68
LAUSANNE, SWITZERLAND(1970)	35	17	48	100	230	220
SEOUL, KOREA	27	67	6	100	22	4
BOGOTA, COLOMBIA (1969)						
SPLIT BY INCOME GROUPS						
- LOW INCOME	55	40	5	100		
- MEDIUM INCOME	5	70	25	100	22	13
- HIGH INCOME	-	10	90	100		

Sources : Owen n; AUTOMOBILE AND CITIES

- STRATEGIES FOR DEVELOPING COURTLINES.

BOVY, h; LE PLAN DE TRANSPORT DE LA REGION LAUSANNOISE.

Notes: (1) Includes private automobile, motorized two-wheel, and taxi trips.

(2) Modal split for work and school trips only.

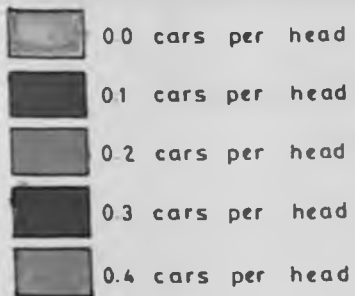
(3) Walk and bicycle trips.



MAP - 1

Car ownership distribution 1970

— Traffic district boundary



SOURCE: NUSG 1970

T A B L E 2

CAR OWNERSHIP PROBABILITIES
N A I R O B I

Income Category	Average Reported Household income £ p.a.	Probability of Household owning "n" cars			
		0	1	2	3
1	48	0.972	0.020	0.008	-
2	151	0.981	0.017	0.002	-
3	251	0.964	0.036	-	-
4	451	0.855	0.131	0.010	0.004
5	751	0.743	0.234	0.019	0.004
6	1051	0.451	0.458	0.087	0.004
7	1801	0.263	0.582	0.137	0.018
8	3001	0.096	0.575	0.298	0.031
9	4000	0.083	0.419	0.393	0.105

Source: NUSG. Nairobi Metropolitan
Growth Strategy: 1972

The latter case was done by the Nairobi Urban Study Group, from Home Interview where it was possible to relate car ownership and household income, irrespective of area of residence, and so as to establish the probabilities of a household owning 0, 1 or 2 or more cars according to income*.

Walking as a mode of travel dominates the other modes of transportation in Nairobi due to other factors apart from car ownership disparities. The alarming world inflation has caused further difficulties among the majority of the population in Nairobi. For instance, the public transport of which some of Nairobi residents have had to rely on because of its relatively low fares was hit by inflation and had to increase their fares in February 1976 and March. According to a report**, the average fare per passenger has gone from 40 cents in July 1975 to 75 cents in 1976, a rise of 87.5%. During the same period passenger per bus per day dropped from around 1,000 to 750. Overall passenger carried have thus declined and adjusting for the rise in population, this was a 28% drop (1976).

The drop in the use of public transport in the city (which is officially monopolized by the Kenya Bus Services Limited) can be assumed to be applicable to the "matatus", since the latter's fares are the same with those of Kenya Bus Services Limited.

* Nairobi Metropolitan Growth Strategy
Volume Two : Appendix Four : Transportation

** Transportation Management Services Ltd: Nairobi
Passenger Transport Study : Projection of
Development - Kenya Bus Service Limited
1975 - 1985 : 10th April, 1976

"Matatus" are the smaller passenger carrying vehicle up to 3 tons unladen weight which are allowed to operate without Licenses under the Transport Licensing Act, from which they have been exempted by Presidential Decree of June 1973.

The major declines in the use of buses and "matatus" occurred immediately following fare rises and this indicates great elasticity of demand dependent upon changes in price.

This leaves walking and cycling as the other cheaper modes of travel. But cycling is not a much favoured mode of travel among the residents of Nairobi (see Figure 1). Since there are no defined and protected cycle tracks in the Central Area of Nairobi, few people are willing to take the risk of intermingling with the motor vehicles and therefore cycling in the Central Area, at present, can be hazardous. Thus with the use of bicycle eliminated, walking, as a mode of travel in Nairobi, has undoubtedly become predominant above all the other modes of transport.

1.2 - SIGNIFICANCE OF THE PROBLEM

The population of Nairobi is increasing at an alarming rate and as it can be noted from Table 3, the highest projections indicates that by 1985, Nairobi's population will be in the region of 1,591,000 while the lowest projections give a figure of 1,396,000 for the same year. The present population is approximately 750,000.

TABLE 3

Nairobi Population Projections

	1	2	3	4 '000
YEAR	M M G S	M C C	M P & P	M P & P
	1973	1975	1974	1974
1975	763	784	777	780
1976	814	845	854	838
1977	868	908	895	900
1978	927	969	959	966
1979	989	1,030	1,030	1,037
1980	1,048	1,107	1,098	1,115
1981	1,112	1,188	1,172	1,198
1982	1,179	1,266	1,251	1,286
1983	1,251	1,346	1,334	1,382
1984	1,326	1,426	1,424	1,454
1985	1,396	1,517	1,506	1,591

SOURCES:

1. - Nairobi Metropolitan Growth Strategy 1973 Table 1:13 1973
2. - Nairobi City Council Planning Section 1975
3. - Ministry of Finance & Planning - EPL/SC 417/01 30/10/74
(low) 1974
4. - " " " " EPL/SC 417/01 30/10/74
(high) 1974

In 1969*, Nairobi and Mombasa together accounted for 70 per cent of Africans, 89 per cent of Asians and 86 per cent of Europeans in Urban Wage Employment in the formal sector. Earnings in Nairobi and Mombasa accounted for 85 per cent of the total ~~of~~ the total urban wage bill, 60 per cent of the wage paid in the formal sector throughout the country and probably a third of all personal incomes in Kenya. Given this disproportionate position of Nairobi (and Mombasa) in the whole field of jobs and incomes, it is only natural that many people should migrate to Nairobi, mostly to be absorbed into informal employment (enterprises and individuals that operate economic activities largely outside the system of government benefits and regulations) or left unemployed.

As stated by the Nairobi Urban Study Group (1970), those without work will generally be at the bottom of the income scale. But even among those actually working, there will be many with very low incomes. While it is true that many of the inhabitants of Nairobi will become prosperous, it is equally likely that the overall income distribution will not shift markedly toward greater equality in the foreseeable future. This is because of the steady influx of people from the countryside whose income will be no more than one tenth of the average of that of the urban population.

* I.L.O. : Employment, Incomes and Inequality

Kenya 1972 pp. 51 - 64

It, therefore, can be assumed that future population increases (as far as employment and incomes are concerned) will mainly fall in the low income groups. Since people in the low incomes cannot afford to own private cars and neither can they cope steadily with the ever increasing public transport fares, most of them will undoubtedly be compelled to walk to work or for other essential purposes.

Although any alarming increase in car ownership in the city is highly doubted, it is nevertheless obvious that should the employment potential of 190,000 jobs in the Central Area materialized by 2000 A.D., there is bound to be car parking problems as such alternative measures to deal with the vehicular and pedestrian traffic will be necessary.

The intense concentration of activities in relation to the available modes of travel is such that almost everybody arriving in the Central Area of Nairobi (and while in there) have to walk some part of their journey. The degree of freedom that can be provided for the pedestrians in the Central Area is therefore of paramount importance, and is likely to have an important effect on the proper functioning of the area and on the quality of environment that can be provided. The Central Area of Nairobi ought to be primarily an area where people move about on foot. It is therefore essential that these pedestrian trips be made safely, easily and conveniently.

A report* that described an analysis of the road accidents in Kenya in 1972 shows that although the greatest number of accidents and casualties occurred in Nairobi Province, the accident rate per million vehicle kilometres travelled was lowest in the Province.

* G.D. Jacobs and I.A. Sayer - "An analysis Road Accidents in Kenya in 1972: Transport and Road Research Laboratories (TRRL) "

The report used information on some 5443 road accidents involving injury to 8637 persons. A startling fact is that about 40 per cent of all accidents analysed involved a pedestrian.

Table 4 shows the incidence of road casualties by class of road user in Kenya in 1972.

TABLE 4

The incidence of road casualties by class of road user in Kenya in 1972

Class of road user	Casualties	
	NO.	%
Pedestrian	2262	26.2
Car driver	1266	14.7
Car passenger	2033	23.6
Motor cyclist & passenger	388	4.5
Cyclist	665	7.7
Occupants of P.S.V's	444	5.2
Occupants of commercial vehicles	1417	16.5
Others	162	1.9
	<u>8637</u>	<u>100.00</u>

Source : G.D. Jacobs and I.A. Sayer
TRRL - Overseas Unit 1976

TABLE 5

Casualties by Class of Road User (%)
in Kenya : 1972

	FATAL	SERIOUS	SLIGHT	TOTAL
PEDESTRIAN	45.0	28.7	20.4	26.2
CAR OCCUPANT	22.4	39.2	41.4	38.2
MOTOR CYCLIST	2.4	4.6	5.3	4.5
CYCLIST	9.4	6.2	8.4	7.7
P.S.V. OCCUPANT	5.8	4.1	4.8	5.2
COMMERCIAL VEH. OCCUPANTS	12.3	15.7	17.9	16.5
OTHERS	2.8	2.2	1.2	1.9
TOTAL	100	100	100	100

Source : Same as for TABLE 4

The above statistics (TABLE 5) show that although the car occupant class of road user had the highest overall percentage in casualties, the pedestrians did however have the highest fatal casualties.

TABLE 6

Accident types in Kenya : 1972

TYPE OF INJURY ACCIDENT	NO.	%
SINGLE VEHICLE	1490	27.4
VEHICLE - VEHICLE	989	18.2
VEHICLE - MOTORCYCLE	195	3.5
VEHICLE - CYCLE	631	11.6
VEHICLE - PEDESTRIAN	2133	39.2
UNKNOWN	5	0.1
TOTAL	5443	100

Source : Same as for TABLE 4

TABLE 7

Accidents types in Urban and Rural
Areas : Kenya : 1972

TYPE OF INJURY ACCIDENT	URBAN %	RURAL %
SINGLE VEHICLE	24.8	74.9
VEHICLE - VEHICLE	48.4	51.6
VEHICLE - MOTORCYCLE	84.2	15.4
VEHICLE - CYCLE	65.2	34.8
VEHICLE - PEDESTRIAN	65.3	34.7
TOTAL	51.7	48.3

Source : Same as for TABLE 4

The above two tables (6 and 7) do indicate that of the types of injury accidents that occurred in Kenya, the accidents involving vehicle and pedestrian topped the accident list. The tables further show that most pedestrian accidents occur in urban areas. This is so mainly because of the presence of large number of vehicles in the Urban areas.

TABLE 8

Types of accidents by severity (%)
Kenya : 1972

TYPE OF ACCIDENT	FATAL	SERIOUS	SLIGHT	TOTAL
SINGLE - VEHICLE	18.5	30.8	49.7	100
VEHICLE - VEHICLE	12.4	26.0	61.6	100
VEHICLE - MOTORCYCLE	8.6	23.7	67.7	100
VEHICLE - CYCLE	17.7	25.0	57.3	100
VEHICLE - PEDESTRIAN	24.8	31.4	48.8	100
TOTAL	19.4	29.3	51.3	100

Source : Same as for TABLE 4

During the first nine months of 1976 road accidents in Kenya claimed 1,298 lives. According to a report*, there were nearly a quarter million accidents throughout Kenya in 1976 and this was 268 cases more than in 1975. Out of the total number of traffic accidents in Kenya in 1976, 2690 people were seriously injured, while 4,604 received slight injuries. Compared with 1975, there were 5,141 fatal accidents in which 1,029 people died and 2,325 were seriously injured and 4,004 slightly injured.

Table 10, below, shows the incidence of road casualties (recorded) by class of road user in Kenya in the first nine months of 1976. The pedestrian casualties still emerges on top after the driver casualties.

TABLE 9

The incidence of road casualties by class of road user in Kenya in 1976

CLASS OF ROAD USER	CASUALTIES	
	NO.	%
DRIVERS	2164	53.5
PEDESTRIANS	1269	31.4
CYCLISTS	231	5.7
PASSENGERS	221	5.5
MOTOR CYCLISTS	156	3.9

Source : Traffic Police H.
Nairobi : 1976

* Traffic Police Headquarters : Nairobi : 1976

The police report further attributed 269 accidents to overspeeding, 321 to improper overtaking, 295 to losing control, 89 to turning right carelessly, 87 to swerving and 94 to not complying with road regulations. On the part of pedestrian casualties, 846 accidents were caused by people who stepped off pavement, 98 by people walking and standing on the road, 87 due to crossing carelessly, and 59 crossing behind stationary vehicles.

In 1976, road accidents in Nairobi claimed 267 lives, 744 were seriously injured and 1831 received slight injuries. In 1975 there were 237 fatal accidents and 262 serious injuries in Nairobi. Table 11 gives statistics on the number of accidents that have occurred in Nairobi since 1971.

TABLE 10

Number of accidents in Nairobi since 1971

Y E A R	No. of accidents	No. of people killed
1971	2,359	233
1972	2,239	252
1973	2,165	282
1974	1,193	279
1975	1,749	237

Source : Traffic Police : Kenya Police
Nairobi : 1976

According to the Traffic Police Headquarters in Nairobi, about 70 per cent of all people killed in the accidents in Nairobi, were pedestrians and that most accidents occurred at roundabouts and zebra crossings. This indicates that many pedestrians are not careful when crossing roads and also that some drivers are, too, to blame for careless driving.

TABLE 11

	TRAMPARIAN	CYCLIST	MOTOR CYCLIST	CAR/ TAXI	P.S.V.	CAR- DRIVEN	OTHER	TOTAL
BOMBAY	70.4	7.6	0.9	←	21.1	→		100
DELHI	46.8	18.7	13.8	←	20.7	→		100
MUMBAI	42.0	17.2	13.4	15.3	1.2	6.9	2.3	100
NAIROBI	43.0	10.4	6.9	28.4	3.9	5.7	2.1	100
SURABAYA	19.2	4.6	49.2	5.2	-	4.5	17.3	100
BRITAIN	26.0	13.0	22.0	32.0	3.0	4.0	-	100

Source : Same as for TABLE 4

Table 11 shows a comparison of casualties by casualties by class of road user among various cities and towns in the developing countries and Britain. The statistics on Table 11 clearly indicates that the problem of pedestrian movements, in terms of safety, is not only prominent in Nairobi but in most cities of the world.

From the foregoing it has been evident from the statistics that of all the analysed accidents quite a big percentage (40%) of the accidents involved a pedestrian. Road accidents, as such are costly and if an appraisal is made in terms of assessing the estimate of the resource costs of medical treatment, funeral costs, damage to vehicles and other property, administration costs, gross losses of future output, and in addition, if a non-resource cost is added (which attempts to place a monetary value on suffering and bereavement)* it will be found that a country spends a substantial amount of its GDP on road accidents.

Table 12 gives the estimated accident costs as a percentage of GDP of various countries including Kenya.

The problem of pedestrian movements, especially in terms of safety, calls for an attack on the harmful side effect of the motor vehicles. Because of his vulnerability, the pedestrian needs to be protected against his other road users. As the conflict between pedestrians and vehicles continue to reach unproportional levels in the city and as the number of fatal and serious accidents also increases every year, this problem, therefore asks for specialised approach to the urban traffic problems so as to gain safety, comfort and convenience for pedestrian traffic. The problem of pedestrian movements in the Central Area of Nairobi does call for remedial measures and future planning and assessment in this context.

* G.E. Jacobs : "The need for road accident research in developing countries : TRRL 1976

	KENYA 1965	THAILAND		RHODESIA	SOUTH AFRICA	ISRAEL	GHANA	U. K.
		1963	1964					
ESTIMATED COST OF ACCIDENTS	£2.9m	£6.3m	£10.2m	£4m	£40m	£26m	£2.8m	£300m*
G D P	£300m	£1720m	£1900m	£310m	£3600m	£1710m	£780m	£12500m
TOTAL ACCIDENT COST ON % OF GDP	1.0	0.4	0.5	1.3	1.0	1.5	0.4	0.7

* Non-resource costs excluded

Source : G. D. Jacobs : TRILL : 1976

1.3. - OBJECTIVES OF STUDY

The overall objective of the study is to define and examine the problem of pedestrian movements in the Central Area of Nairobi without the use of detailed quantitative analysis, but rather by use of descriptive method which concentrate on exposing the major problems and to come to viable and implementable solution to the problem. Other objectives of the study are : -

- a) To identify the existing pedestrian facilities in the Central Area of Nairobi;
- b) To identify problem areas in the Central Area of Nairobi, in terms of pedestrian/vehicle conflict;
- c) To set out a policy for pedestrian movements in the Central Area of Nairobi;
- d) To identify the location of major land uses in the Central Area of Nairobi;
- e) To illustrate as an example at certain points, how to solve such problem as an action plan in certain areas.
- f) To recommend areas where further research, as regards the problem of pedestrian movements in the Central Area of Nairobi, is needed.

1.4 - STUDY ASSUMPTIONS

The operative assumptions for the study are that:-

- a) The major pedestrian routes in the Central Area of Nairobi are related to the location of the major land-uses;

- b) All people in the Central of Nairobi go to their destinations on foot from their arrival points;
- c) The ratio between pedestrians and vehicles at some places have reached disagreeable proportions (in the Central Area of Nairobi);
- d) Socio-Economic factors plays a part in the problem of pedestrian movements in the Central Area of Nairobi.

1.5 - SCOPE OF STUDY

Within the scope of the study, the 'Central Area' is defined as that part of Nairobi that is bounded by Uhuru Highway, the Railway, the Nairobi River, Mburuni Road and Wakulima Lane.

The term 'pedestrian', in the study, generally refers to a foot traveller. The study does not specialise in the examination of any category of pedestrians, for instance on the old, the handicapped or children, but deals with pedestrians in general.

1.5.1 - ORGANIZATION OF THE STUDY

Chapter One deals with the introduction of the study and will include the statement of the problem and its significance, the objectives and assumptions of the study. Chapter One also has a review of the related literature and the final section of this chapter deals with the research methodology adopted for the study.

Chapter Two examines the Nairobi Central Area in terms of its land uses and concentration of activities. This Chapter also looks into other factors of the Central Area of Nairobi such as its layout structure, space hierarchy, scale of development and present traffic conditions and difficulties.

Chapter Three, researches on the problem of pedestrian movements in the Central Area of Nairobi, with reference to the pedestrian generators, existing pedestrian policy and delineation of problem areas, particularly those analysed in detail in the study. The last section of Chapter Three examines the constraints to the pedestrian policy in the Central Area of Nairobi.

In Chapter Four, a policy for pedestrian movements in the Central Area of Nairobi is considered. Alternatives are also suggested in this Chapter. The last Chapter of the study contains the summary and conclusions.

1.5.2 - LIMITATIONS

Time, finances and manpower have been the major limitations of the study especially during the field surveys. Owing to the above mentioned constraints, it was not possible to carry out an exhaustive survey particularly as regards pedestrian counts and observation of pedestrian movements and problems on every part of the Central Area of Nairobi. As such the study concentrated on certain points on the major pedestrian routes.

Lack or non-existent of previous research and the non-availability of data on pedestrian aspect (and their movements in particular) in the Central Area of Nairobi, was yet another critical limitation of the study. This meant that no comparative analysis could be made with previous studies.

In the study, the following are also not taken into account:-

- a) Land ownership
- b) Rents and Returns and litues

- c) Financial outlays to carry out the recommendations are not being worked out.
- d) Under 2.8.2. - parking situation limitations about environmental factors.

Finally the study is working within the framework of national plan.

1.6 ASYMPTOTIC OF RELATED LITERATURE

An examination of Urban transport developments during the last thirty years reveals that little attention has been given to non-motorized forms of transport be it in the transport planning process or in reality itself.

It is only recently that it has been realized that a broadening of transportation approaches was essential so as to cope with such more recent issues as energy conservation, environmental protection and the ever increasing resistance of citizens, in developed countries, against massive development of transport hardware. As a result many countries, especially in the developed countries, are presently developing new approaches which are inclined to transportation software, on systems operations; on better utilization of the existing facilities, on more flexible intermediate forms of transport, especially on pedestrian and bicycle transport.

On average, pedestrian transport accounts for 15 to 35 per cent of Urban travel in developed countries, and from 30 to as high as 70 per cent in cities of developing countries. The high percentage of pedestrian mode of transport in the developing countries is so because the non-motorized forms of transport are vital to a large proportion of the population which cannot afford any form of mechanized transport.

The pedestrian has for a long time been a forgotten element in transportation planning. It seems that originally he (pedestrian) was of interest only to social and economic geographers, thus in Europe one of the earliest European investigators of pedestrian traffic must have been Miibschmann, whose study of a shopping street in Frankfurt, West Germany was published in 1952 (1). Retail researchers for instance, Farnes and Nelson, also paid much attention to the pedestrian. Farnes, for example, introduced a "value of show-window" to relate pedestrian flows along shop windows with the town's population as a whole (2). Nelson has made the relationship between retail business and pedestrian traffic into one of his main topics. He (Nelson) pointed out that "rents and land values in the down-town areas of many cities are almost directly proportionate to the volume of pedestrian traffic on the sidewalk". Moreover, he gave some very specific examples as to how pedestrian counts can be of use in retail location planning (3).

How close this relationship between land values and pedestrian flows can be, has been shown by Heidemann, who has given very striking examples of streets in the town centres of Brunswick, Dortmund and Munich, West Germany. Heidemann goes so far as to state that pedestrian flow diagrams might be better planning tools than land value figures, "as pedestrian traffic offer an objective and by speculative influences unbiased picture of the economic situation" (4). In Denmark, it is understood that in 1956 land values in the town centre of Copenhagen, as expressed in Danish Crown/m² were estimated at approximately one-tenth of the volume of pedestrians passing by between 06.00 and 20.00 hours in both directions (5).

Urban transportation planning in developed countries is said to have gone through considerable mutations during the last thirty or so years.

Three major phases of evolution can be depicted, the motorisation age; the search for balance transportation and for new technologies and; more recently, the awareness of transportation impacts and of limited resources.

The motor age is generally attributed to the United States of America where it started in the twenties and picked up tremendous momentum in all western countries after the Second World War, with its strongest impact on Europe in the 1960 - 1970 period where half of the private automobile produced in the world were sold.

This period of the motor age is characterized by the most formidable effort in the history of public works with the construction of city, nation and continent-wide highway and freeway systems. Large scale regional land use and transportation studies (7) were carried out in most Urban areas of the developed world to guide the development of fully inter connected highway networks. This era can also be seen as "hypnotized" by the private automobile (8) which brought unprecedented levels of collective mobility and personal opportunities to over larger proportions of western populations and to the most affluent segments of developing countries population.

During this motorisation age, other means of transport went largely ignored, more especially in North America. Walking became gradually an "unsafe proposition" on all components of the highway system. Little attention was given to pedestrian and other non-motorized transport by town engineers and by planners too, overwhelmed by the gigantic tasks of accommodating the motor vehicle.

The only exception to this lack of concern to pedestrian transportation, was in relation to the pedestrian safety (9), issue which was generally approached from the standpoint of disciplining and channelizing them to reduce the number of pedestrian/vehicle conflicts. During this motorization age the only consistent advocates of the "pedestrian cause" were architects and urban designers defending a qualitative view of the city and its traditional amenities. Notable works on this cause were by Lewis Mumford, J. Jacobs, K. Lynch, L. Halprin among others. But in general very little pedestrian research was conducted with the notable exception of the works by Gehring, Kirch, Heidemann and Schubert in Germany.

The period of the search for balanced transportation and new transport technologies emerged in the United States of America in the mid-sixties, when it became apparent that the motor vehicle could not do "the job" alone.

It was recognized that large segments of the population, the young, the old, the urban poor, were deprived of most of the basic urban amenities and opportunities available to the car owning population. It thus became fashionable to talk of "balanced transportation" which was basically more highways with some consideration given to transit service. A wave of subway construction projects were initiated during this period in many cities of the world which did not have this type of infrastructure.

As the successful decade of space exploits ended, it was felt strongly that these new technological achievements could revolutionize urban transportation (10). The search for automated transportation systems, personalized rapid transit systems of high performances at low cost (11), dual mode transportation and even automated highways was launched in most industrialized countries.

It can be seen here, that, pedestrian transport lacked the required sophistication to compete with the gaudy and glamour of this new technology. Emphasis was given to supply systems to new technologies and to modal split debates, within the circles of motorised modes of transport. Although some efforts were made to develop pedestrian malls, these efforts were isolated and the objective was mostly assigned to counter the dominance of suburban shopping centres by injecting new life, new amenities into declining cities.

Then came the environmental concern and resource limitations awareness. This period started about 1968 - 1970 when it was gradually realized that a broadening of planning and transportation approaches were needed to cope with the stiffening awareness of citizen groups increasingly aware of induced growth and of adverse and environmental effects of sustained development of major transportation facilities such as urban freeways.

Turning away from traditional practice of solving transportation problems by increasing the transportation hardware, these new approaches gave emphasis to better utilisation of existing transport infrastructures through modification of systems operations and altering of user behaviour (12). Successful schemes of reversed highway space for buses and high occupancy vehicles are one product of this approach.

Traffic restraint (13) schemes were also designed and slowly put into operation to modify the balances of transportation by reducing the use of the least efficient and most space consuming types of transport in dense urban perimeters (14).

New interest, in developed countries, was shown for intermediate forms of transport (15) such as jitneys, public automobiles, car pools, bus pools, dial-a-ride schemes for handicapped or for general public. For the first time in recent transport history, considerable attention was given by users, professionals and public officials to non-motorized forms of transport (16). It is thus no wonder that during this time bicycle sales surpassed automobile sale in United States of America and that European cities of all sizes converted parts of their city centres into integrated pedestrian precincts, closely tying major centres of activity to all forms of urban and regional private and public transport.

More efforts were made to achieve better land use mixes combining residential uses with other activities to reduce the needs for motorized travel (17). In this content, planning and design of pedestrian facilities and of transport interfaces became an important task of urban designers and of transport planners.

Thus the technical literature gap on non-motorized transport has been rapidly filled during the last few years by such work as the synthesis on "Pedestrian Planning and Design" by John Fruin (18) in the United States of America; the GLC (Greater London Council) "Pedestrianized Street" survey (19), the O.E.C.D. (Organisation for Economic Co-operation and Development) "Streets for people" (20), or MAUDEP seminars (16) and others like the Highway Research Board and the Institute of Traffic Engineer of North America. The recent abundance is also reflected in many bibliographies and other recent academic course notes and research work in various of pedestrian planning, modeling and design.

Unfortunately literature related to this study from developing countries is scarce if not non-existent.

In most developing countries, as already mentioned, only the very affluent segment of the population can afford to own and to operate an automobile. But a great majority of the population depend on walking, bicycling and public transport for all their travel. The very scarce information available on non-motorized transport indicate the very high dependence of the population on these transport means as indicated in Table 1. Even though the use of bicycles, cycle and motor scooters play a significant role in cities of developing nations, little is, often, known about these highly efficient and economical means of transport.

Most cities in the third world countries that do estimate the number of pedestrian trips confirm the high dependence of the population on walking. As stated by W. Owen "In these Cities, the very poor operate outside the mechanized transport system or do not travel at all" (21). In such a situation private transport is an extreme luxury, but even the so-called "cheap" public transport is too expensive for large shares of the population. Most poor wage earners in third world countries earn less than 300 dollars (American) and cannot spend such a high proportion of their income, about 10 per cent, for transport after meeting the survival costs of food, shelter, education and other necessities of life for a family.

Yet in these conditions, it is really surprising how little attention has been given to pedestrian and even bicycle facilities in cities where these means of travel are the only alternatives left for large part of the population and principally for low income groups where higher levels of mobility could provide better employment opportunities (22). In most third world cities, sidewalks have been extensively cut to make way for motorized traffic movement and for parking of cars. Sidewalks are used extensively for commercial activities, for highway repair work, utility location or building construction sites, disrupting already difficult conditions of walking (23).

Pedestrian crosswalks are almost non-existent or when they exist, motor traffic pays little attention to them. In many instances, new roads are constructed without adequate provision for pedestrians.

It should, however, be noted that this poor state of the pedestrians' lot in terms of their facilities planning and operations is by no means a special attribute of the cities of the third world countries. Similar situations exist in cities of the developed nations but with less serious consequences, since the levels of congestion are less acute and the amounts of travel by these means of transport is less intense permitting better overall management of all traffic flows.

1.6.1 LITERATURE REVIEW RELATED TO PEDESTRIANISATION

During the last few years the pedestrian has really come to the front, especially in the developed and industrialized countries, however, not least because of the increasing call the world over for pedestrian precincts where people can do their shopping at leisure and in greater safety. The reason behind the idea of pedestrian precincts, is of course the retailers expectation to attract more customers with the resultant increase in trade. At the same time this would lead to an increase in pedestrian flow in the area concerned. Therefore the effects of pedestrianisation are often measured by the increase of pedestrian flows.

There is nothing especially new about reserving places for pedestrians only. The concept is as old if not older, than the 16th Century sketches Leonardo da Vinci drew to illustrate a scheme for separating the movement of people, vehicles and sewage.

There are numerous examples of pedestrian malls, skywalks, shopping centres, parks, plazas and arcades the world over.

What is new, however, about today's pedestrianisation is that they are being developed as part of a strategy to counter the impact of the motor car in the Central Areas of cities. A study by G. Kenneth Orski of the Organisation for Economic Co-operation and Development (OECD) shows that nearly 170 cities in Europe, Britain and the United States of America have temporarily or permanently banned the motor vehicle traffic from sections of their downtown areas. There were 47 such cities in Germany, 20 in Netherlands, 15 each in Denmark and France, 11 in Britain and others in Austria, Belgium, Finland, Italy, Ireland, Norway, Portugal, Sweden and Switzerland and 24 pedestrian zones in the United States of America.

A major stumbling block towards the installation of pedestrianized zones in most cities has always been the opposition of the traders on the affected streets. For some unknown and curious reasons, businessmen who spend their lives figuring out ways and means to coax more customers into their premises still believe that people shop from cars rather than on foot. For example in the United States of America although the record showed that wholesale business declined in pedestrianized areas, the evidence on retail sales was just the opposite for in 1972 retail sales went up from 14 per cent to 35 per cent on pedestrianized streets.

The experience in Europe has been similar. For instance, during the first week of a traffic ban in Vienna, shops reported sales rises ranging from 25 per cent to 50 per cent. In Essen, Germany, sales increased between 15% and 35% and in Rouen they rose from 10 per cent to 15 per cent.

A noted fact is that as long as there is adequate parking and public transport nearby, it seems that most people would rather do their shopping on a street that is solely left for pedestrians.

The number is rapidly increasing among the European and American cities (unfortunately third world is still rather dormant) that have set out to curb the excesses of the motor vehicle by creating auto-free or pedestrian zones in the Central areas of their cities.

Advantages and arguments for pedestrianisation can be drawn from two broad conclusions that; pedestrian zones can significantly reduce noise levels and air pollution, enhance the visual appeal of the central areas of cities and increase retail trade; and that it takes more than closing a few streets to produce a pedestrian zone that will work out properly and effectively.

In the advancement and promotion of pedestrianisation, Europe is still the place to look for bolder and broader pedestrianisation schemes whose primary motives are to preserve and enhance the historic quality of their central areas.

In Denmark, one year after banning all vehicular traffic Copenhagen's main shopping street, Strøget, pedestrian volumes had increased by 20 to 30 per cent (5). The street now includes some five adjoining streets.

In Britain, Norwich city closed London Street, strengthening the commercial vitality and restoring much of the early charm. The pedestrianisation of Norwich's London Street was just a step in a larger plan to create two pedestrian precincts in the areas around the city's historic Cathedral and Castle.

The plan strategically locates additional parking areas on the periphery of the precincts and reroutes public transit to provide access to the areas. London Street is thus an example of the pedestrianisation of an historic shopping street and principal thoroughfare and it is also interesting as one part of a comprehensive environment management scheme for a city of some size. London Street was originally pedestrianised in 1967 and was one of the first conversions of an existing shopping street in Britain.

In West Germany, the Kaufinger Strasse in Munich is a 50,000 sq. metres pedestrian district in the heart of Munich is the largest in the country and presumably in the world, and yet it is in the process of being steadily expanded to over twice its original size. The joyous atmosphere to be found there has been widely praised and there are many aspects of the Munich development worthy copying elsewhere.

In the United States of America, the New York City's office of Midtown Planning and Development in 1971, unveiled a vision of pedestrian peace that should have warmed the spirit of the most hard bitten New Yorker (6). It was a plan for Converting Madison Avenue between 42nd and 57th Streets into a pedestrian mall with shade trees and sidewalk cafes, benches and fountains, making it an ideal place to shop and stroll and take the air. What made the vision all the more exciting was that it was a part of a broader strategy to restore some measure of humanity and order to Manhattan's clogged streets.

In the Central Area of Nairobi the most outstanding pedestrian facility that can be said to be free from vehicular traffic and thus pedestrianised street, is the Aga Khan Walk. This is a completely traffic free street running from Harambee Avenue north to City Hall Way and forms an ideal link between the business and commercial areas north of the City Hall Way and the governmental offices along Harambee Avenue. But as a pedestrian - only street it lacks most of the necessary facilities like cafes, benches and tree shades.

1.7 - RESEARCH METHODOLOGY

Various research methods have been utilized in the collection of data for the study. Pedestrian and vehicular counts have been made with the use of hand tally counters, while measurements, for instance, of the various widths of streets and pavements have been obtained by the use of a measuring tape and from existing layout maps of the Central Area of Nairobi. Where walking speeds were to be established, use was made of stop watches.

Informal interviews and discussions were also held with various officers in the Government, Nairobi City Council and individuals. Besides collecting data from the field surveys, other sources of information were journals and reports.

The Traffic Section (Nairobi) of the Kenya Police and the daily local newspapers were yet other sources of data: the former source was vital in respect of accident data involving a pedestrian, while the latter was a source of complaints to the newspapers, from the general public regarding pedestrian safety and inconvenience in the study area.

Due to the constraint element, it was impractical during the field surveys, to interview a population sample based on the total daytime population of the study area. As such interviews were carried out at the various selected problem areas within the study area. A ten per cent random sampling was adopted during the interviews. This was so because of the little patience of the average man in the street. An interview schedule was used and although the questions on the interview schedule were written in English, Swahili was widely used especially when communication in English became impossible.

INTERVIEW SCHEDULE

1. How did you come to the Central Area ('town')?
2. What was the purpose of the journey?
3. Where have you come from within Nairobi City and region.
4. How long will you have been away from your home.
5. What problems do you face when crossing or walking along roads/streets/avenues in the Central Area of Nairobi.
6. What do you think would be the solution to the problems (mentioned in question 5).
7. Other remarks.

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CHAPTER 2

THE NAIROBI CENTRAL AREA

2.1. - INTRODUCTION

In the Central Areas of many countries, the concentration of the entire range of human activities is the greatest and the most complex in nature. These, central areas, are the focal points of commerce, business, industry, government, educational and cultural institutions. As such, they are incalculable assets to their various nations and their condition and efficient functioning are of utmost concern of their respective authorities.

The problems and difficulties in cities of the developing are mainly caused by the rapid growth with little economic base, housing or infrastructure to support the ever continuing influx of immigrants in search of employment opportunities.

Most central areas are the oldest parts of urban areas having the greatest rate, complexity and a number of interrelationship among diverse land uses and activities. Although the infrastructure is complete in some of the central areas, portions may be redundant, obsolete, or irrational because of its evolution over time. Uses often occur in buildings and districts which might have been designed originally to accommodate quite different activities. The older some parts of the central areas are, the more pronounced such contradictions are likely to be present.

Cities, world over, differ by reason of their principal economic function or functions, whether educational, governmental, industrial, trade or residential, all contain most of these in some degree and proportion. The unique characteristics of the Central areas, setting them from suburbs, small towns or village, derive from their concentration on economic, social and cultural functions and the age of their urban tissue (1).

Land values, as an economic function, are highest in central areas because of their artificial or natural market forces, resulting in the most intensive uses of land. Land costs are, however, not always equally distributed throughout the central areas. There are frequent pockets of blight where small retail and service business can still exist. On the other hand, low intensity uses and structures serving such functions are continuously being replaced by those which are able to compete in high rents of the more central locations. In some cases diverse land uses and activities overlap within the same space and functions often do relate with each other horizontally and vertically through various means of communications. Congestion of vehicles and pedestrians is normally an ever-present phenomenon and this is as a result of the high concentrations of functions.

Social functions in many cities and central areas in particular, are associated with the concentrations of slums and obsolete housing. Social segregation by race, income and ethnicity in some of the central areas are more pronounced. Even if not such a dominant factor today it has been pointed out elsewhere that all central areas historically function as reception areas for immigrants who usually employed in occupations with awkward hours and thus prefer to be within walking distances.

The threat of the motor vehicle together with the well established link between their exhausts and lung cancer and other respiratory ailments, is the basic reason for keeping humans and vehicles separated in all types of human settlements.(1). But in many central areas little or no action at all is being taken commensurate with the problem of bringing more compatibility between pedestrians and vehicles. The regeneration of the physical environment of the central areas will thus be dependent, to a large extent, upon the way in which the automobile is handled in the future (1).

Nairobi became a communications centre and the headquarters of the provincial administration following its establishment in 1899 as a railway depot. The community's permanence was confirmed in 1905 when it became the capital of Kenya, with a population of about 10,000. Thereafter, the importance and size of the town increased steadily, and in 1919 Nairobi became an incorporated municipality.

In the early years, the growth of the town(Nairobi) had been controlled only by economic forces, with no co-ordination of development other than by the layout of a gridiron street pattern in the centre. In an attempt to order the situation, a town planning consultant was appointed in 1926 to make recommendations on zoning arrangements. A further master plan study was commissioned in 1948.



NAIROBI CENTRAL 1898.



PLATE 1

NAIROBI CENTRAL 1975.

The commission laid down the guidelines for the following twenty years, earmarking land for residential, industrial and other uses.

Following independence in 1963, the boundaries of Nairobi City were enlarged from the 'old city' area of 90 square kilometres (35 square miles) to embrace an area of 690 square kilometres (266 square miles) including Nairobi's peri-urban settlements and certain other important features such as the Game Park, Jambasi Airport and large area of ranching land in the east. This boundary aimed at giving the city adequate reserve land for future expansion.

Nairobi itself is characterized by a single major employment centre, composed of the central commercial area and the adjacent industrial area which together held, in 1972, 44% of the city's employees. In 1972, about 70% of the total city population of 626,000 lived within the area of the old city (within the pre - 1964 city boundaries).

Beyond the old city several distinct residential areas are located:-

- to the north and west these are predominantly low density and high income areas, but with a very substantial part of the population in high density clusters of low income housing in Dagoretti;
- to the south and east they comprise areas of high density, accommodating middle and low income households.

Thus Nairobi is not only the principal urban centre of population, it is also the social, economic and communications hub of the country. It is a classic primate city. It is, therefore, inevitable that the movement of people towards urban areas will impinge most heavily on Nairobi itself. (see Tables 13 and 14).

Whilst Nairobi does not have a long history of growth (Urbanisation did not start until the beginning of the twentieth Century) it should be noted, however, that the initial settlement and administration took place in the area which is now defined as the Central Area. The Central Area of Nairobi, at present has an area of 2.5 square kilometres.

Within the Central Area of Nairobi, there is a whole spectrum of commercial and other non-commercial activities, with the result that a large proportion of the city's population have to travel to the Central Area for their various needs and for employment.

TABLE 12

Projected population of the main
Urban Centres : Kenya

Urban Centre	Rate of growth (%)	Population (2000 A.D.)
Nairobi	6.7	3,219,000
Mombasa	5.5	1,393,000
Nisumu	8.2	484,000
Nakuru	6.8	473,000
Thika	7.5	226,000
Mogoret	6.5	217,000
Kitale	5.3	69,000

Source : Kenya's National Report to the
UN on the Human Environment: 1972

TABLE 14

National Population Projections

	1971	2000 A.D.	Change
Kenya total	11,671	31,209	+ 19,538
Rural	10,371	23,209	+ 12,838
Natural increase			+ 16,565
Migration			- 3,727
Urban	1,300	8,000	+ 2,200
Natural increase			+ 1,179
Migration			+ 1,116
Nairobi	585	2,880	+ 6,700
Natural Increase			+ 2,973
Migration			+ 3,737
Other Urban Centres	715	5,120	+ 4,405
Natural Increase			+ 1,794
Migration			+ 2,611

Source : U U S O

2.2 - LAND USE AND CONCENTRATION OF ACTIVITIES

In 1948, a Master Plan*, was commissioned and it laid down the guidelines for the development of Nairobi, for the next twenty years. The plan earmarked land for residential, industrial and other uses. It introduced the principles of neighbourhood units and was also largely responsible for the present layout of the Industrial Area. The plan, furthermore, proposed important extensions to the road network.

As for the Central Area the 1948 Master Plan, had the task of deciding on the usefulness of extending the then Commercial Area. The plan claimed, at that time, no one could say with certainty how buoyant commercial life would have been in the Nairobi of the future, since development, in those days, depended partly on the trend of economic life elsewhere and the measure of economic decentralisation throughout the British Empire.

Prior to commissioning the 1948 Master Plan, the Commercial Area was "scarred by large number of open patches, untidy and unsightly in appearance, which sealed off many buildings from the general flow of the activity". The Plan therefore proposed that the gaps in the Commercial Area be filled in the future developments. In general the 1948 Master Plan recommended the prevention of the Central Area from spreading beyond the Nairobi River to the north and the Railways to the south, thus making it a compact area. The Central Area (the known as the commercial area) was also to be freed of all incongruous uses, such as industries, warehouses and assembly shops and that it was to be developed exclusively for commerce and indoor recreation.

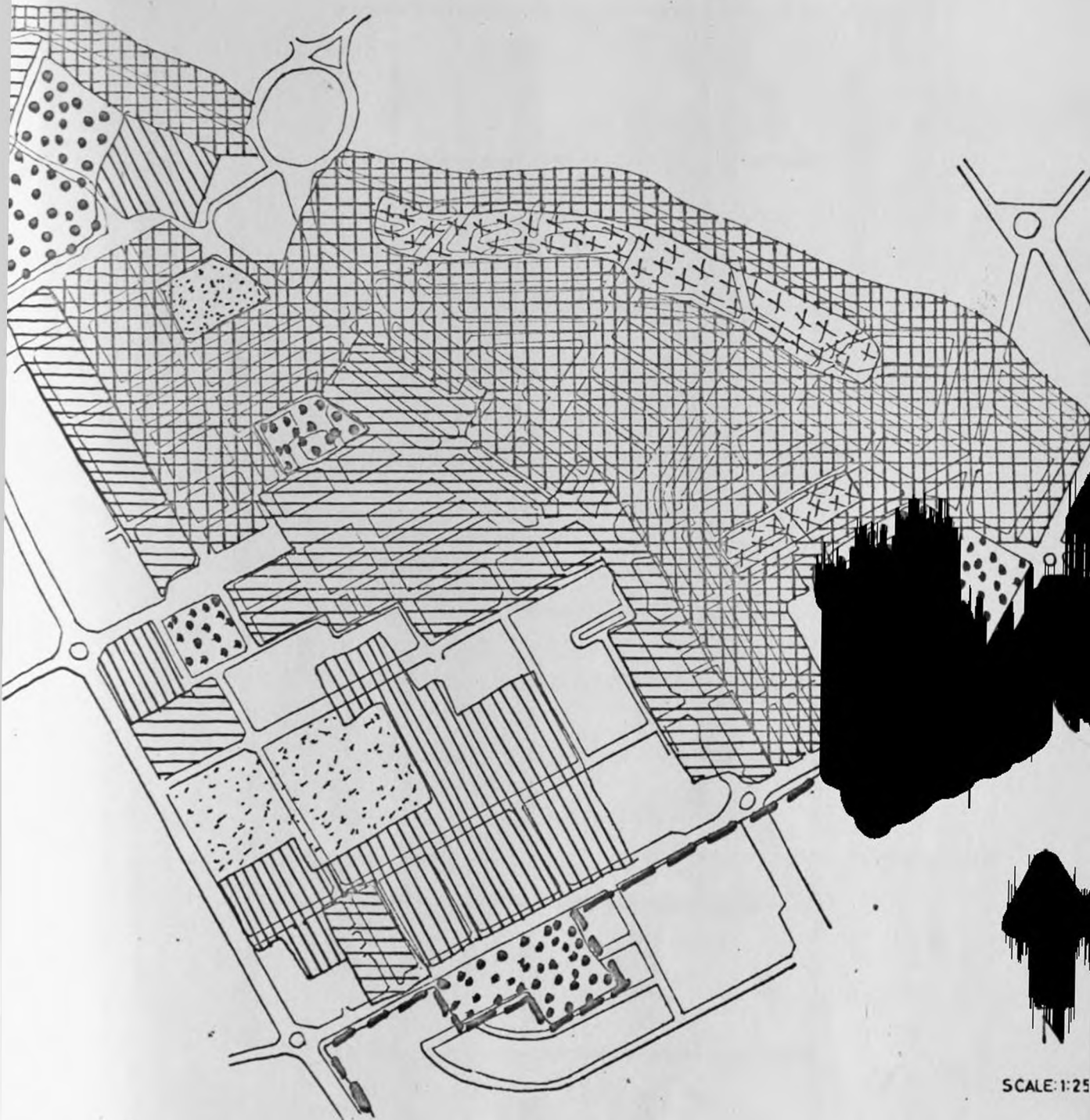
* Nairobi Master Plan for a Colonial Capital; a report prepared for the Municipal Council of Nairobi: 1948.

Map 2 shows the land uses in the Central Area of Nairobi in 1972, while Table 15 gives statistics of building uses in the Central Area. The Table shows that while there has been an overall increase in the area of building changes were not uniform. The large increase in car parking results from the application of the City Council's requirements for new buildings. Much of the increase in residential accommodation results from the construction of new hotels and the conversion of buildings to lodging houses in the area to the east of Tom Mboya Street. The area of primary growth appears to lie to the west of Government Road between Mama Ngina and Haile Selassie Avenue. This area includes prestige commercial development and the centre of Government administration.

A technical report (2), by the City Council of Nairobi, on the private building investment in the Central Area (1971), shows that capital investment was widespread over almost all of the study area. Between 1965 and 1970 (see Map) the centres of major investment have been in the prestige areas of Government Road - from Haile Selassie Avenue to Mama Ngina Street - and they are bounded by Kenyatta Avenue, Aoinange Street, Kimathi Street and City Hall Way. Between 1965 and 1967 the major proportion of investment was in the northern part of the Central Area, that is between Rohatar Dadah Street and Kijabe Road.

Commerce activity is generally spread over the Central Area. Earlier concentrations of investments were in the Government Road/Tom Mboya Street area and Kijabe Road together with some major investments at Kenyatta Avenue and Mwalimu Njiru and Aoinange Streets. Since 1968 high buildings investment has been concentrated in that area bounded by Habera Street and the General Post Office; and the area adjacent to the Kenya Cinema.

CENTRAL AREA — NAIROBI



SCALE: 1:25

MAP 2 - LAND USE

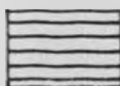

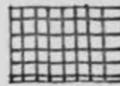





- | | | | |
|---|--|--|------------|
|  | Prestige shops, offices, hotels and entertainments |  | Industry |
|  | Secondary shops and offices |  | Public |
|  | Government |  | Open space |
|  | Storage |  | Railway |

TABLE 15

Building uses in the Central Area: Nairobi 1967 - 1971

Building use Area m²

Period	Commercial	Office	Residential	Industry	Storage	Other	Parking	Total
1967/68	272,696	396,573	203,866	62,048	147,739	161,991	24,159	1,269,072
1970/71	332,013	503,167	243,793	58,979	147,681	183,105	58,674	1,517,412
% Increase/ Decrease	+18	+27	20	-5	-	+13	+102	+20

SOURCE: NUSG 1972

Both early and recent investment in Office building use is restricted primarily to that section shaped by Main Ngina Street and Government Road. Government Offices, are concentrated along Harambee Avenue although recent buildings are not outside the Central Area on the Hill Area Office Complex which is to the west of Uhuru Highway.

Hotel investment is not so widespread in the Central Area and they tend to be concentrated in specific areas. Early concentrations of hotels investment were in the Moktar Dadah Street, Monrovia Street and College Road, while recent developments of this activity has been concentrated at the western side of the Central Area.

Major concentrations of residential building investment have been in the Kijabe Road, Kirinyaga Road and River Road areas. Whilst other residential investment occur in other parts of the central, these more or less relate to overseer's or caretaker's flats and private houses rather than major residential investment.

Investments in bars, cafes and restaurants are mainly to the east of Tom Mboya Street and south of Luthuli Avenue. Another area is central between Government Road and Tom Mboya Street.

Earlier storage facilities were to be found south of Haile Selassie Avenue and eastwards of the Railway Station. Since 1965, major private investment in the storage use has been in Kijabe Road, Kirinyaga Road and River Road.

As for Industry, this use is specialised geographically and is principally concentrated in the Pumwani Road, Racecourse Road, Karume Street triangle and at the northern end of the Kirinyaga Road.

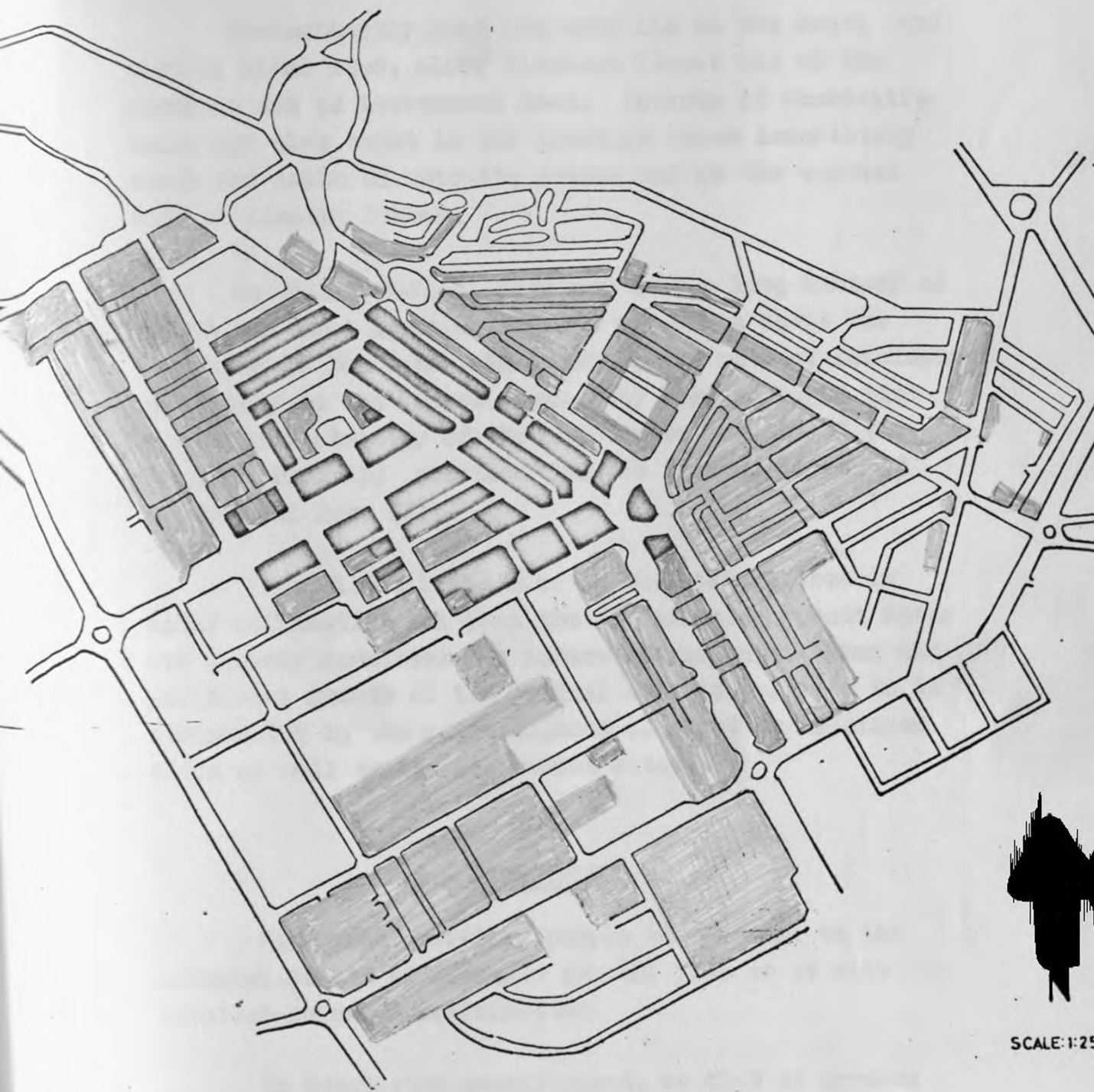
Public use building investment has been in the Government Road/Tom Mboya Street area except for the Roman Catholic Cathedral on City Hall Way and the Hebrew Synagogue at the corner of University Way and Uhuru Highway.

Notice should, however, be taken of the fact that, the above only represent official building investment for which approval of the Nairobi City Council has been sought and obtained, but excludes building use of which no proposals have been submitted and approved.

The Nairobi Urban Study Group, in 1970, gathered data by use of an employment survey and economic appraisal of retail activity in the Central area by type of firm and location. Although the information obtained was not useful to the M U S G - in that they were not totally relevant to the determination of the future of the Central area in relation to the strategy of growth of the City - , they however did underline the wide range of types of retail activity found in the Central Area at present. As the M U S G asserts, a superficial view of the Central area of Nairobi indicates a flourishing and attractive commercial centre. But a more careful examination reveals a most complex pattern in which these attractive aspects form only a small part of the total area. The majority of the shops supply cheap goods to the growing market of relatively low paid employees and importantly, the area of these uses is increasing (4).

A glance at the Central area of Nairobi, at present, gives a picture of an attractive international centre of government and commerce, for the hotels, restaurants and specialist shops provide an aura of relatively affluence and large scale commercial activities. But intermingled into this picture are isolated spaces or plots of apparently poor quality and inefficient property which in most cases could be under pressure for redevelopment as a result of the demands of rapidly growing City. Map 3 shows the rateable land values in the Central Area (1972). The basis for the map was a rating valuation in costs per square foot that was prepared by the Valuation and Rating Section of the Nairobi City Council. The rating valuation were then assembled by categories and the results were then plotted (3).



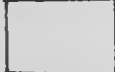
CENTRAL AREA — NAIROBI



SCALE: 1:25

MAP - 3

RATEABLE LAND VALUES
(SHILLINGS PER SQUARE FOOT)

	SHS 102 320
	SHS 28 102
	SHS UP TO 28

Source: NUSG. 1972

Predominantly poor property lie to the north and east of River Road, along Biashara Street and at the northern end of Government Road. Pockets of short-life buildings also exist in the prestige areas immediately north and south of Kenyatta Avenue and on the eastern side of Kimathi Street.

So whilst Nairobi does not have a long history of growth, in that urbanisation did not begin until the beginning of the twentieth Century, its rate of development, especially in the Central Area, has been so rapid that the overall strategy of the city up to the end of the Century (2000 AD) provides for the limited growth of the Central Area (3).

Virtually all the land in the Central Area is under utilization and even the few existing vacant sites are already committed for future development. Thus the additional growth of the Central Area is expected to be accommodated by the redevelopment of existing developed sites as well as the few vacant sites.

2.3 - EMPLOYMENT

Employment provides people with access to the material fruits of economic growth, just as it also provides personal satisfaction.

In Kenya open unemployment, or that of persons actively seeking jobs in the modern sector, has been worsened by heavy migration from rural areas to the urban areas, with Nairobi as the major receiving area. The urban areas have many attraction, not the least of which are higher wages. Many people, especially school leavers, convinced that they are capable of jobs in industry, migrate to the city.

Most remain unemployed for long periods before they settle for lower-paid or more menial jobs than they had wanted.

An analysis was made of the distribution of employment in 1969, for Nairobi, by type and by location. The analysis was based upon statistics obtained from an employment survey carried out in 1969/70 by the Nairobi Urban Study Group and from the Ministry of Finance and Economic Planning. Table 16 shows the distribution of employment in Nairobi in 1969 while Table 17 gives the possible distribution by 2000 A.D.

The initial estimates of employment potential, by NUSG*, totalled approximately 190,000 jobs out of a total of 650,000 jobs projected for the whole of Nairobi City by the same year. Tables 18 and 19 show the employment statistics in the Central Area in 1970 and the possible employment in the Central Area by 2000 A.D. This projection, for 2000 A.D., was based upon the existing trends of employment growth with additional provision for some 90,000 jobs in secondary centres. It can be noted that should these projections materialise then the Central Area would have 29.2 per cent of the total Nairobi employment by 2000 A.D.

As the NUSG, rightly, pointed out, from experience elsewhere, it is considered that this level of employment would give rise to severe problems of journey-to-work movements, particularly when seen in conjunction with the movement demands of the nearby industrial zone.

Transportation tests carried out by the NUSG, in 1970, showed that to accommodate the movements demands of such level of employment would certainly require excessive investment in roads and their associated junctions in the area of maximum disruption to the existing fabric of the city.

* Nairobi Urban Study Group

TABLE 16
DISTRIBUTION OF EMPLOYMENT

NAIROBI: 1969

Employment type	Central Area	Secondary Centre	Industrial Area	Residential Areas	Other sites*	TOTAL
Commerce	12,500	1,800	-	4,000	900	19,200
Offices	28,100	-	-	18,300	-	46,300
Industry and Storage	5,100	-	29,400	26,400	6,500	67,200
Hotel	1,800	-	-	400	-	2,200
Other uses	1,500	-	-	27,200	-	28,700
Self employed	-	600	1,600	4,100	3,000	9,300
T O T A L	49,000	2,400	31,000	80,300	10,400	172,900

* "Other sites" includes Hospitals, further and higher Education, barracks and prisons.

SOURCE: NUSG

1970

TABLE 17

DISTRIBUTION OF EMPLOYMENT BY 2000 A.D.

Employment Group	Central Area	Secondary Centres	Residential Areas	Industrial Areas	Other Sites	TOTAL
Commerce	88,100	171,000	98,900	5,400	2,600	366,800
Manufacture	9,900	2,100	0	108,000	12,200	132,200
Other	2,000	3,600	86,000	5,400	53,700	150,700
TOTAL	100,000	177,500	184,900	118,800	68,500	649,700

Source : E U S G : 1972

TABLE 18

EMPLOYMENT IN THE CENTRAL AREA 1970

Building use	No. of Employees (modern sector)	%
Commerce (Retail & Wholesale)	12,000	26
Offices	28,000	57
Industry and Storage	5,100	10
Hotels	1,800	4
Other uses*	1,500	3
T O T A L	49,000	100

SOURCE: NUSG:
1972

- * "Other uses" includes places of worship, education (except Commercial Schools) etc.

TABLE 19

POSSIBLE EMPLOYMENT IN THE CENTRAL
AREA - 2000 A.D.

Building use	No. of employees	2000 AD %	1970 %
Commerce	19,000	19	26
Offices	65,000	65	57
Industry and Storage	4,000	4	10
Hotels	9,000	9	4
Other uses	2,000	2	3
TOTAL	100,000	100	100

SOURCE: NUSG
1972

A further examination, of the needs of such an employment potential showed that car parks in the Central Area, could deal with short-term parking only and that the construction of additional long-term parking around the periphery would be necessary.

No serious consideration was given on what would be and will be the effect of such an employment potential on pedestrian traffic in the Central Area by 2000 A.D.

2.4 - LAYOUT PATTERN

In the early years, the growth of Nairobi had been controlled by economic forces, with no co-ordination of development other than by the layout of a gridiron street pattern in the centre (present Central Area).

The present size and layout pattern of the Central Area is as a result of the implementation of the various proposals and recommendations that the 1948 Master Plan for the then Nairobi Municipality - came up with.

The 1948 Master Plan had recommended that the Central Area (then known as the commercial area) should be prevented from spreading afield*. This meant that the Central Area had to be kept compact for various reasons such as:-

- Obvious advantage of providing amenities within easy reach of one another. The assumption here was that facilities such as Restaurants benefit by the close proximity of banks, government buildings, shops, offices and so does commerce generally.

* at that time the Commercial Area was bounded by the swamp and the Railway.

- - The mid-day traffic problem and the consumption of time and money in homeward drives are somewhat lessened.
- The parking problem brought within reach of solutions. The assumption here was that one or more centralized parking places would be able to accommodate the car population as the walk to the place of destination would be a short one.
- Further commercial development would drive the buildings up and the height zoning was to be sufficiently generous to permit vertical expansion. High buildings, the plan asserted, permitted the land to be used to maximum capacity and their size ensures that architectural quality will be attended to and modern services included. High buildings also concentrate business into better equipped hands thereby raising the standard of the distributive industries to a level which only larger businesses could afford.

The plan also suggested a road system, within the Central Area, which was to give freedom of through traffic as well as an easy exit for traffic into the suburbs and the industrial area. The road system was also to give new frontages which are valuable for office sites.

Bulks of buildings (according to the 1948 Master Plan for Nairobi's Central Area) of similar uses were to be grouped together for administrative convenience and provide an aspect of good, unified architectural appeal. This is why, to date, most of the Government offices, for instance, form a single congregation of buildings along Harambee Avenue.

At present, the major access (motorway) to the Central Area is to the west by means of Uhuru Highway and its associated junctions at University Way, Kenyatta Avenue, City Hall Way and Haile Selassie Avenue. On the whole, there is no means of traffic circulation around the Central Area and this therefore means that there are quite a number of cross town trips traversing the Central Area even when such trips have no particular business in the Central Area.

Another factor is that, there is no system of priority street use - for instance no streets are used solely as traffic links, parking and access streets; or others used exclusively by pedestrians or primarily for shopping. Only Government Road, Kenyatta Avenue, University Way, Racecourse Road and Haile Selassie Avenue can be said to be distributory roads in the Central Area, but even these have dual purposes - that is, they perform as local service roads as well as local distributor.

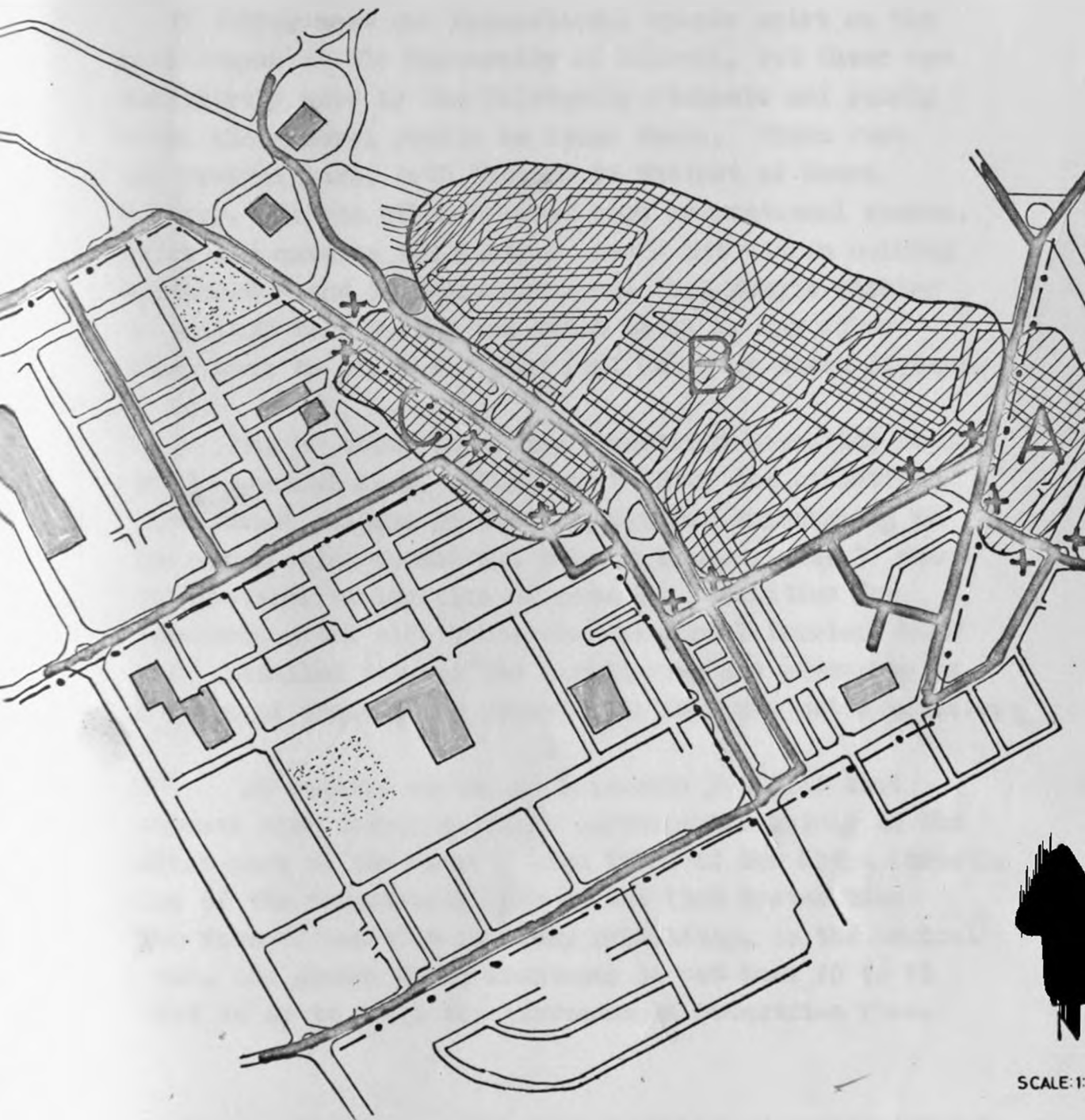
Map 4 shows the layout pattern of the Central Area with reference to the road network and the public transport routes. The public transport services at present pass through the Central Area mainly due to lack of turning space and facilities.

Open spaces are rapidly diminishing within the Central Area, especially, with the ever going on of construction of new buildings. Other open spaces are normally used by motorists as illegal car parks, car washing and motor mechanical repair sites.

Very few outdoor recreational spaces exist in the Central Area apart from the Jevanjee Gardens (on Moktar Dadah Street), City Square (on City Hall Way) and the small square outside the International Life House building on Mama Ngina Street.

This lack of abundant recreational spaces has led to a situation whereby people have resorted to utilise the various road 'refuges', that are planted with grass, as resting places during their 'lunch breaks'. It is very common to find people playing cards or draughts on the carriageway 'refuges' of Kenyatta Avenue and Muindi Mbingu Street and preachers making use of the street pavements during lunch hours.

CENTRAL AREA — NAIROBI



SCALE: 1:1

MAP 4 - LAYOUT PATTERN

 PUBLIC TRANSPORT ROUTES

 DISTRIBUTION ROADS


 CAR PARKS (OFF-STREET)

 OPEN SPACES

 JUNCTIONS WITH PEDESTRIAN
GUARD RAILS

 AREA WITH VERY NARROW STREETS
NARROW PAVEMENTS & ON-STREET
REPAIRS OF VEHICLES

 AREA WITH NO OFF-STREET
PARKING & NARROW PAVEMENTS

 COMMERCIAL HUB OF CENTRAL
AREA - NO PROVISION OF
OFF-STREET PARKING

Other open and recreational spaces exist on the main campus of the University of Nairobi, but these are exclusively used by the University Students and rarely would the general public be found there. Uhuru Park and Central Park, both located to the east of Uhuru Highway, are the other nearest open recreational spaces. These are outside the Central Area - but within walking distances - and it therefore means that people wishing to utilise them during the lunch break or any other times have to cross the busy dual carriage Uhuru Highway.

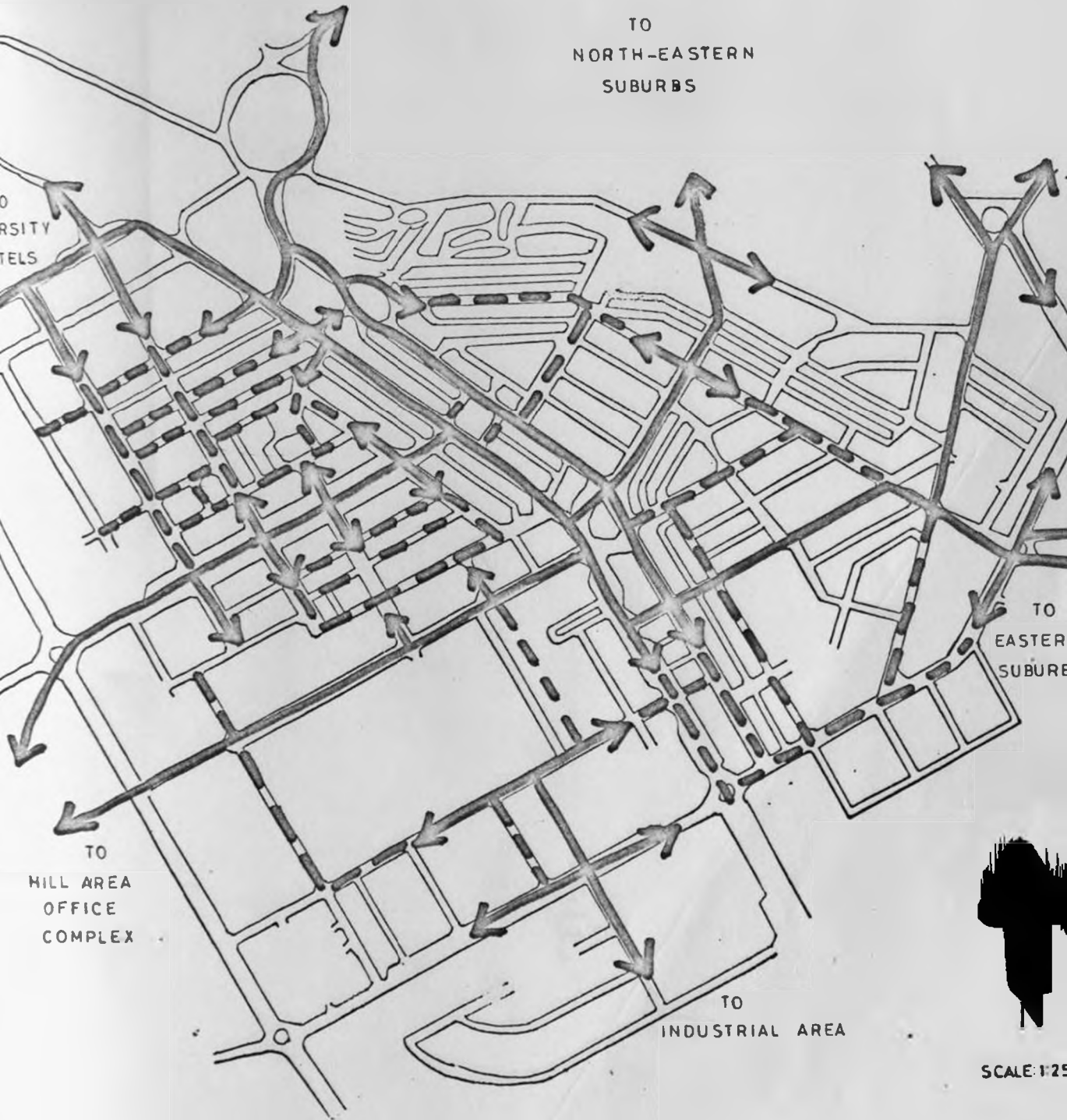
Map 5 shows the major pedestrian commuting routes in the Central Area, while Maps 6 shows the pedestrian circulation pattern in the City Centre, emphasising on the circulation around and between blocks. Map 7 shows the location of location of crossing facilities for pedestrians and also junctions where rail barriers have been installed between the carriageway and pavements as a means of segregating pedestrians from the motor traffic.

As regards widths of pavements you find that streets with narrow pavement widths exist mainly in the older part of the Central Area (east of Tom Mboya Street). One of the suggestions made by the 1948 Master Plan for Nairobi was that in every rebuilding, in the Central Area, the ground floor frontages be set back 10 to 15 feet so as to allow for increases in pedestrian flow.



* Central part of the Central Area.

CENTRAL AREA — NAIROBI

TO
NORTH-EASTERN
SUBURBS



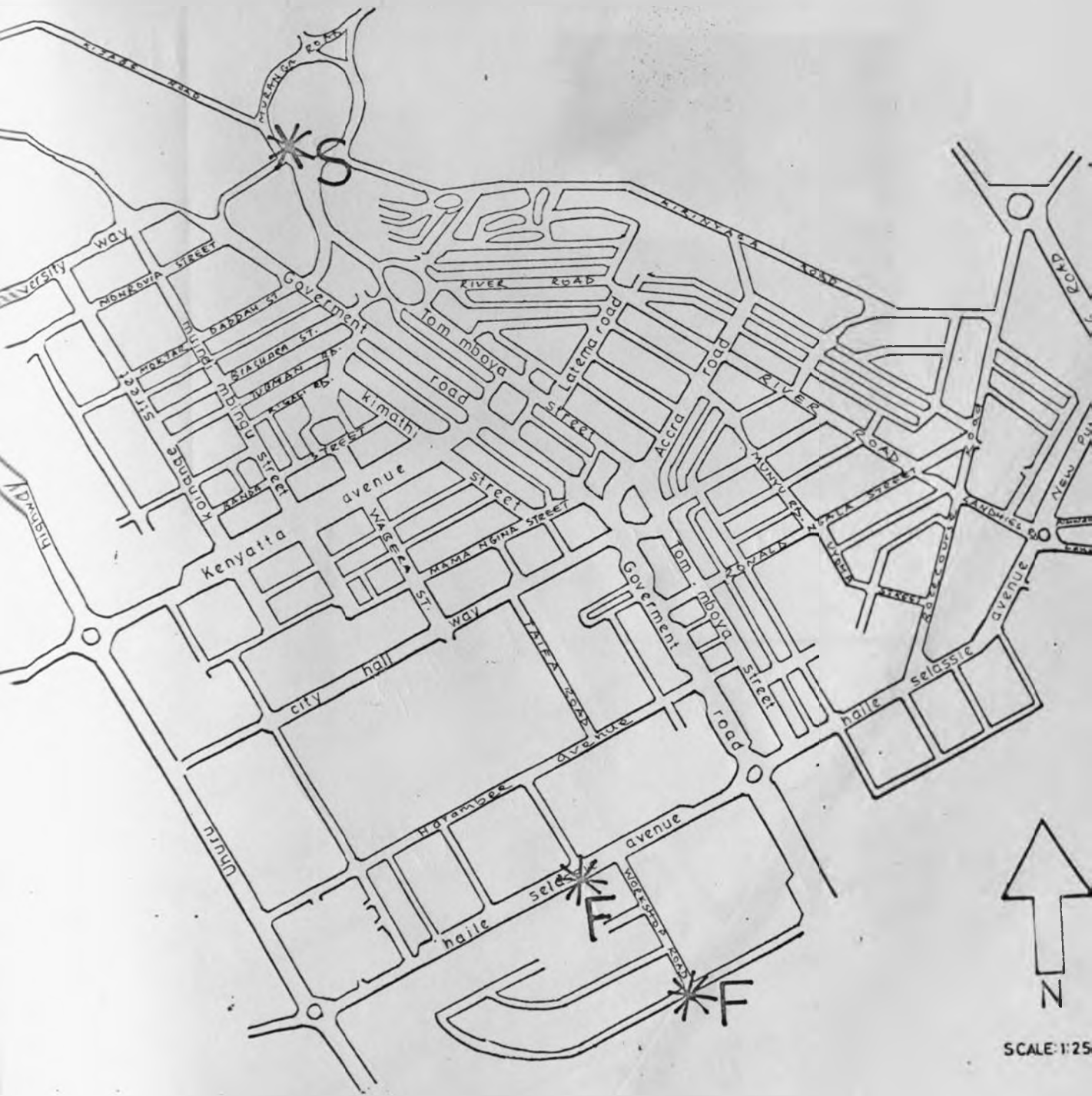
MAP 5 - PEDESTRIAN ROUTES

-  Pedestrian commuter routes
-  Other busy routes

Source: Nairobi City Council

SCALE: 1:25

CENTRAL AREA — NAIROBI



MAP - 7

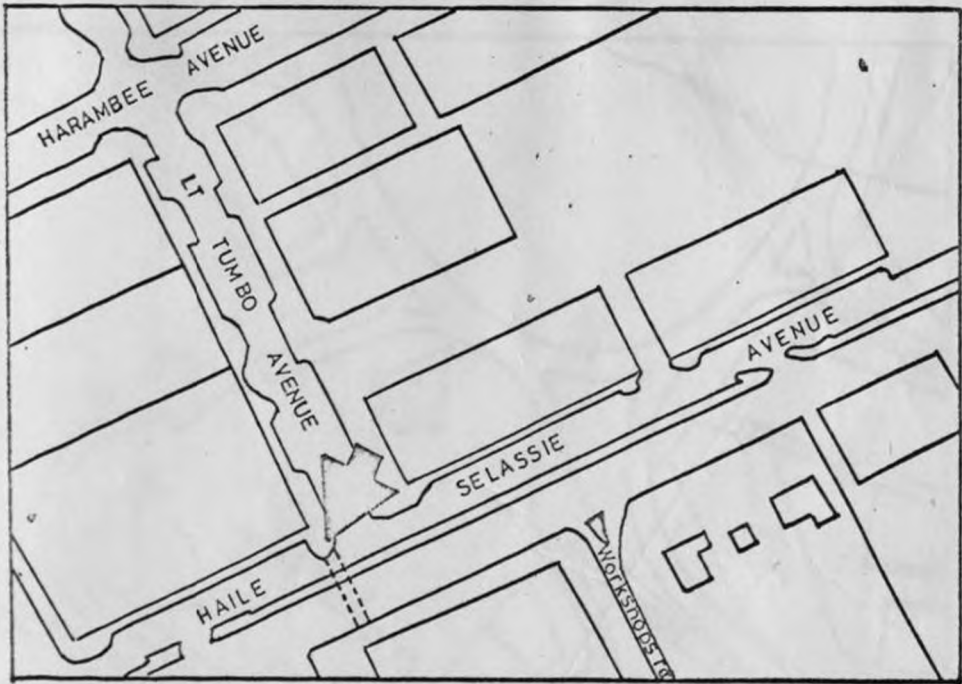
Location of crossing facilities

*F Footbridge

*S Subway (tunnel)



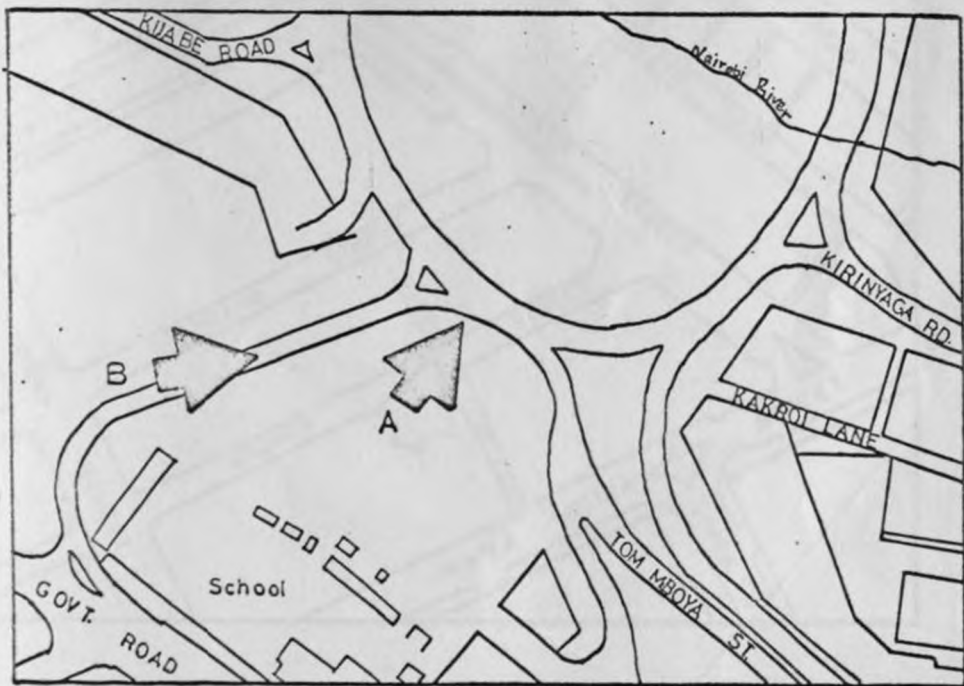
PLATE- 2 Crossing facilities- footbridge



viewpoint of PLATE 2



PLATE-3 Crossing facilities- pedestrian tunnel



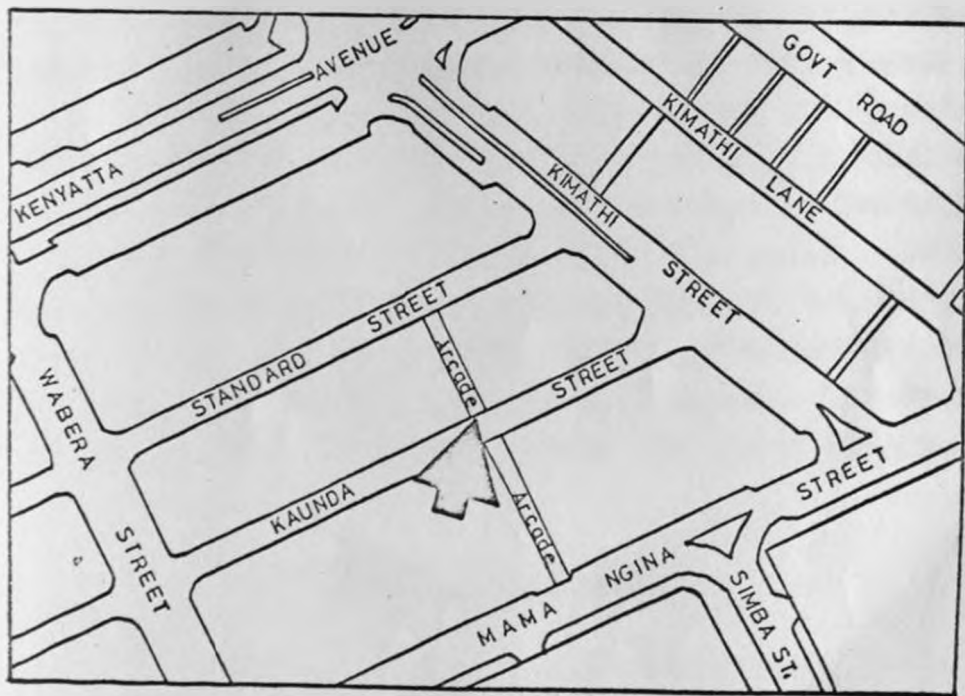
viewpoints of:

A - PLATE 3

B - PLATE 19



PLATE-4 Pedestrian arcade



viewpoint of PLATE 4

2.5 SPECIAL CHARACTERISTICS OF THE CENTRAL AREA

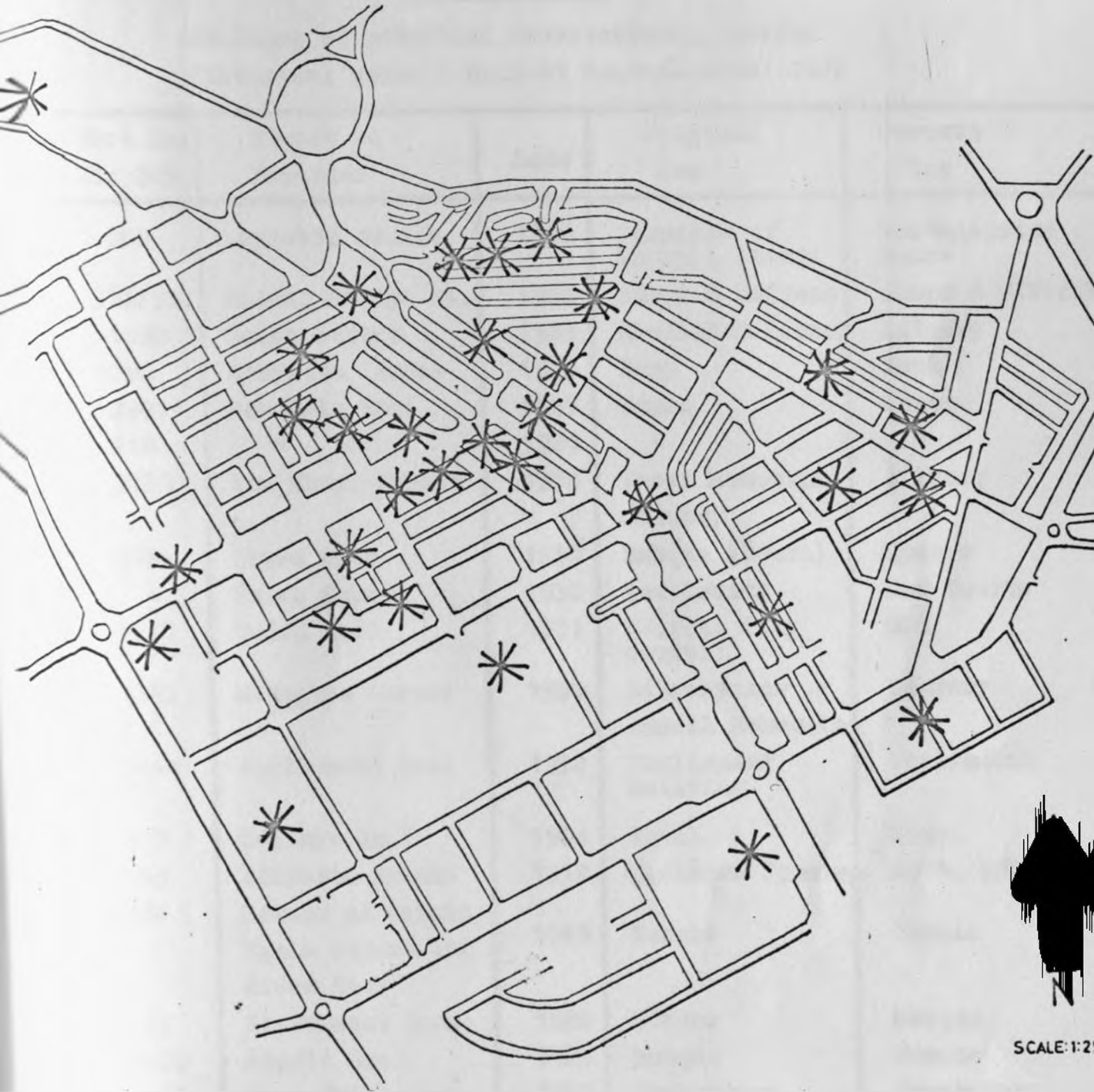
Within the Central Area, there are certain buildings and areas which are of particular importance and there is a need to provide for adequate pedestrian access and the maintenance of a visual balance in relation to traffic. Map 8 shows the location of various buildings of architectural and historical interest in the Central Area while Table 20 gives the location of some of these buildings, by street; the date when the building was constructed; its original use and current use.

Another special characteristic of the Central Area and Nairobi City as a whole is its climatic conditions. Nairobi has no real winter or summer and for greater part of the year the days are sunny and the nights cool and pleasant. The long rains occur in March/May and short rains from the end of October till middle of December (5). The climatic condition of Nairobi is a resource that has not been fully exploited. Despite the favourable climatic (weather) conditions, very few open air or verandah Cafés exist in the Central Area of Nairobi, nor are there any identifiable plazas that can be utilized by people during the lunch breaks.

2.5 TRAFFIC CONDITIONS

In 1970 some 31 per cent of all vehicle trips in Nairobi were to and fro the Central Area, compared to only 9.5 per cent of the vehicles to and fro the Industrial Area. This in real figures meant that in 1970, there were some 187,000 vehicles trip ends each day (24 hours) to the Central Area. Later on this was estimated to have increased to 204,000 in 1972 and to 235,000 by 1975, an increase of about 5 per cent per annum (6).

CENTRAL AREA — NAIROBI



SCALE: 1:2

MAP - 8

BUILDINGS OF ARCHITECTURAL
AND HISTORICAL INTEREST

Source: NUSG

TABLE 20

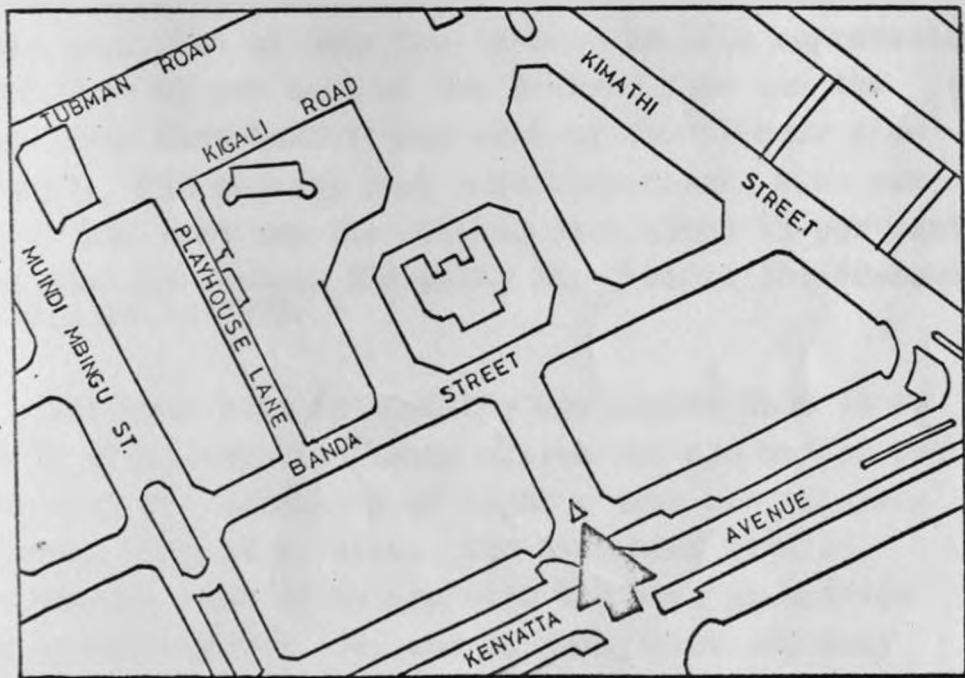
Building of potential Architectural and/or
Historical value : Nairobi Central Area: 1972

Plot No. LR. 209	Street or Location	Date	Original Use	Current Use
900	Kenyatta Avenue	1928	Premises of Noorali Dhanji	Westminister House
933/934	Muindi Mbingu St.	1928	Shops & Offices	Shops & Offices
1890	Banda Street	1928	MacMillan Library	Library
1000	Kenyatta Avenue	1929	Bank	Bank
2201	Rehmtula Road	1929	House	House
2184	" "	1929	"	"
2226	Tom Mboya Street	1930	Sesai Memorial Library	Library
2934	Lagos Road	1930	Mosque (Bohra)	Mosque
-	Faifa Road	1930	Law Courts	Law Courts
5577	Faifa Road	1931	Nairobi City Council	NCC
4393	Mfangano Street	1950	Library for Ismail Rehmtula	Library
3444	Parliament Road	1952	Parliament Building	Parliament
943	College Road	1904	Hotel	Hotel
939	Kenyatta Avenue	1912	Business Premises	Govt. Office
2334	Corner of Ronald Ngala Street and River Road	1918	Temple	Temple
134	Government Road	1920	Mosque	Mosque
6839	Kigali Road	1925	Mosque	Mosque
5578	Hama Ngina Road	1925	Presbytery	Presbytery
643	Kenyatta Avenue	1927	Restaurant	Bank
650	Corner of Haile Selassie Avenue & Govt. Road		Railway Headquarters	Railway Headquarters

Source: H U S G - Central Area : RYNDERS G.O. 1972



PLATE-5 Buildings of architectural and historical interest



viewpoint of PLATE 5

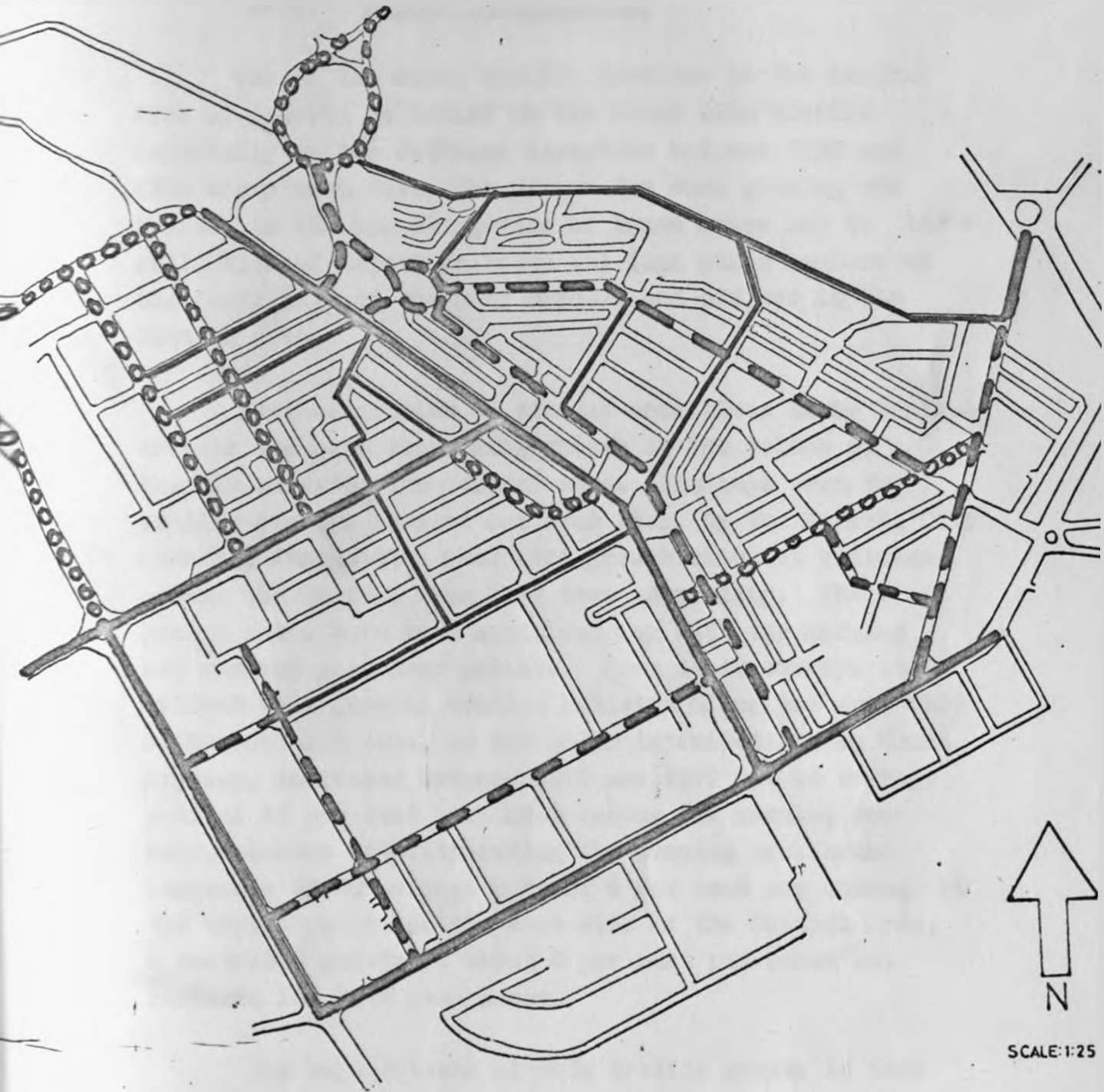
Heavy traffic flow occur on the routes surrounding that part of the Central Area containing the modern sector - Uhuru Highway, University Way, Government Road and Hails Selassie Avenue. Generally there are no such heavy circulation around the eastern half of the Central Area as there are no suitable routes to accommodate such movements. The most heavily used route is the section of Uhuru Highway between the Central Area and the Industrial Area.

The highest proportion of the intra-Central Area trips seem to cross in the north - south axis - along Tom Mboya Street, Government Road and across Kenyatta Avenue. Low proportions of the trips cross in the east - west direction.

Peak hour traffic - in 1970 the Central Area generated approximately 187,000 vehicles trip ends per 24-hour day. Out of this the 12-hour traffic represented between 80 - 85 per cent of the 24-hour flow and the average peak flow hour 11 per cent of the 12-hour flow (two-way). The morning peak hour directional flow was about 14 per cent and the evening peak about 13 per cent of the one way 12-hour flows. (6) Map 9 shows the 12-hour traffic flow in 1973.

The peak hour intensities are higher than those normally experienced in large cities and are may be due to the very low intensity of night - time and off-peak in Nairobi City as a whole. The peak hour traffic, incidentally, also coincides with the peak pedestrian flows in the Central Area and as such there are many conflict areas between the pedestrian and vehicles, with the pedestrian in the losing end in terms of safety, comfort as well as convenience.

CENTRAL AREA — NAIROBI



MAP-9

12 hour traffic flow

—————	5000	10000	vehicles
- - - - -	10000	15000	vehicles
○ ○ ○ ○ ○	15000	20000	vehicles
—————	20000	32000	vehicles

Source: A.Lulu University of Nairobi
1973

2.6.1 TRAFFIC DIFFICULTIES

One of the major traffic problems in the Central Area of Nairobi is caused by the lunch time traffic especially in the outbound direction between 1230 and 1300 hours each day. The reason for such peaking are related to the non-staggering of lunch hours and to the collection of school children (6) (and other members of the families) at the many schools and offices in the Central Area.

Another problem of traffic conditions in the Central Area is the ever increasing growth in the volume of traffic entering the Central Area. Findings from the traffic surveys carried out each year, by the Nairobi City Council, since 1972 show that growth rates of vehicles, around the Central Area have been increasing. These growth rates have been monitored for both the morning and evening peak hour periods. From these surveys it is evident that general traffic activity along the west side of the Central Area, at the major intersections on Uhuru Highway, increased between 1972 and 1975 at an average rate of 11 per cent per annum during the morning peak hour, whereas activity during the evening peak hour increased at an average rate of 6 per cent per annum. At the access points on the east side of the Central Area, a sustained growth of about 8 per cent per annum was recorded for both peak hours.

The implications of this traffic growth is that the rate of growth in private vehicle ownership over the next ten years will be approximately 110,000 vehicles about twice the 1975 level (6), and assuming a level of car utilisation similar to that recorded in 1970, this means that traffic volumes are bound to double over the 1975 - 1985 period. This would be an increase of some seven per cent per annum of daily (12-hour) traffic volumes (6).

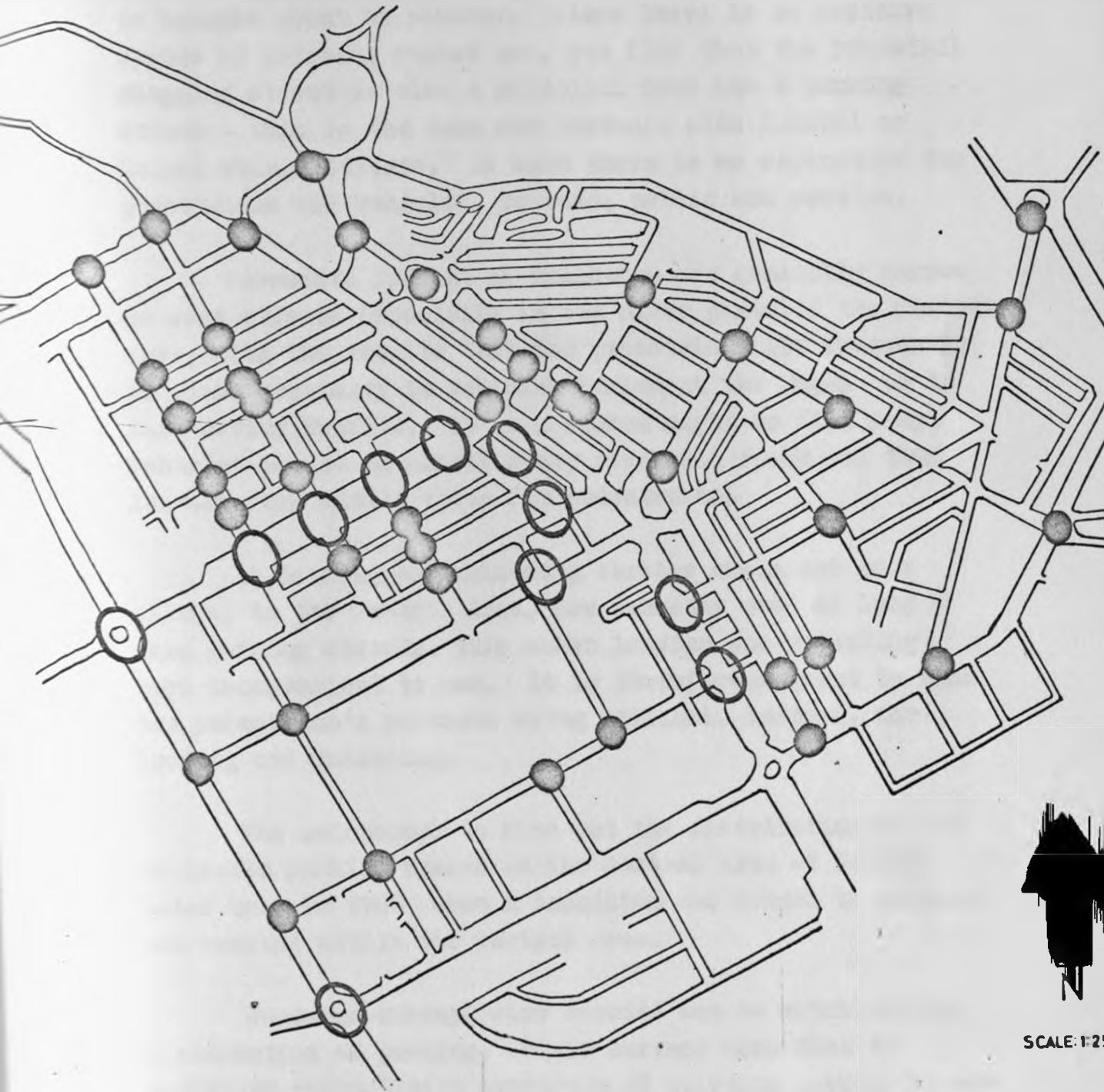
This rate of annual increase in traffic is sufficient to create intolerable demand on the road network in the City as a whole and almost unimaginable conditions within the Central Area of Nairobi.

One other traffic difficulty in the Central Area, apart from the congested streets is associated with the presence of a large number of critical intersections (Map 10). These are intersections which have relatively high traffic volumes and at which turning movements are difficult to make and delays are common. These critical intersections are not only a bother to the vehicles but also to the pedestrian traffic flows who cross them daily. Although most of these difficult intersections existing in 1973 and 1974 are not controlled by traffic signals (6), the pedestrian's lot has not been much improved, in that the duration (in seconds) of the pedestrian right of way is still not adequate in relation to the number of pedestrians that cross these intersections. Thus the traffic signals in the Central Area of Nairobi, at present, are highly in favour of the motor vehicle (This point is examined further in Chapter Three of the study).

2.6.2 - WARNING SITUATION

Whenever motor vehicles are permitted to enter into an area, the environmental conditions are altered. While by allowing vehicles into an area may improve accessibility for the vehicles at the same time environmental standards tend to lower. Environmental standards here is to be seen to refer to the general comfort, convenience and aesthetic quality of the physical surroundings and this is from the eyes of the people living or walking about in that area. In addition it may also refer to those aspects of the environment which are directly or indirectly affected by the presence of vehicles in urban areas.

CENTRAL AREA — NAIROBI



SCALE: 1:25,000

MAP - 10

- Critical intersections
- Existing traffic signals

Source: NUSG (1976)³

One notable problem in the Central Area of Nairobi is brought about by parking. Since there is no positive system of priority street use, you find that the principal shopping street is also a principal road and a parking street - this is the case for instance with Kimathi or Muindi Mbingu Streets. As such there is no separation for pedestrians and vehicles, private, public and service.

Pavements in front of buildings are generally narrow on most streets especially in the older parts of the Central Area, with the results that the pedestrians are frequently in close proximity to vehicles parked at the kerb or to fast moving traffic. It is a common sight to find many vehicles parked in almost every available space and thus leaving very little space for pedestrians.

As loading and unloading service areas and rear alleys, in the Central Area, are commonly used as long term parking streets, this makes loading and unloading bays inconvenient to use. It is therefore frequent to find the pedestrian's pavement being utilized, instead, for loading and unloading.

The endeavours to find out the distribution of the available parking spaces in the Central Area of Nairobi dates back to 1966 when a committee was formed to examine car parking within the Central Area.

Numerous surveys were carried out to establish the distribution of parking. Field surveys were done to establish quantitative estimates of existing parking places for both public and private parking in commercial buildings as well as surface and multi storeyed garages. The exercise also included manual counts for the unauthorized parking areas. The Central Area was thus divided into development parking districts and an estimate of both kerb and off-street parking was made for each district.

TABLE 21

Parking inventory data (1971)

CAR PARKING	NO. OF PLACES	%
Short-term Kerb Parking	6568	42.6
Long-term offstreet Parking	<u>8932</u>	<u>57.4</u>
Total	<u>15,500</u>	<u>100.0</u>

Source : K U S G 1973

Between 1966 and 1971, the amount of parking space had increased by some 13.6 per cent in the five years. This was an increase of 2.6 per cent per annum, compared with a growth in traffic at that time of 10 per cent per annum. Generally there has been a decline in the use of unauthorized parking places mainly due to the construction of new buildings on vacant sites. There is unbalance in this supply of offstreet parking to the east of Government Road where street parking accounts for some 90 per cent of the supply.

A survey of on street parking showed that practically all streets are affected by parking of some sort, irrespective of their traffic importance. By 1971 only 1536 out of 6,283 street parking places were metred which leads to unorderly use of street parking, whereby some vehicles are frequently parked on the pavements which should be solely for the pedestrian use.

2.6.5 - CONFLICT BETWEEN TRAFFIC AND ENVIRONMENT

The presence of vehicles in any part of a town brings about the problems of accidents, anxiety, inconvenience which are normally caused by large or fast moving vehicles that in many instances are out of scale with the environment.

Other problems, of course, include noise, fumes and vibrations which are associated with vehicles igniting and stopping or moving. Visual intrusion is also another problem introduced in an area by the presence of vehicles.

An analysis of the network capacity in the Central Area of Nairobi revealed that many of the streets were loaded to capacity (Network capacity, is when the peak hour traffic is compared with the street capacity to produce a volume/capacity ratio, a convenient measure of congestion).

A report (6) prepared by the planning section of Nairobi City Council in 1974, showed that (working on 1974 parking conditions in the Central Area) some 6.04 kilometres or 26.6 per cent of the Central Area network had a volume/capacity ratio of 1.0 or more which is interpreted as meaning that this proportion of the network had reached or exceeded capacity. The report said, a further 6.65 kilometres or 29.2 per cent had volume/capacity ratio of between 0.7 and 1.0, that is the approached capacity conditions. Thus approximately 56 per cent of the Central Area network was congested and caused delays during peak hours to both traffic and pedestrians. A critical examination revealed that much of this congestion was brought about by on-street parking and illegal parked vehicles. According to the report (6), a 0.9 volume/capacity ratio is assumed to be acceptable.

Environmentally, however, any conditions of congestion are unwanted. Ideally the environment capacity of a street should be lower than the theoretical traffic capacity which therefore means that a volume/capacity of not greater than 0.7 or 0.8 should be the most appropriate especially on busy shopping streets, for this kind of range would provide adequate time for pedestrians to cross traffic routes and also reduce noise and exhaust pollution levels, but at the same time would affect parking availability (6).

The most environmentally defective streets in 1974, were Government Road, Biashara Street, Muindi Mbingu Street and Wabera Street, Tom Mboya Street and River Road, as indicated by a technical report/^{by} the Nairobi City Council (6). The report also noted that all the above streets were shopping streets with high volume/capacity ratios.

2.7 FUTURE ROLE OF THE CENTRAL AREA

According to the Nairobi Urban Study Group (4), there can be little doubt that Nairobi will and should maintain its roles as the centre of national and international commerce and administration in Kenya. As its international functions expand there will be increasing demands only for prestige business accommodation but also for the many other facilities needed to cater for the growing numbers of people. Other secondary functions, which at present take up a considerable area of the Central Area and which are likely to continue, include cheaper accommodation of all kinds and increased space for retail food outlets.

Even if the policy of decentralization of as many as possible of the public administration functions, (such as the spread of the government departments beyond the Central Area to the Hill Area office complex) is implemented, the future role of the present Central Area of Nairobi would still be to accommodate:-

- (i) the headquarters of national and city government;
- (ii) the headquarters of national and international commerce;
- (iii) the centre of tourist activity - hotels, local and international tourist agencies and transport facilities, tourist - oriented shopping and restaurants;
- (iv) specialist and luxury shops;

- (v) University and higher education;
- (vi) A limited amount of general shopping, a local market to cater for the employees in the Central Area and the residents of the surrounding neighbourhoods;
- (vii) Service industrial for governmental and commercial firms and for low and medium income markets;
- (viii) Central level of entertainment facilities;
- (ix) Some middle income housing and ancillary facilities for shopkeepers and employees.

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CHAPTER 2

THE PROBLEM OF PEDESTRIAN MOVEMENTS IN THE CENTRAL AREA OF NAIROBI

3.1 - PEDESTRIAN GENERATORS

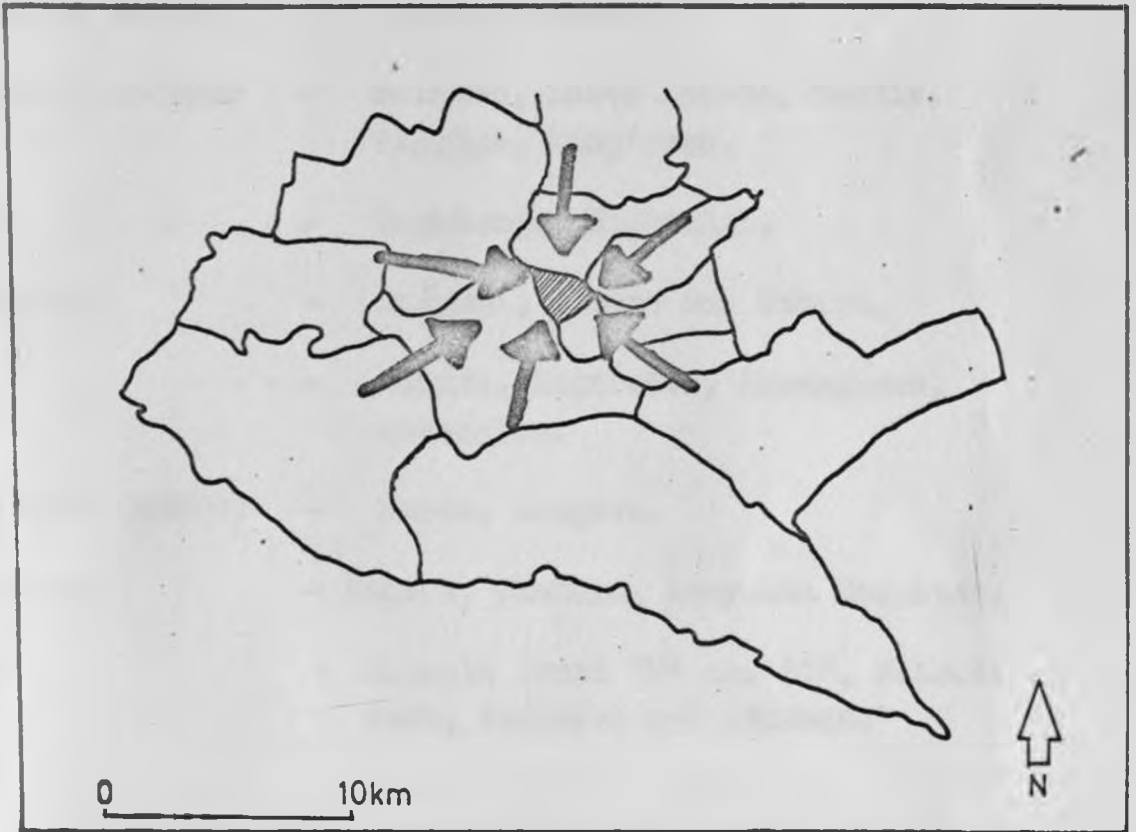
From the findings of N U S G in 1970, it was evident that walk trips for all purposes dominated the modal split. 44.6% of the commuter trips were made on foot as compared to 30% by private transport and 14% by public transport with cycling having the lowest percentage. These trips were from the various residential areas to either work, school, shopping or other useful purposes.

In 1970 the vast majority of trips, in Nairobi, fell within the range between 0 and 5 miles (8 km). The majority of walk trips occurred in the lower distance ranges, some 70% were below 2 miles (3.2 km) and 85% were below 3 miles (4.8 km). The percentage of walk trips falls rapidly with increasing distance but nevertheless maintains a significant element up to the greatest distances considered.

The various residential suburbs outside the Central Area are the major pedestrian generators to the Central Area and the Industrial Area. Map 11 shows the pedestrian generators from the various directions of Nairobi to the Central Area. The list below gives the location of the major residential suburbs in Nairobi that are regarded as pedestrian generators. The compass directions are a guidance to their location in relation to the Central Area:-

EASTWARDS - Uhuru, Makadara, Jericho, Jerusalem, Bahati, Kileleshwa, and Shaurimoyo.

WESTWARDS - Eastleigh, Pangani, Ngara and Pumwani.



MAP 11 Pedestrian generators

 Central Area

- SOUTH-EAST (OUTER)** - Embakasi.
- EAST (OUTER)** - Cutering, Kuru Dura, Umoja.
- NORTH-EAST** - Kuaraka, Kariobangi, Dandora, Kariobangi South.
- NORTH-EAST (OUTER)** - Kamiti, Kahawa.
- NORTH-WEST (OUTER)** - Mimito, Lower Kabete, Gachie, Mangige, King'ero.
- NORTH** - Parklands, Highridge.
- NORTH-WEST** - Langeni, Kabete and Uthiru.
- WEST** - Riruta, Kagorotti, Kawangware, Lavington.
- SOUTH-WEST (OUTER)** - Karen, Langata.
- SOUTH-WEST** - Tibera, Jamburi, Kenyatta Hospital.
- SOUTH** - Nairobi South "B" and "C", Nairobi West, Madaraka and Otieno.

Apart from those pedestrians that commute on foot to and from the outlying residential suburbs, then those who commute by means of public transport, namely the 'Kenya Buses', 'Matatus' and the 'Country' buses. There are also those who come into the Central Area by means of private cars.

As such the various arrival - departure points of these modes of transport can also be viewed as pedestrian generators within the Central Area. These arrival - departure points within the Central Area include the bus stops of which the busy ones are:-

- Hilton - City Hall Way
- G.P.O. (General Post Office) - Kenyatta Avenue

- Tusker - Ronald Ngala Street
- University Way
- Ambassadeur Hotel - Government Road
- Development Bank - Government Road
- Nation House - Tom Mboya Street
- O.T.C. - Race Course Road

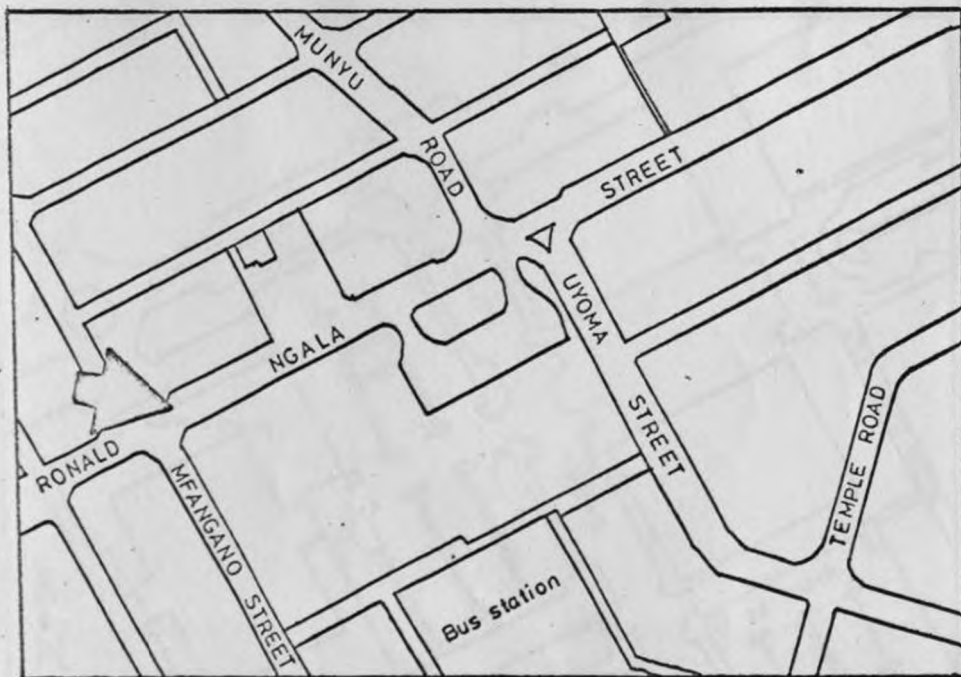
The "matatus" have no officially recognized stops and stages and they tend to compete with the "Kenya Bus" and as such utilize the "Kenya Buses" stops. It is however a common sight to find them ("matatus") stopping anywhere on the streets to pick or drop their passengers. Below, are some major "matatu" spots (arrival - departure) within the Central Area:-

- Accra Road
- 'Kaka Hotel' - Racecourse Road near St. Peter's Clergers Church
- Near Railway Station - Government Road
- Agip House - Haile Selassie Avenue
- Railway H.S. - " " "
- Near Bus Station - Turkana Lane
- Tusker - Ronald Ngala Street
- Opposite O.T.C. - Racecourse Road
- River Road - Tom Mboya Street roundabout
- Junction of Landhies Road and New Pumwani Ring Road
- Behind the Retail Market on Pumwani - Landhies Roads.

As for the country buses, most of them arrive and depart at the Country Bus Station along Landhies Road to the east of the Central Area. Railways Headquarters, Agip House and outside the Extelecoms buildings (all on Haile Selassie Avenue) are other busy spots for the country buses.



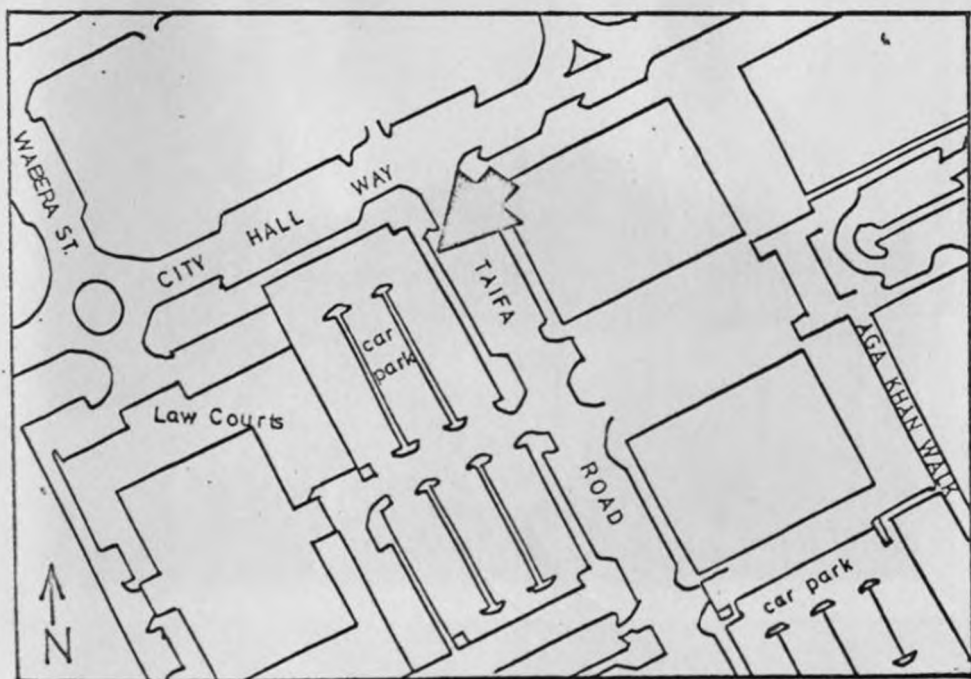
PLATE-6 Pedestrian generator - bus/matatu stage



viewpoint of PLATE 6



PLATE- 7 Pedestrian generator- car park



viewpoint of PLATE 7



PLATE-8 Inconvenience to pedestrians:
cars parked on pavement(sidewalk)



PLATE-9 Pedestrian generator:
matatu arrival-departure
point

The various land - uses in the Central Area of Nairobi are also pedestrian generators for it is there that people go to and from daily. (See map of land - use in the Central Area).

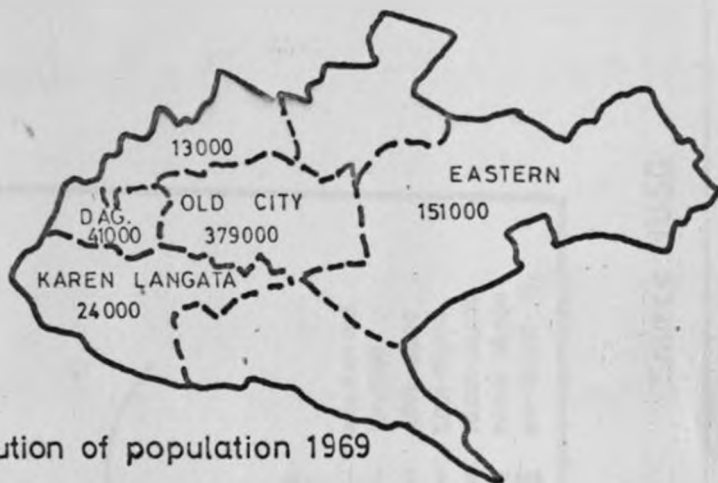
Most of the pedestrian commuter traffic to the Central Area of Nairobi comes from the eastern suburbs via Maccourse Road, Landies Road, Secra Road and Muringa Road. Other important routes include workshops Road from the Industrial Area and railway yards; City Hall Way and Kenyatta Avenue from the Hill Area office Complex and to a lesser extent Haile Selassie Avenue and State House Road (see Map).

Map 12 shows the distribution of population in Nairobi in 1969 while Map 13 and 14 give the recommended strategy by H U S G and population distributions for 1985 and 2000 A.D. respectively.

Table 22 gives the modal split (unrestrained*) for Nairobi in 1970 and possible situations in 1985 and 2000 A.D. Table 23 gives the predicted daily trips by different modes of travel, in Nairobi by 1985 and 2000 A.D. These percentages are based on the assumptions by H U S G that will be 2.5 million daily trips in Nairobi by 1985 and 5.8 million such trips by 2000 A.D. as compared to 0.6 daily trips in 1970.

Map 15 shows the 1970 walk movements in Nairobi by sector. The figures for the intrasector walk movements shows that the Central Area experiences a lot of walking movements as compared to the other sectors of Nairobi. The assumption by this study is that this trend will continue and that the intrasector movements will still be more in the Central Area by 1985 and 2000 A.D.

* 'Unrestrained' - in which levels of provision were directly related to the demand, with car ownership being determined by income level.



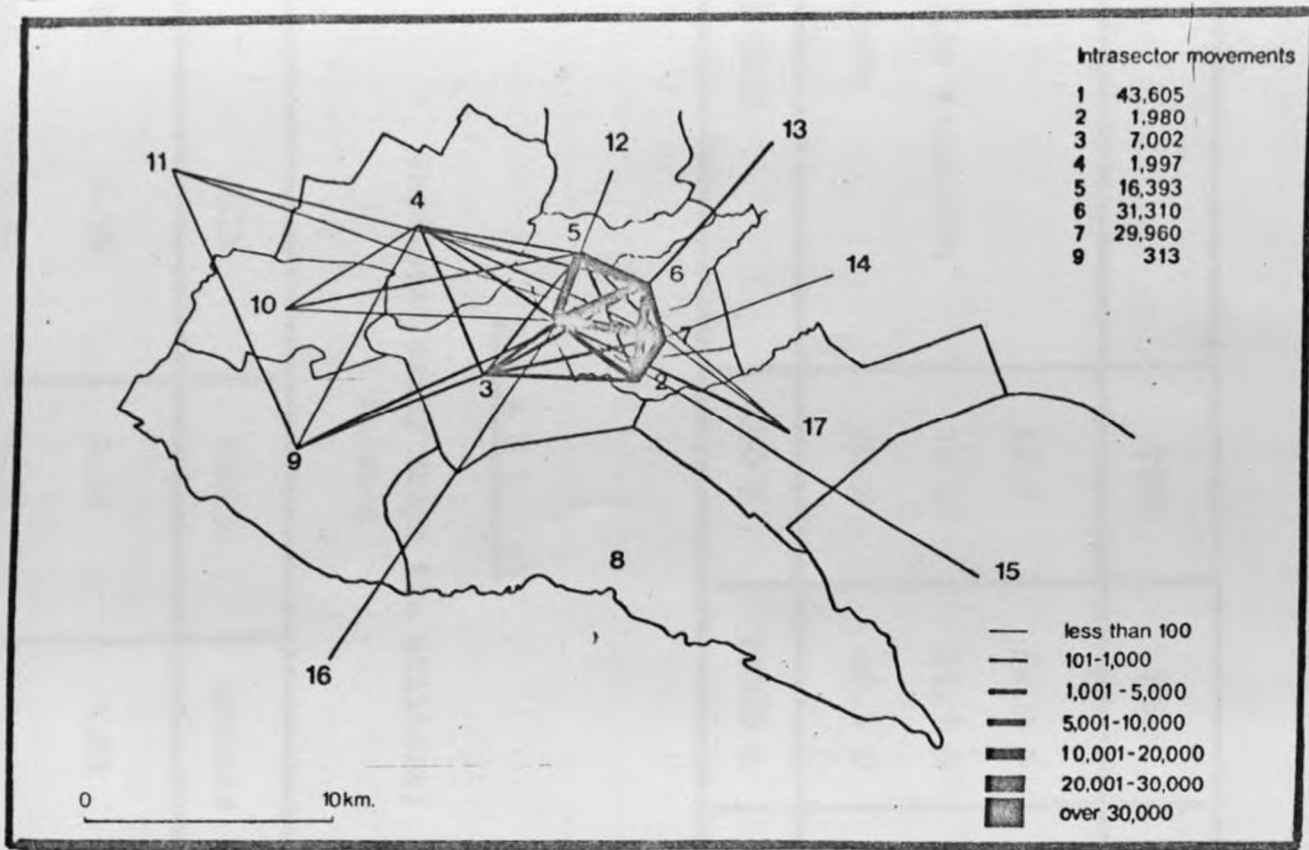
MAP-12 distribution of population 1969



MAP-13 Recommended strategy -
distribution of population 1985



MAP-14 Recommended strategy -
distribution of population 2000



MAP-15 1970 walk movements by sector

Source: NUSG

TABLE 22

Modal Split (unrestrained) : Nairobi

	1970	1985	2000
Walk	46 %	38.0 %	24.5 %
Public transport	14 %	21.7 %	19.7 %
Private	40 %	40.3 %	55.8 %
ALL MODE	100 %	100.0 %	100.0 %

TABLE 23

Predicted daily trips (in millions)
: Nairobi

	Walk	Public	Private	Total
1985	0.95	0.54	1.01	2.5
2000	1.42	1.14	3.24	5.8

3.2 - EXISTING PEDESTRIAN POLICY

Since the problem of pedestrian movements in the Central Area of Nairobi takes a lower priority in the City's transportation planning process, there is thus no positive and effective pedestrian policy. There are no radical solutions which are proposed for the improvement of the pedestrian traffic within the Central Area, despite the fact that all busy pedestrian routes should have signalized crossings and generally all traffic management should favour pedestrian movements as much as possible (1).

Apart from the zebra-crossings and a few signal controlled crossings the only grade separated pedestrian crossing facility open to general public is the footbridge across Haile Selassie Avenue, joined to the New Post Office parcel sorting building and the Kenya Polytechnic compound. This footbridge is, however, not in the line of major pedestrian movement and this was due to building restraints (1). The footbridge would have been on a more appropriate position if it had been located so as to form a continuation of Aga Khan Walk, for at the junction of the Aga Khan Walk and Haile Selassie Avenue there is a busy arrival - departure stops on both sides of the Avenue. These stops on Haile Selassie Avenue are widely utilized by the public buses, 'matatus' and country buses.

A pedestrian tunnel exists under Uhuru Highway, north of the University Way intersection which provides a vital link for the students walking from the lecture halls and the main library on the main campus of the University of Nairobi to the residential and recreational areas on State House Road. This tunnel, however, at times suffers from lack of adequate street lighting and security fencing. If more safety measures could be provided it would be heavily used than it is at present. Other pedestrian tunnels exist under, the Muranga Road roundabout near 'Globe Cinema'.

The east side of the Central Area has the least in terms of pedestrian facilities and it is therefore not surprising to find that major intersections, the vehicle - pedestrian conflict is of disproportional ratios. For instance, an average of 3,500 pedestrians per hour cross the New Mumiani Ring Road at its junction with Landhies Road and this surpasses all known standards for at - grade crossing facilities.

One of the City Council by-laws requires that every new development (buildings) in the Central Area of Nairobi should provide a canopy over the pedestrian pavement (sidewalk).

Although the City authorities do not officially recognize the informal sector activities in the Central Area, very little is done to check on the numerous temporary activities that go on the pavements of the streets and thus causing inconvenience to pedestrians.

The traffic regulations do, however, forbid jaywalking at zebra and other crossing points on the streets. This law is rarely enforced by the relevant authorities.

With the recent installation of signal controlled crossing points, the pedestrians (and drivers too) are required to comply with the signal symbols that give the right of way to the road users. On the part of pedestrians, any person who fails to comply with the mandatory requirements imposed by the red light on the signalled crossing points can be fine, in a court of law, up-to 600 Kenya Shillings.(2) But the signal light controls still being in their experimental stages within the control Area, the police authorities have to be reluctant to enforce this law as yet.

The original design for the Central Area study prepared in 1971 included only one objective, among others, that was related to the movement of vehicular and pedestrian traffic. The relevant objective was to provide safe and direct access to the Central Area for pedestrians and cyclists (1). The implementation of the object is yet to materialise.

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3.3 - PROBLEM AREAS (SELECTED)

Areas that are problematic to the movements of pedestrians in the Central Area of Nairobi are so numerous and widespread that it was not possible for this study (in light of already stated limitations) to cover all of them in detail. The study has, therefore, confined itself to selected sites for detailed analysis and these are:-

- 1 - Uhuru Highway near junction with City Hall Way;
- 2 - Haile Selassie Avenue's Zebra crossing near the Landlies Road - New Pumwani Ring Road - Pumwani Road roundabout;
- 3 - Jogoo House 'B' pavement (sidewalk) on Harambee Avenue;
- 4 - Luthuli Avenue pavement (sidewalk);
- 5 - Pumwani Road pavement (sidewalk);
- 6 - Signalized crossing on Government Road junction with Cabral Street;
- 7 - Aga Khan Walk - the part between City Hall Way and Harambee Avenue; and

- 8 - The footpath leaving Kirinyaga Road (near Voi Road) and going across the Nairobi River.

It is assumed that the problems encountered by pedestrians at these selected areas are representative of the other problem areas in the Central Area that the study did not cover. Map 16 show the location of the studied problem areas in the Central Area of Nairobi.

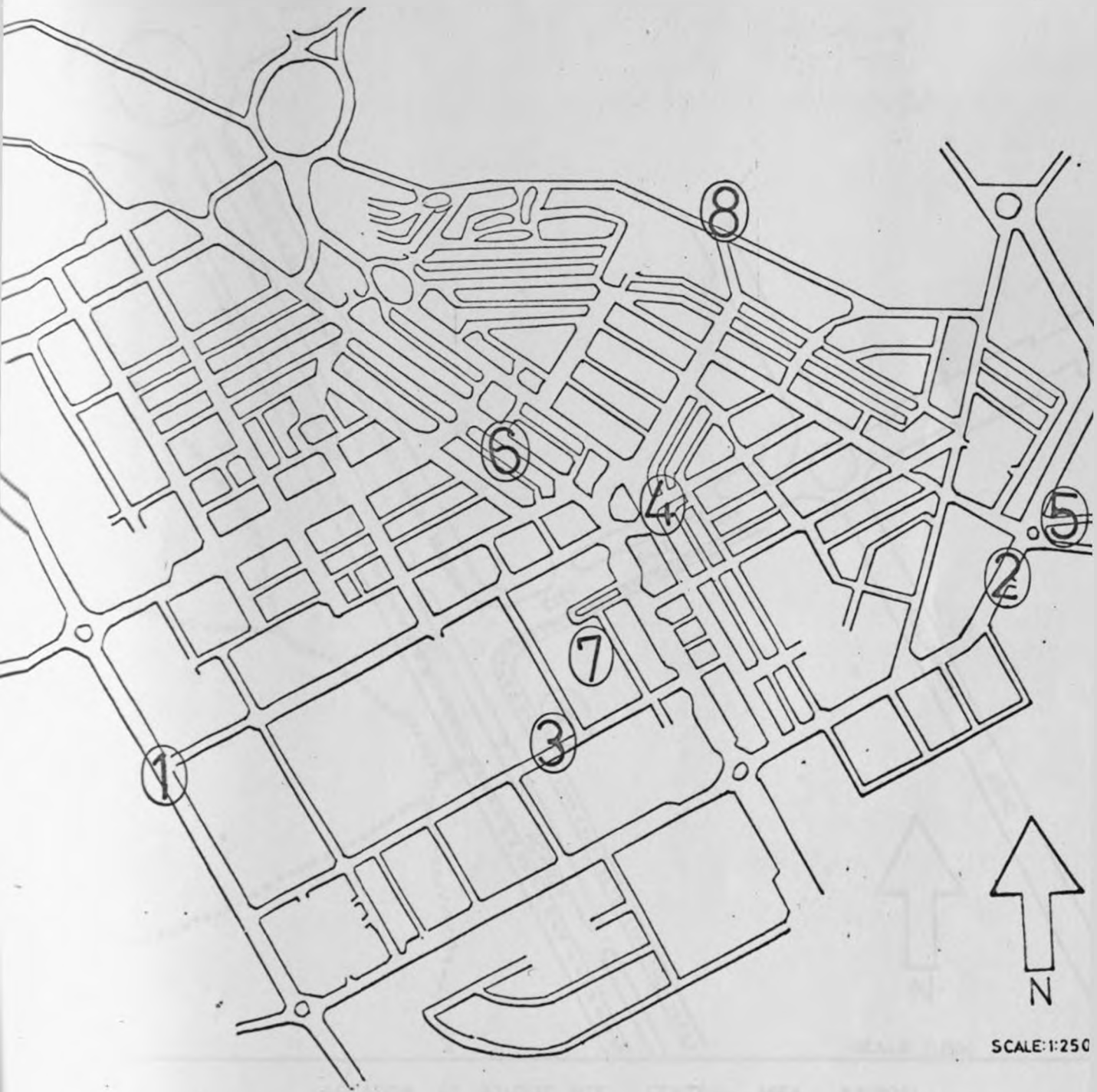
3.3.1 - UHURU HIGHWAY UNCONTROLLED CROSSING

Uhuru Highway is the main access road to the Central Area of Nairobi from the west and also the main direct route to the Industrial Area. The highway is a dual carriageway with three lanes on each carriageway and a central median. The width of the highway is 24 metres and each traffic lane is three metres wide, thus leaving the central median (at the crossing point) a width of 6 metres.

'Pedestrian - only' phases are incorporated in the traffic signal mode of operation on Uhuru Highway. While they provide a measure of relief to pedestrians they cannot cope with the peak hour pedestrian flows.

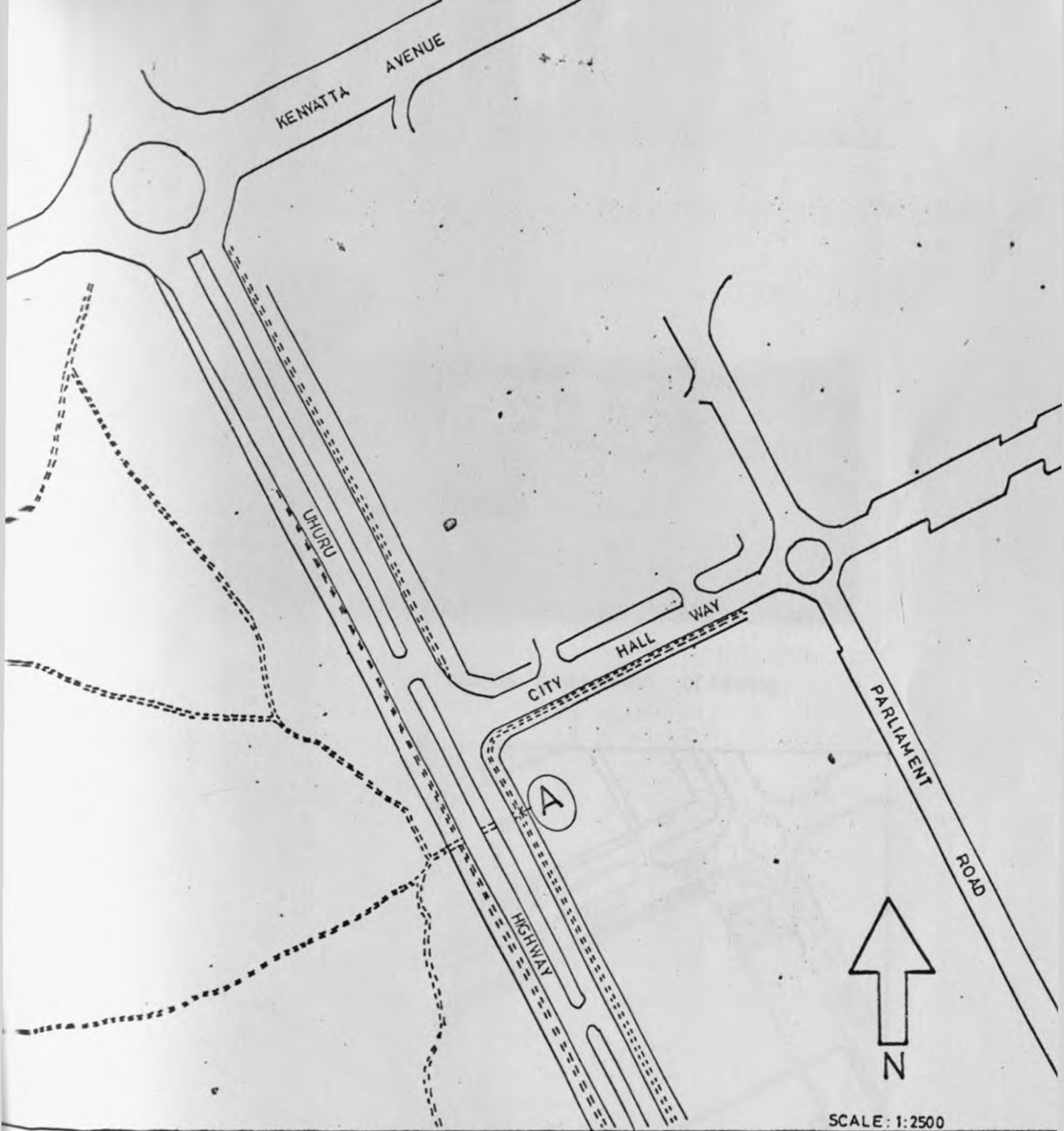
The major pedestrian crossing point on Uhuru Highway to and fro Uhuru Park is near the City Hall way (near Hotel Inter-Continental). This crossing point is 290 metres and 410 metres from Uhuru Highway/Haile Selassie Avenue and Uhuru Highway/kenyatta Avenue signalised crossing points respectively. The distance from the crossing point to the City Hall way/Uhuru Highway junction is only 35 metres long. The concrete pavement that the pedestrians have to wait on the Central median is 6 metres wide and 3 metres long and is diagonally shaped.

CENTRAL AREA — NAIROBI



MAP-16 - Location of studied sites

- | | |
|---------------------------|-------------------------------|
| ① Uhuru highway | ⑤ Pumwani road sidewalk |
| ② Haile selassie avenue | ⑥ Goverment road crossing |
| ③ Jogoo House sidewalk | ⑦ Aga khan walk |
| ④ Luthuli avenue sidewalk | ⑧ Footpath off Kirinyaga road |

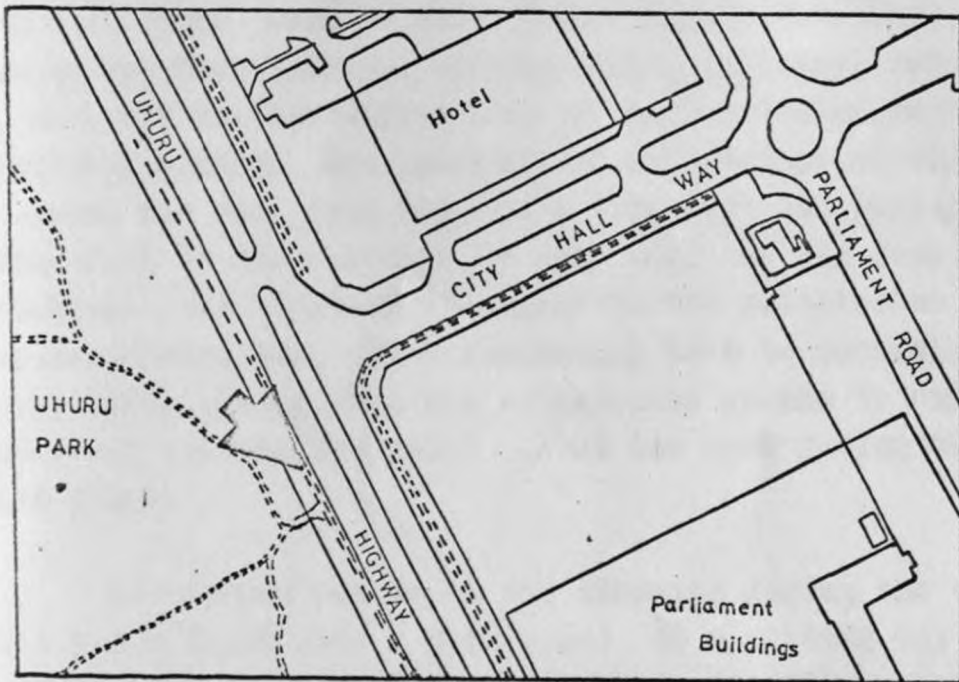


LOCATION OF STUDIED SITE CENTRAL AREA NAIROBI

(A) UNCONTROLLED PEDESTRIAN CROSSING
ON UHURU HIGHWAY



PLATE-10 Uncontrolled pedestrian crossing



viewpoint of PLATE-10

This crossing is, however, uncontrolled and as a result has a high proportion of accidents and long pedestrian delays. There is a steadily increasing hazard to life and property caused by the increasing volume of pedestrian traffic which has to cross the highway to reach the recreational facilities in Uhuru Park and offices on the 'Hill Area Office Complex'.

Since 1971 the number of offices and the volume of pedestrian traffic has increased tremendously and at the same time there are between 8000 and 9000 civil servants working on the hill, the vast majority of whom walk to and from work across the Highway (1).

This flow of pedestrians from the Hill Area Office Complex has to cross Uhuru Highway when the motor vehicle traffic is at its peak. Thus pedestrians using this uncontrolled crossing (near the Inter-Continental Hotel - City Hall Way) seem to have a hard time of it, particularly during the rush-hours on working days. Drivers, desperate to beat the traffic lights pass by this crossing point at breakneck speeds. The hundreds of pedestrians attempting to cross the road from the Uhuru Park side can barely put their foot on the carriageway lest they are run over by vehicles. The frustration caused to the pedestrians (and the motorists, too, who occasionally have to suddenly apply their brakes when the pedestrians decide to force their way across the road) is at its apex during the peak hours.

Pedestrian counts at the crossing during the evening peak hours (4.00 p.m. - 5.00 p.m.) of a working day gave an average of 1,390 pedestrians. In 1972, February, the number of pedestrian's crossing at this point was about 1250 per hour during the peak times of working days and an average of 766 per hour during the whole day.

In 1973, there was a flow of between 20,000 and 32,000 vehicles in a 12 hour flow (2). During the surveys for this study there was an average of 2,400 vehicles that passed during the evening peak hour (4.00 p.m. - 5.00 p.m.) of a working day.

Observations at the site showed that during the evening rush hour (4.00 p.m. - 5.00 p.m.) it took an average pedestrian some 62 seconds to cross the highway. This timing compares unfavourably to the 17 seconds that it took an average pedestrian to cross the highway during the off-peak times or when there were few cars and longer gaps in the traffic flow. The method used in determining the various time taken to cross the highway at different times of the day as follows:-

- a) time taken by a pedestrian while waiting on the kerb for a gap in the traffic flow;
- b) time taken to cross one side of the carriageway;
- c) time taken while waiting on the central refuge for a gap in the traffic flow on the second carriageway; and
- d) time taken to cross the second side of the carriageway of the highway.

Analysis of the data collected revealed that the pedestrians wishing to cross the highway at the site of study endured a lot of delays.

The Buchanan report considered that an average delay, to all crossing pedestrians of two seconds was a rough guide to the borderline between acceptable and unacceptable conditions for pedestrians (3).

Pedestrians delay when a person is trying to cross a road, depends upon the gap in the traffic stream that is looked for by the person in order to cross the road.

This, in turn, depends on the width of the street, the mental and physical agility of the person concerned. Traffic planners tend to assume that the pedestrian requires a five second gap in the traffic stream to get across the road (4) (5). Furthermore, on a test street, 30 feet wide (6), it was found that it took people an average of six seconds to get across (not including thinking time), while many, older people, women with children, were taking eleven and twelve seconds. On four lanes with a central refuge it was found that five seconds were required for each carriageway.

A more generous allowance than some traffic planners have entertained (4), allows a seven second gap in the traffic stream for people, but on the thirty foot road even this requires a speed of 3 m.p.h. which is a considerable strain for the less energetic and athletic (see table 24).

TABLE 24

People crossing : speed and distance

Speed in M.P.H.	Seconds required to cross the road		
	18ft. road	24ft. road	30ft. road
1	12.3	16.4	20.5
1.5	8.2	10.9	13.6
2.0	6.1	8.2	10.2
2.5	5	6.5	8.3
3.0	4	5.4	6.8
3.5	3.5	4.7	5.8
4.0	3.1	4.1	5.1

Source : J. R. Allison, A. J. Johnson
M. Stevenson and D. Chris, 1972.

There is thus a need to allow a suitable gap in the traffic stream for the different groups of people, and this must be calculated taking into account the function of the road in question, its width and frequency of refuges.

It is for the above stated reason, that although it has been suggested (5) that "the critical point for pedestrians is reached when the traffic flow is about 500 v.p.h.", when the average delay to pedestrians is calculated at about two seconds, this level must be considered as unfavourable to people because it only allows for a break in traffic stream of five seconds. If more than five seconds is required, and it is thought to be (6), then to achieve a longer time it is necessary to reduce the vehicle flow, or increase the spacing of the vehicle flow. May be instead of these two (reduction of vehicular flow or spacing of the vehicular flow) time interval should be increased, since with this you will have to open new links.

The pedestrians, from Uhuru Park side, wishing to cross the highway at this uncontrolled point had to wait for some 12 to 30 seconds, during the evening peak hours (4.00 p.m. - 5.00 p.m.) looking for a gap in the traffic stream. Consequently most of them, obviously frustrated, opted to taking risks by dashing across the highway.

Therefore, unless remedial measures are taken up by the City Council authorities, the accident rates are bound to escalate at this uncontrolled on Uhuru Highway.

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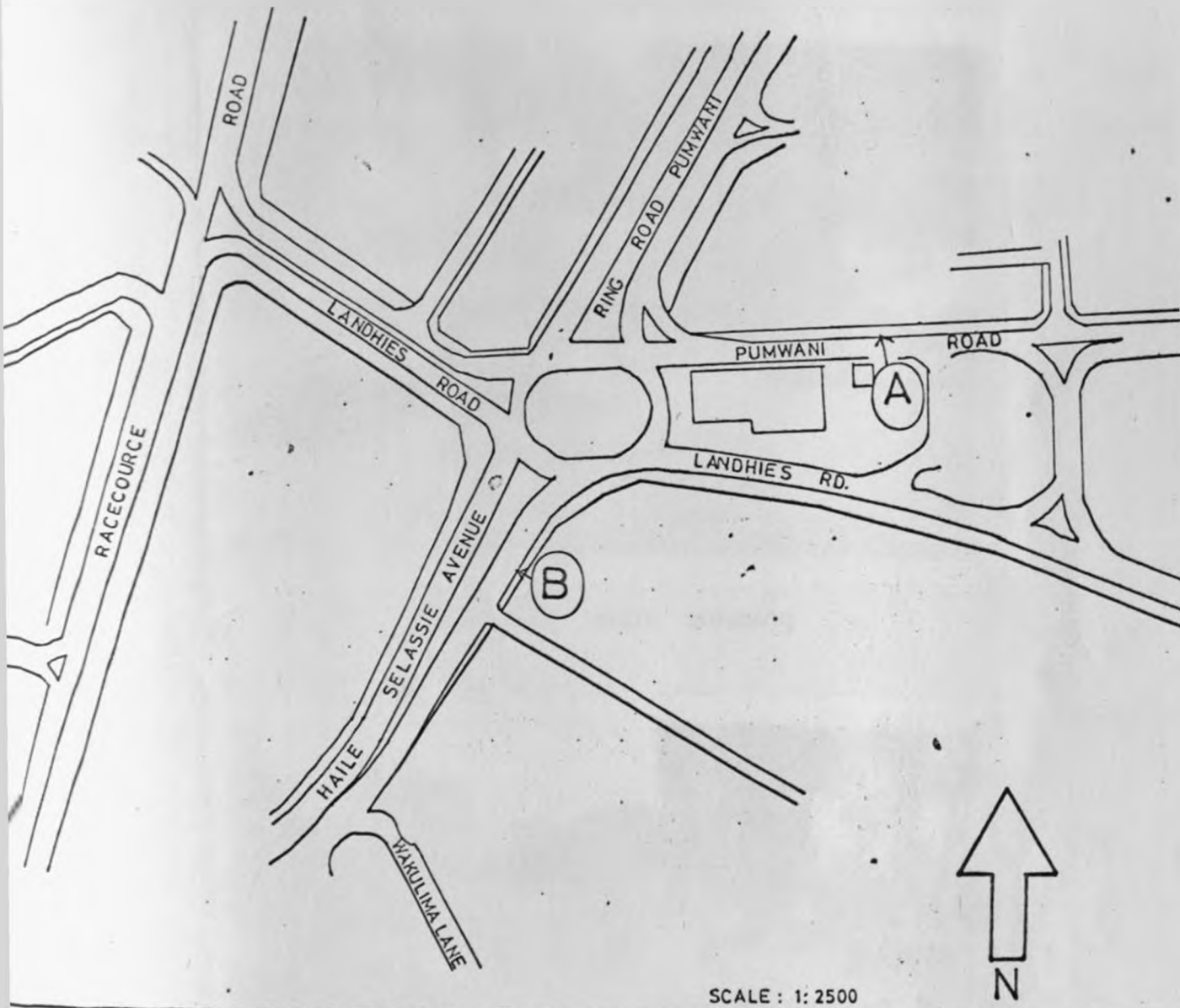
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3.3.2 - ZEBRA CROSSING - HAILE SELASSIE AVENUE NEAR THE RUTHURWA ROAD ROUNDABOUT

This problem area is located on the Haile Selassie Avenue near the Haile Selassie - Landhies Road - Ruwani Road and New Ruwani Ring Road roundabout.

The zebra crossing lies across a dual carriageway. Each carriageway has three lanes. There is a continuous central refuge the site. The width of the Avenue at the studied site is about 30 metres.

The flow of pedestrians crossing the zebra in a day varies between 550 and 650 pedestrians per hour. Pedestrian counts during the evening peak hours show that some 4,200 pedestrians cross the zebra (both direction between 4.30 p.m. and 5.45 p.m.). During the same period the traffic flow is about 2,000 vehicles. The outer carriageway (near the Ruthurwa Railway Landhies) is frequently used by the public transport buses.



LOCATION OF STUDIED SITES — CENTRAL AREA — NAIROBI

- (A) PUMWANI ROAD SIDEWALK
- (B) ZEBRA CROSSING - HAILE SELASSIE AVENUE



PLATE 11 Obstructed zebra crossing



PLATE 12 Busy zebra crossing

The main purpose for studying this problem area was to observe the various problems pedestrians face while utilising one of their facilities. At zebra crossings it is generally assumed that the pedestrian has the right of way once he or she has set a foot on the crossing before the vehicle reaches or passes the crossing point. Thus zebra crossings rely too much on the cooperation between the motorists and pedestrians for their success.

This zebra crossing on Haile Selassie Avenue is a major pedestrian commuter route used both by workers and school children going to the Central Area from the eastern residential suburbs and vice versa.

Observations carried out at the zebra crossing revealed that there are quite a number of problems that face pedestrian movements. Below are the major observations noted:

- i) Very few vehicles stopped for pedestrians waiting on the kerb at the zebra crossing. This meant that pedestrians had to move on the crossing (and gain their right by force) in order to make some of the vehicles stop.
- ii) Further observations showed that drivers paid less attention to pedestrians when the pedestrians were few. This therefore indicates that zebra crossings alone are not adequate means of safety especially on other zebra crossings in the Central Area where few pedestrians were crossing.
- iii) It was also observed that drivers tended to pay little or no attention at all, to pedestrians wishing to cross the road at the zebra, when the vehicle speed was high. Observations made during the off-peak periods showed that not a single vehicle stopped at the zebra crossing when the speed was highest (over 50 km per hour).

Although no detailed analysis carried out at the site to determine the mean speed for vehicles not stopping for pedestrians at the zebra crossing. The rough analysis made above is somewhat in line with the finds of other studies done elsewhere.

For instance study done in a European country shows that few vehicles stopped at zebra crossings when at high speeds as shown by Table 25.

- iv) There were occasions where drivers drove their vehicles among a group of pedestrians already on the zebra crossing. Obviously this is dangerous especially to the old or handicapped pedestrians. This particular zebra crossing is frequently used by old women with heavy loads of vegetables and other bulky goods from the nearby wholesale market along Wakulima Lane.
- v) The presence of three motor traffic lanes on each carriageway also present crossing problems to pedestrians on this Avenue. Sometimes motorists on the outer lane made a mistake at this zebra by not counting on a pedestrian who was intending to cross the road, being hidden by a vehicle which has stopped or parked in the lane nearest to the kerbstone.
- vi) Many pedestrians were forced to dash out between moving vehicles especially in long lines of motor vehicles during the peak hours. This dashing - out habit was noted to be common among the small children (age 8 to 10 years) from the nearby 'St. Peters Claver' Primary School.

From such observations it is quite apparent that the present simple zebra crossing on this Avenue is not satisfactory especially at such a crossing where there is a high pedestrian flow.

TABLE 25

Number of vehicles stopping for pedestrians
while Crossing

Zebra Crossing No.	Mean speed for vehicles not stopping (km/h)	No. of vehicles stopping for pedestrians while crossing (%)*
1	23	45
2	18	48
3	26	32
4	28	20
5	53	0

Source : Study by SANKHARU 1975

- * This percentage is calculated in relation to the total number of vehicles that should have stopped for pedestrians while crossing.

REFERENCES

- 1) TORE VAAJE - "Analysis of pedestrian accidents as a basis for priority of safety measures".
 J.I.P; CONGRESS 24/25 JUNE 1976 -
 'CROSSING THE ROAD' AT GEICO, NORWAY.

3.3. 3. - JOGOO HOUSE 'B' - PAVEMENT (SIDEWALK)

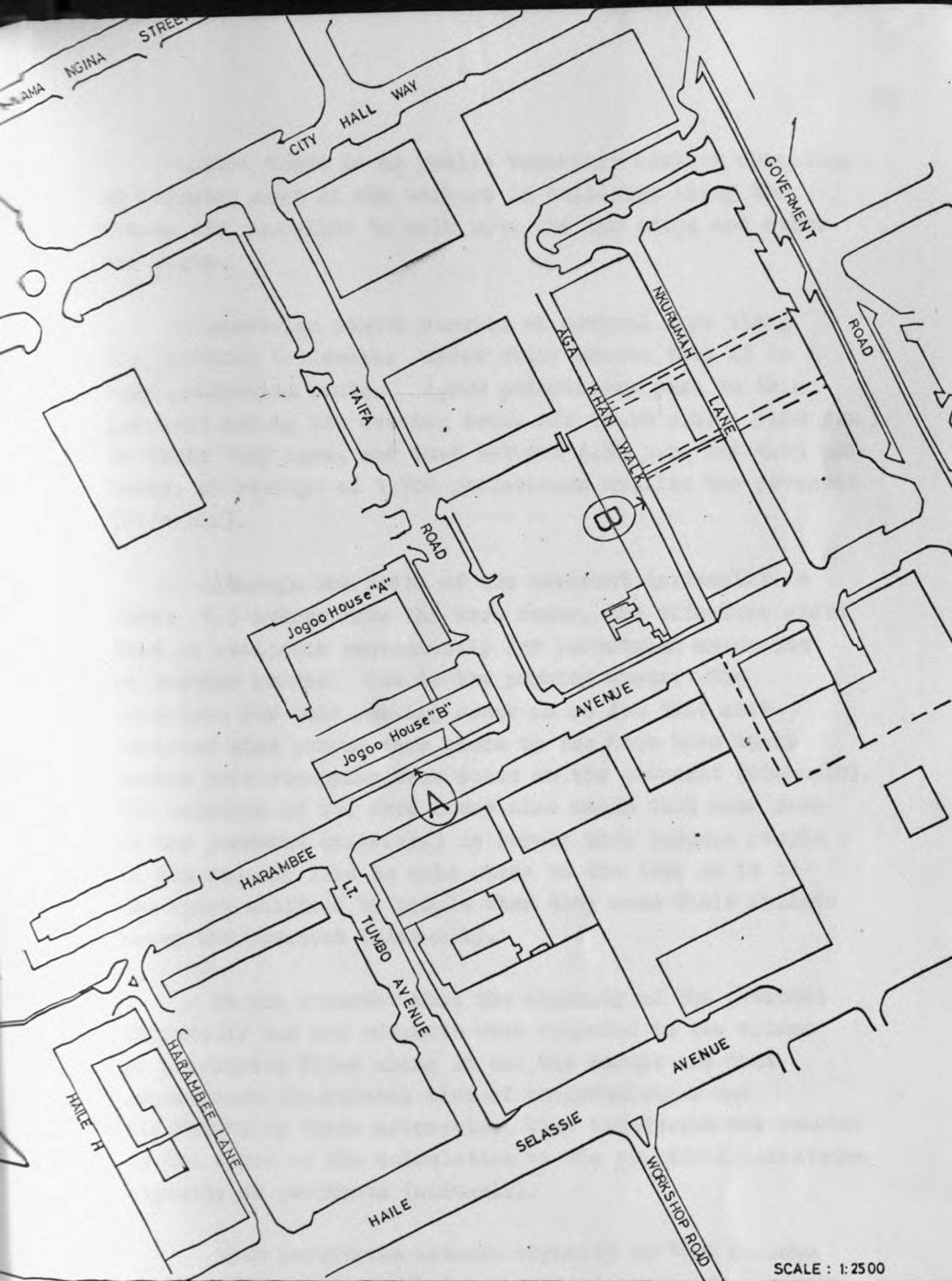
The problem area is located along Harambee Avenue near its junction with Taifa Road.

Along Harambee Avenue are found Government Office buildings (such as Jogoo House, Treasury, Presidents Office, Sheria House, Parliament and Kenya Police Headquarters) and other establishments like banks, insurance and motor vehicle sales companies. Perhaps the most important landmark on this avenue is the Kenyatta Conference Centre building. This building attracts many tourists and conferences throughout the year.

Harambee Avenue is a two-way traffic road with angle or kerb parking on the side. Outside Jogoo House 'B' there's an angle parking system.

The pavement (sidewalk) studied is located outside the Jogoo 'B' House. The pavement is about 80 metres in length and its width from the iron fence to the road is about 1.95 metres. The surface of the pavement (sidewalk is composed of concrete slabs).

Nearly all (except those with private cars) civil servants coming into the two Jogoo House are required to use only one entrance and this creates congestion and inconveniences especially during the lunch breaks and in the evening after 4.30 p.m.



SCALE : 1:2500

MAP-19

LOCATION OF STUDIED SITES — CENTRAL AREA — NAIROBI

(A)

JOGOO HOUSE PAVEMENT (SIDEWALK)

(B)

AGA KHAN WALK

Since there is no public transport service operating on Karambae most of the workers in buildings along the Avenue are compelled to walk upto the bus stops and other car parks.

Pedestrian counts carried on several days along the pavement (sidewalk) under study showed that it is a busy pedestrian route. 4,200 pedestrians pass on this pavement during the evening break off (4.00 p.m. - 5.00 p.m.) on their way home, and that between 4.30 p.m. and 4.45 p.m. alone, an average of 1,700 pedestrians utilize the pavement (sidewalk).

Although the width of the pavement (sidewalk) is about 1.9 metres from the iron fence, the effective width that is available conveniently for pedestrian movements is further reduced due to the parking space. The kerbstones for this parking space is so low that most vehicles when parked very close to the kerb have their bumper bars occupying some space on the pavement (sidewalk). The presence of the iron fence also means that some part of the pavement (sidewalk) is rarely used because people do not usually like to walk close to the iron or it is the space utilized by people when they meet their friends along the pavement (sidewalk).

It was apparent that the capacity of the pavement (sidewalk) was not adequate when compared to the volume of pedestrian flows along it and the result was that pedestrians experienced alot of inconveniences and discomfort in their movements. This conclusion was reached on the basis of the calculation of the practical pedestrian capacity of pavements (sidewalk).

This pedestrian network capacity is 'the maximum number of pedestrians that can utilize a specific section of the network during one hour without the pedestrian density or delay being so great as to cause unreasonable inconvenience, discomfort, or restriction of a person's freedom to manoeuvre under the prevailing pavement and traffic conditions' (1).

The level of tolerance has varied between ten and fifteen persons per foot width of pavement per minute and deduct 3 foot dead width in shopping areas and one and half foot elsewhere (1).

The problem to the pedestrian movements on this pavement (sidewalk) is therefore brought about by the narrowness of the pavement (width)

REFERENCE

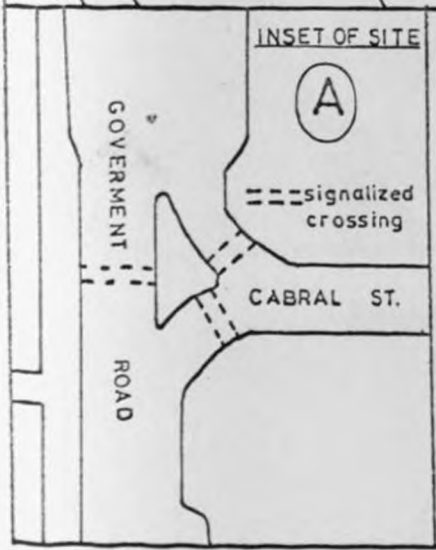
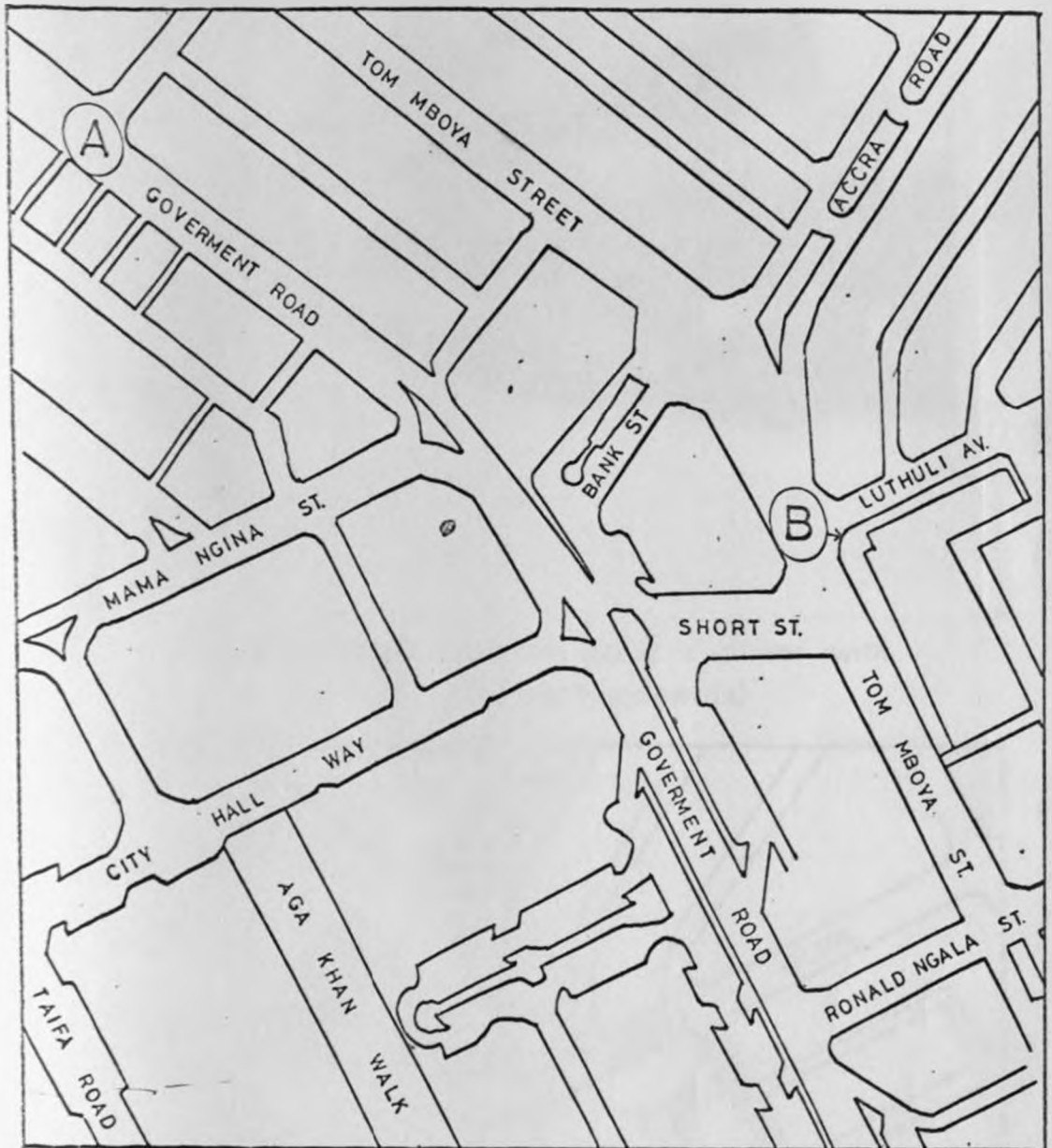
- (1) J. R. Allison, A. J. Johnson, M. Stevenson and D. Chrisp : " A method of analysis of the pedestrian system of a town centre: Nottingham City" : In Statistics Vol.33 No.194 Jan. 1972 pp.42 - 43.

3.3. 4 - LUTHULI AVENUE - PAVEMENT (SIDEWALK) OF A SELECTED AREA

The criterion for choosing and studying this problem area was to determine whether the pavement (sidewalk) on such a shopping place was adequate in relation to the number of pedestrians that utilize the space during the busiest periods of the day.

Luthuli Avenue is a major outlet from the modern part of the Central Area of Nairobi (west of Government Road) to the older parts of the Central Area (east of Tom Mboya Street).

As noted earlier in the study (Chapter two) the older part of the Central Area, east of Tom Mboya Street houses most of the hotels, boarding and lodging and restaurants and other retail shopping and light industries.



LOCATION OF STUDIED SITES

- (A) SIGNALIZED CROSSING ON GOVERNMENT ROAD
- (B) LUTHULI AVENUE PAVEMENT (SIDEWALK)

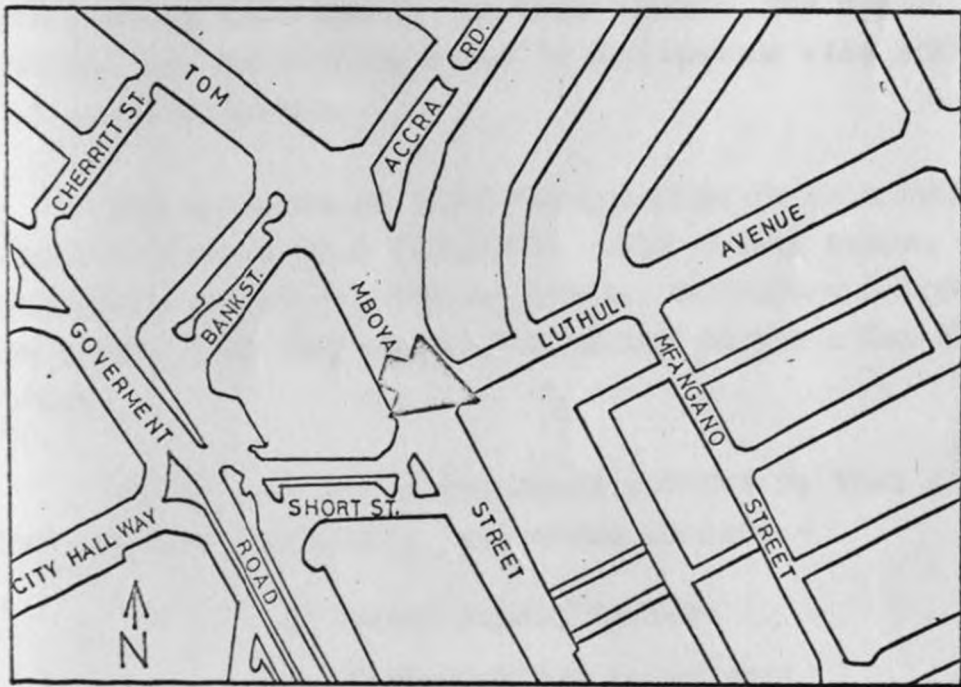
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SCALE: 1:2500

MAP - 20



PLATE-13 Window shopping along a street with narrow pavement (sidewalk)



viewpoint of PLATE 13

During the lunch breaks on working days Luthuli Avenue thus experiences a heavy flow of pedestrians from the Government Offices, and other business offices in the western part of the Central Area on their way to the eating establishments in this part of the Central Area. The food prices in this part of the Central Area (east of Tom Mboya Street) are relatively cheaper compared to those in the tourist and prestige hotels in the western part of the Central Area.

The site studied is that stretch of Luthuli Avenue between Tom Mboya Street and Mfangano Street. This stretch is about 60 metres long and the studied pavement (sidewalk) on the stretch has a width of 3 metres.

Luthuli Avenue on the whole has a road reserve of about 15 metres and is a two-way traffic flow road - with parking (on-street) on both sides. The space occupied by the parking space is 2.4 metres wide and is 180° parking system.

The pavement of this studied site is on a commercial -cum-residential plot (No.2708) with retail shops, physician, drapers; photo me studio, furniture shops on the ground floor and residential flats on the other four floors.

There are other temporary activities that go on the pavement (sidewalk) and these include:-

- watch repair kiosks;
- Newspaper and magazines;
- Lottery kiosks
- Shoe - shining boxes and
- maize roasting business

These temporary activities occupy almost half of the pavement width thus reducing the space that can be effective to be used by the pedestrians.

Throughout the day, quite a substantial space on the pavement is occupied by window shoppers admiring the wrist-watches, radios, televisions, radio-cassette players and household furniture that are displayed.

Thus about a metre or so is the only space on this pavement that can be said is available for the heavy pedestrian traffic flow that pass here especially on Saturday mornings.

Pedestrian counts carried out at the site on several Saturday mornings between 10.30 a.m. to 11.30 a.m. and 12.00 to 1.00 p.m. showed that some 3,000 and 2,500 pedestrians walked or shopped along the pavement respectively.

Observations revealed that there were high levels of congestions and general inconveniences experienced by pedestrians. This is inevitable on such a pavement, especially if you consider that the level of tolerances varies between ten and fifteen persons per foot width of pavement per minute and deducting 3 foot dead width in shopping areas (1).

The site studied on Luthuli Avenue is typical of most problem areas in the older parts of the Central Area where the room left for pedestrians is relatively small and yet this part of the Central Area of Nairobi has a high population (in transit) and this therefore causes some locomotion problems on the part of pedestrians.

REFERENCES

- 1) J. R. Allison : A. J. Johnson, M. Stevenson and D. Crisp - "A method of analysis of the pedestrian system of a town centre : - Nottingham City : In Urbanistica Vol.33 No.194 Jan. 1972 pp. 42 - 43

3.3. 5 - PUMWANI ROAD - PAVEMENT (SIDEWALK)

Pumwani Road is situated to the eastside of the Central Area of Nairobi. The road reserve is 15 metres wide and the actual carriageway is 7.5 metres wide.

The length of the pavement studied upto the junction with the nearest road is 130 metres. The width of the pavement (sidewalk) is about 4 metres from the wall that separates it and the mosque and the primary school.

On the pavement itself, about $\frac{2}{3}$ of the space is permanently utilized by shanty kiosks (temporary activities) which specialize in selling clothes and household utensils and crockery. Basically the pavement is permanently utilized by hawkers.

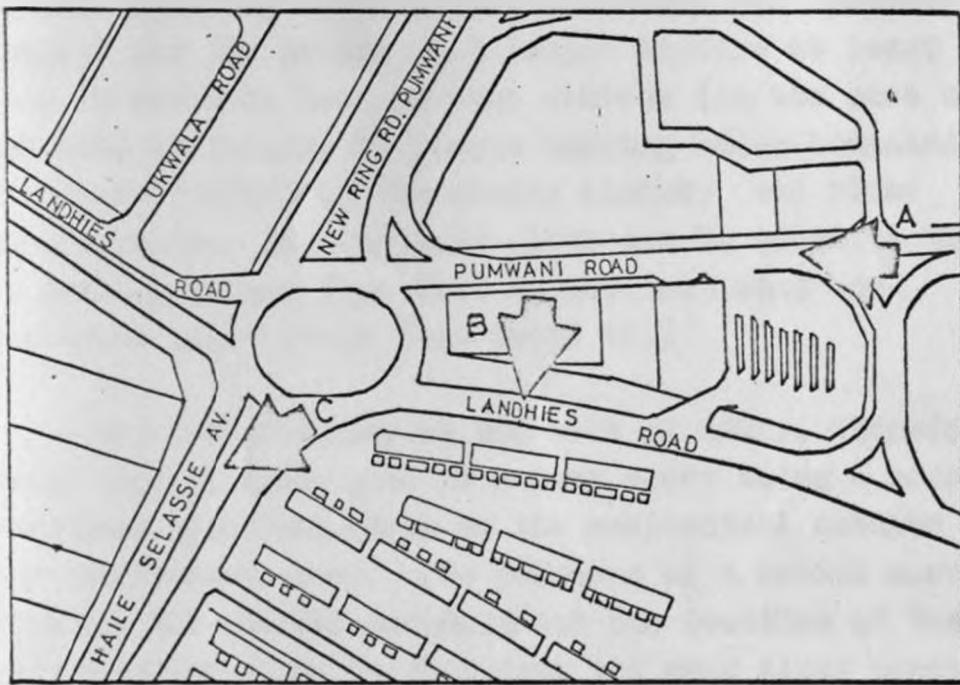
From the junction with the New Pumwani Ring Road up to the zebra crossing on Pumwani Road there is a pedestrian guard railings. Whereas this guard rail services a useful purpose in ensuring safety to pedestrians, it in reality occupies some of the pavement space (about 30 cm). Thus the actual space left for the free movement of pedestrians on this pavement on Pumwani Road is only about 60 cm which is further reduced by people buying items from the kiosks or chatting with friends.

A point also worth noting is that Pumwani Road is a major and busy pedestrian commuter route from the residential suburbs of the north eastern of the City to the Central Area. An average of 3,500 pedestrians per hour cross the New Pumwani Ring Road at its junction with Landhies Road. This junction is a uncontrolled crossing.

Data from the surveys along the pavement on Pumwani Road showed that during the evening peak hour (4.00 p.m. - 5.00 p.m.) an average of 3,250 pedestrians passed along the pavement.



PLATE-14 Temporary activities on pavement (sidewalk)



viewpoints of:

A - PLATE 14

B - PLATE 11

C - PLATE 12

The average pedestrian flow per hour varied between 800 and 1,000.

It was therefore evident from the findings of the study that there were high degrees of congestions, and inconvenience that were being caused to the pedestrian traffic.

This conclusion is based on the practical pedestrian capacity of pavements (sidewalks), which determines what sort of levels of pedestrian congestion, delay and personal inconvenience are people expected in their capacity as pedestrians to tolerate. The level of tolerance has varied between ten and fifteen persons per foot width of pavement per minute and deduct 3 foot dead width in shopping areas, one and a half elsewhere (1). It is normally assumed that the dead shopping width is not available for pedestrian movement for the reason that people require at least this space in order to look in shop windows (in the case of this site it is used by people looking at or bargaining for prices in front of the shanty kiosks) and stand outside shops. Further dead width can be added to this for parking metres (one foot to one foot six) or pedestrian guard rails (one foot) (1).

The observations on the site of study, therefore, showed that Lumsden Road is a busy route being a major pedestrian commuter route to the residential suburbs from the Central Area. The presence of a retail market opposite the studied pavement and the location of the country bus station further down the road along Landhies Road means that there are a lot of activities that go on in the area, that can be viewed as pedestrian generators.

REFERENCES

- (1) J. R. Allison; A. J. Johnson; M. Stevenson and D. Chrisp : - "A method of analysis of the pedestrian system of a town centre: Nottingham City : In ERISTICS Vol.33 No.194 January 1972 pp. 42 - 43.

3.3. 6 SIGNALIZED PEDESTRIAN CROSSING - GOVERNMENT ROAD

The introduction of traffic signals at many busy pedestrian crossing places has eased movements considerably and has demonstrated the usefulness of signals in this respect (1).

Map 10 shows the location of the signalised pedestrian crossing places. From the map it is evident that the signalised crossing points covers only some of the critical areas when the pedestrian - vehicle conflicts are prominent. It should be noted, however, that this task of signalising crossing points is still in the early stages.

One factor is that even at these pedestrian crossing that are light controlled, the pedestrians still undergo some delays in their movements.

Observations and findings from the field surveys at the signalised crossing on Government Road showed that quite a large number of pedestrians took risks to cross the road when it was not their rightful turn to do so.

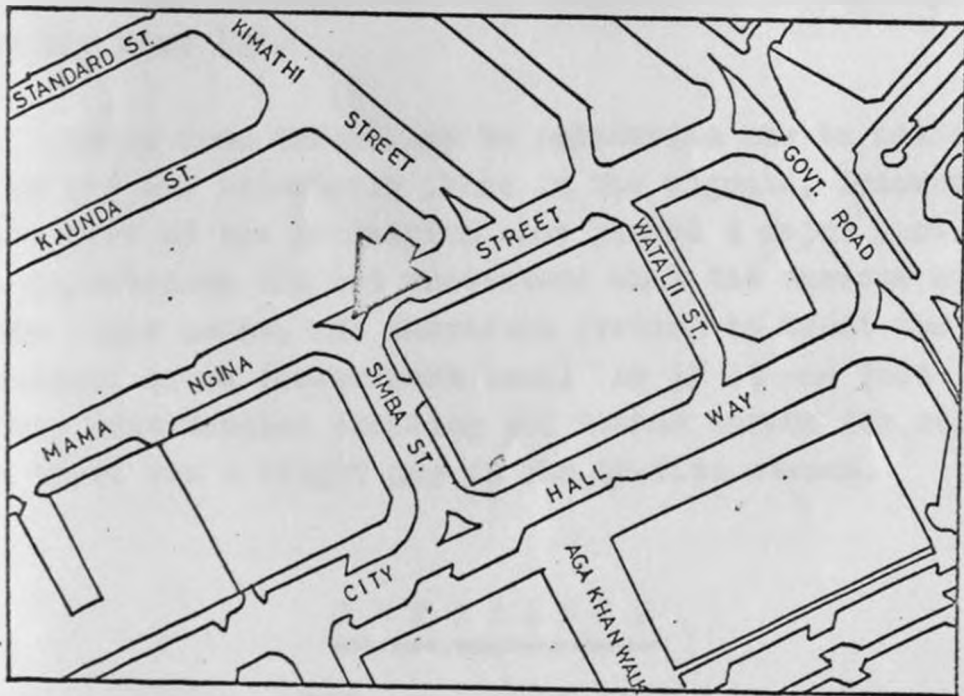
Over 70 per cent of the pedestrians that were counted and observed at the crossing point (on a 15 - minute interval) did cross the road illegally. The method used to obtain this percentage was to :-

- i) Count the pedestrians who crossed the road when the "green man" symbol was on; and
- ii) the number of pedestrians that crossed when the "red man" symbol was on the light.

The surveys were carried out on weekdays and on Saturday mornings. On Saturday mornings there were more pedestrians crossing the point. This is so because many people do their shoppings on Saturdays and quite a number of business firms do work on Saturdays.



PLATE-15 Crossing facilities- signaled crossing



viewpoint of PLATE 15

For instance on a Saturday morning some 500 pedestrians crossed this signalised crossing every 15 minute between 10.00 a.m. and 12.00.

The time allocated for the pedestrian in the whole cycle for the signals was about 30 seconds and this proved inadequate, as very few pedestrians finished crossing the road by the time the "green man" symbol phase had ended. Only about $\frac{1}{3}$ of the pedestrians crossing the road during the green (pedestrian) phase finished crossing the road by the time the red/amber phase was showing to vehicles.

The main factor affecting delay at the signalised crossing points more likely to be the proportion of cycle time allocated to pedestrians giving them right of way to cross the road (2).

Apart from the delays to pedestrian due to inadequate timing for the pedestrian phase in the signals, ignorance on the part of the pedestrian also played a major part. Some pedestrians did not understand what the various symbols in the light meant, and therefore decided to treat the signalised cross (Government Road) as if it was just another uncontrolled crossing and dashed across the road when there was a slight gap in the traffic stream.

REFERENCE

- 1) G. R. Clarke - N U S G - "A short term traffic and environmental plan for the Central Area up to 1985 : Nairobi City Council : 1976
- 2) G. D. Jacobs, S. J. Older and D. G. Wilson:
"A comparison of X - way and other pedestrian crossings" - RRL Report LR 145 : 1968 p.16.

3.3. 7 THE AGA KHAN WALK

Aga Khan is the most outstanding pedestrian facility in the Central Area of Nairobi. This is a traffic free street stretching from the City Hall way to Harambee Avenue.

As a through pedestrian facility, it forms a link between the Government Offices along Harambee Avenue and the business and commercial areas north of City Hall way.

The walk stretches for some 285 metres from City Hall way to the Harambee Avenue with a width of 25 metres. There are two concrete made pavement (7 metres wide each) on sides of the walk. Between these two concrete made pavements is a murrum surface area with an open storm drainage in the middle. There are no street lights and only a few pockets of flowers exist in the walk.

Aga Khan walk as such does not pose any problem to the pedestrian movements except that as a pedestrian-only street it lacks some facilities and amenities that would be useful to the pedestrians using the area.

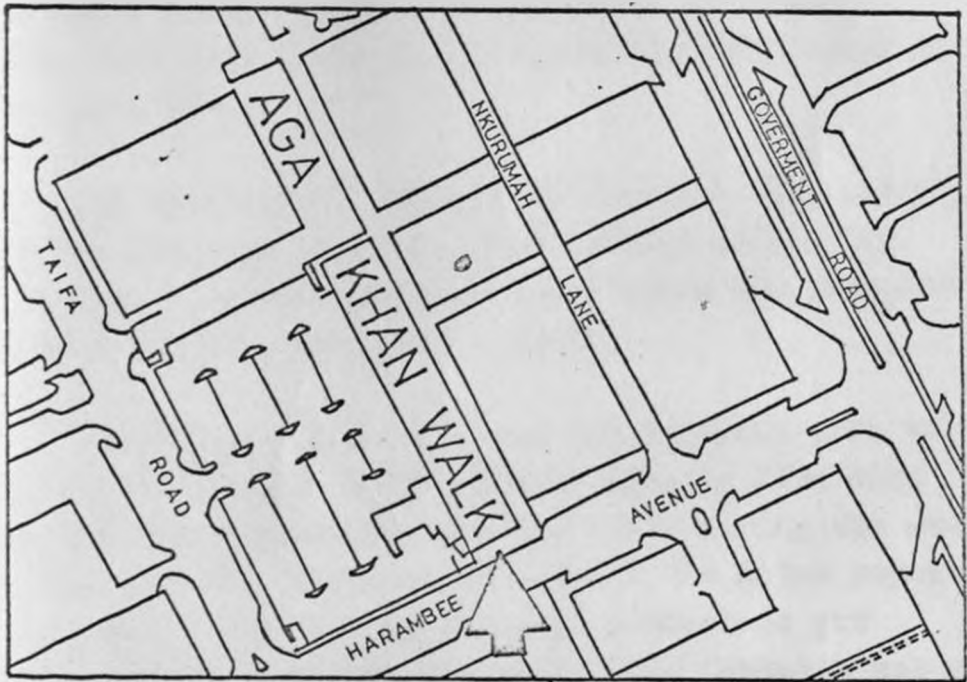
Observations have shown that the Aga Khan Walk is a very popular spot for workers during the lunch breaks on working days. People paying the electricity bills are normally seen queuing outside the electricity House and quite a number visit the Uchumi Supermarket. On weekends the walk is normally crowded with cinema-goers at the Nairobi Cinema in Uchumi House.

The space could therefore certainly do with benches or concrete slab seats, for at present many people resting in the area have no alternative but to sit on the raised wall of the nearby car park. The walk could also be more useful if kiosks and stalls were planned for selling postage stamps and newspapers and magazines.

R.R. For 'Location Map' see 3.3.3 - site 'B'



PLATE-16 Vehicle-free street



viewpoint of PLATE 16

3.3. 8 - INDIAN FOOTPATH OFF KIRINYAGA ROAD

This is another major pedestrian commuter route mainly used by people coming into the Central Area for work, school or business from the northern and north-eastern residential areas of the City.

The footpath is not catered for in that its surface is marred. It joins the Kirinyaga Road near the latter's junction with Voi Road. The footpath goes north towards the Nairobi where there is a footbridge.

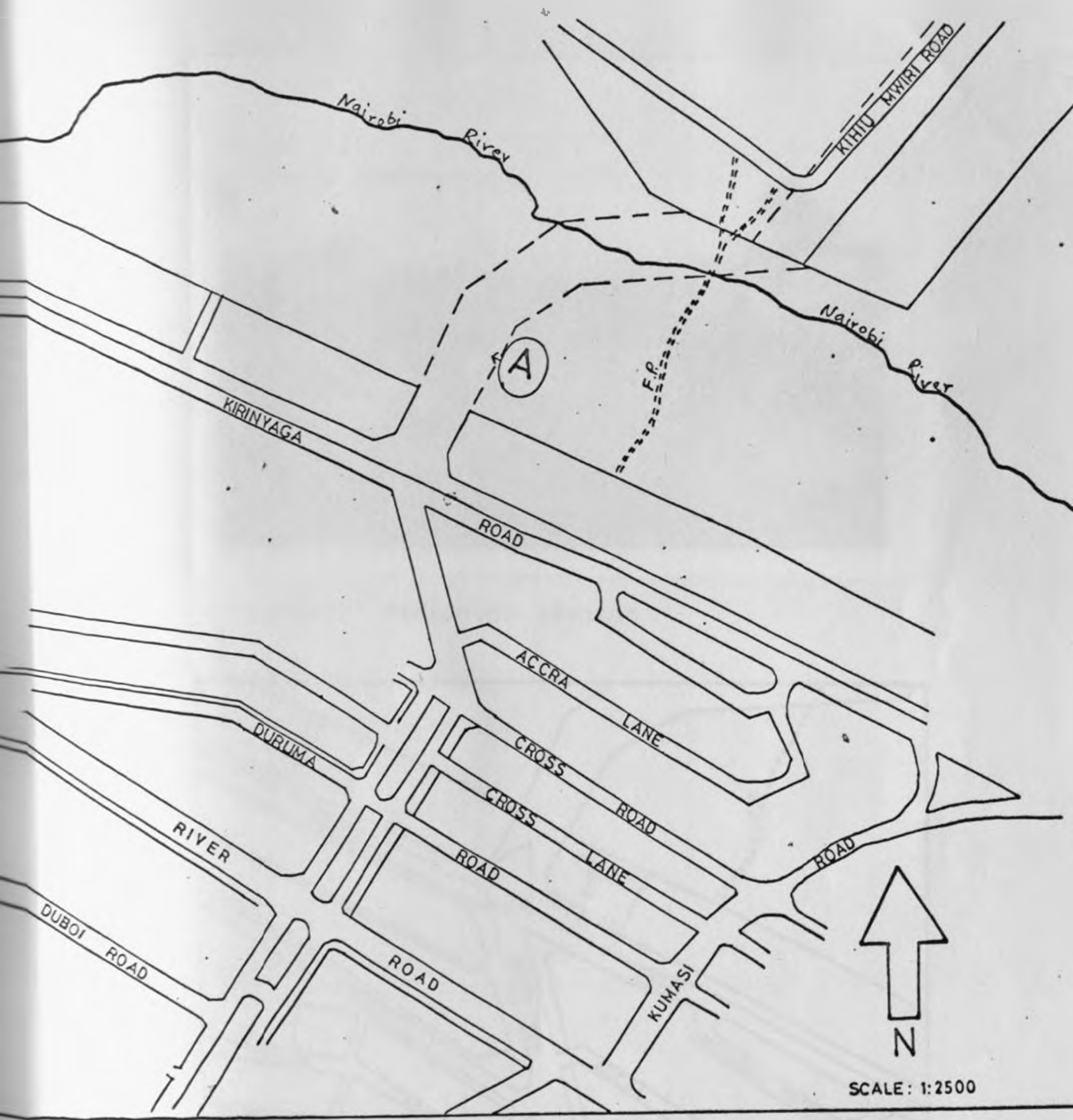
Various activities go on along the footpath and these include kiosks selling fresh vegetables and food. Not far off from the footpath are activities that deal in motor vehicle maintenance and repairs and other light industries.

During the lunch hours, (12.30 - 1.30 p.m.) an average of 2100 pedestrians pass along the footpath on their way for lunch in the kiosks along the footpath or to the Ngara Area. Quite a large number of school children also pass along the footpath from the schools in the Ngara area.

The food kiosks along this footpath lack water supply and drainage is poor. The rubbish collection also seemed to be unsatisfactory and hence the presence of so much litter along the footpath.

Pedestrians passing along the footpath have to endure quite a lot of inconveniences ranging from dust during the dry season (and mud and water during the wet periods) to auto fumes and noise from the motor repairs. The foul smell from the uncollected rubbish is yet another problem along the footpath. The footpath has no street lighting and thus renders it unsafe for pedestrian use after dusk.

The City Council authorities should with immediate effect recognise the footpath as a major link and outlet of the Central Area to the northern parts of the City and take appropriate action to improve the condition and facilities on the footpath.



LOCATION OF STUDIED SITE CENTRAL NAIROBI

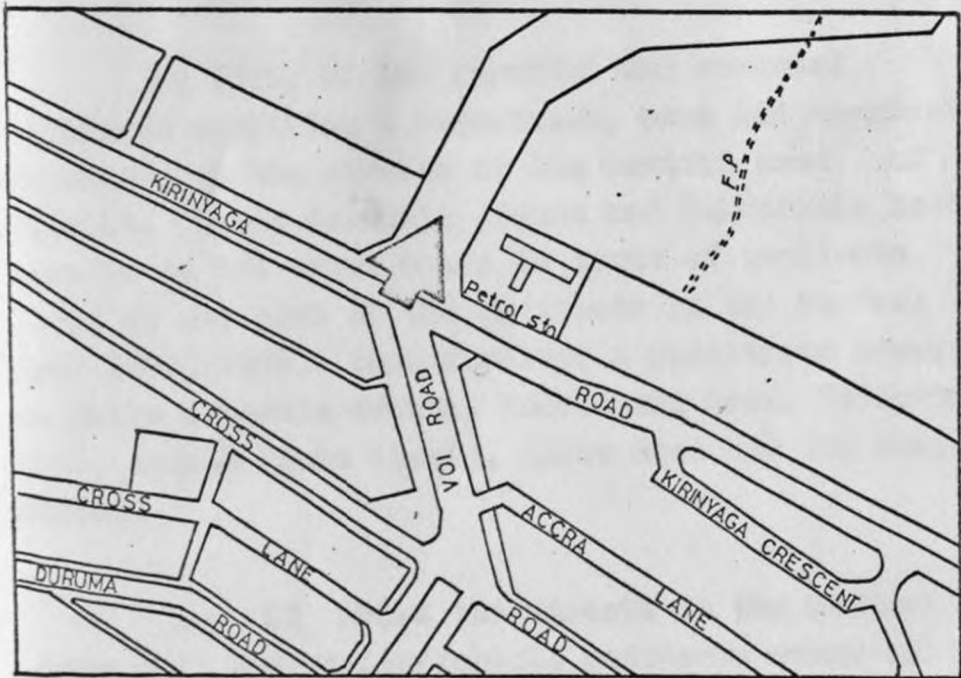


PEDESTRIAN ROUTE TO NORTH EASTERN
RESIDENTIAL AREAS ACROSS THE NAIROBI RIVER

MAP - 21



• PLATE-17 Pedestrian footpath



viewpoint of PLATE 17.

3.4 - DISCUSSION OF PROBLEMS, THEIR CAUSE AND EFFECTS

3.4.1 - IMPACT ON PEDESTRIANS

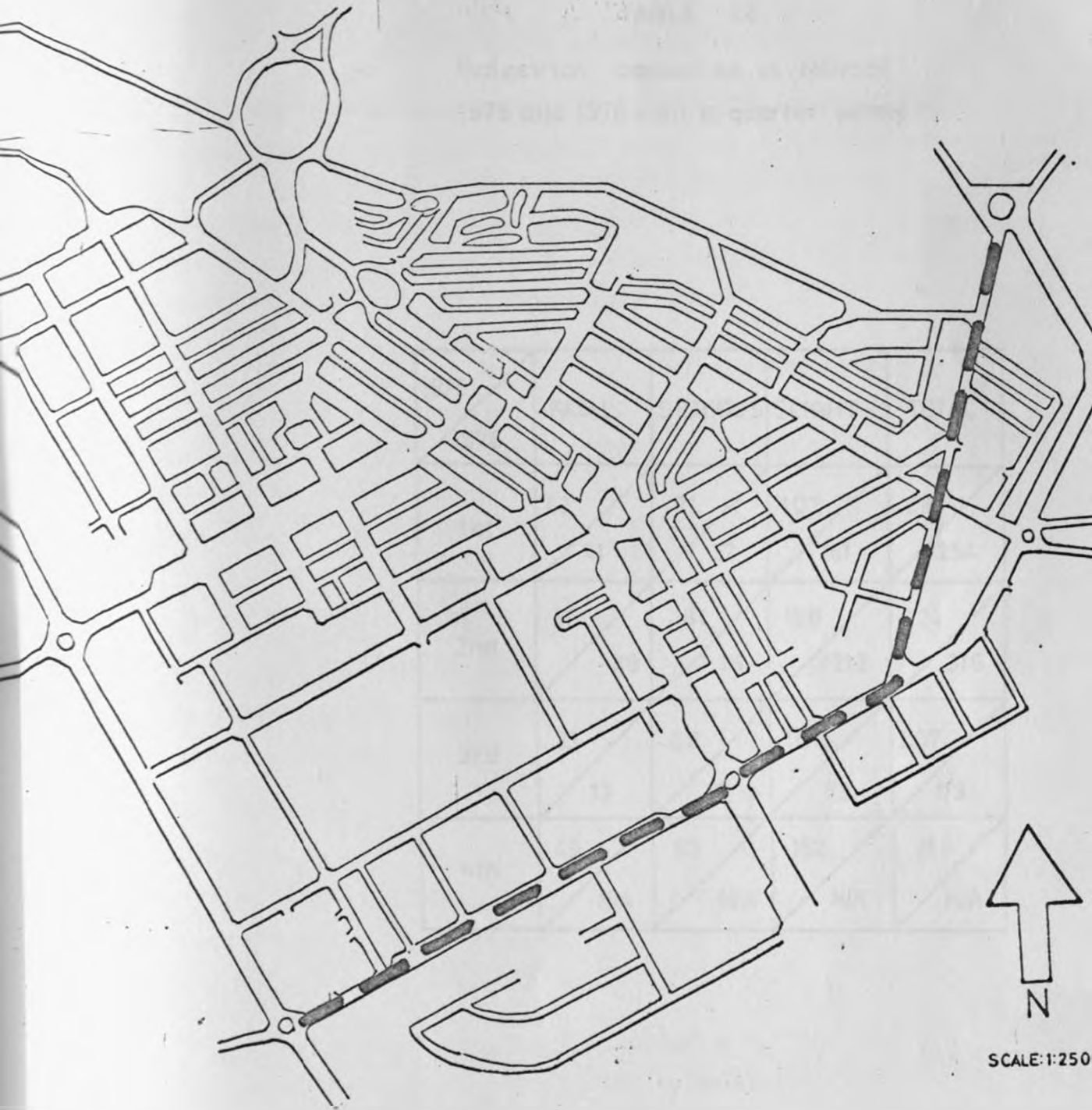
In 1976, road accidents in Nairobi claimed 267 lives, 744 were seriously injured and 1831 received slight injuries. In 1975 there 237 fatal accidents and 262 serious injuries in Nairobi.

Table 26 gives the statistics on pedestrian casualties in accidents in Nairobi for the years and most of 1976.

In 1975, of the reported and recorded accidents involving a pedestrian, some 224 accidents occurred, on the streets of the Central Area of Nairobi. Haile Selassie Avenue and Racecourse Road seem to be the worst roads in terms of accidents. About 46 per cent of the accidents in the Central Area (1975/1976) that involved a pedestrian occurred on Haile Selassie Avenue, Racecourse Road, Government Road, Ronald Ngala Street, River Road and Tom Mboya Street.

Map 22 shows the streets in the Central Area where most pedestrian/Vehicle accidents occur and also the location of the critical intersections in the traffic routes.

CENTRAL AREA — NAIROBI



MAP - 22


 Streets where accidents (involving a pedestrian) are frequent

TABLE 26

Pedestrian casualties in Nairobi
1975 and 1976 - on a quarter yearly

1975 1976	FATAL	SERIOUS	SLIGHT	TOTAL
1st	42 41	71 52	102 161	215 254
2nd	35 39	61 16	128 212	224 316
3rd	33 13	68 27	106 73	207 113
4th	49 N/A	63 N/A	152 N/A	269 N/A

3.4. 2 - INCONVENIENCES TO PEDESTRIANS

Most cities have problems of traffic congestion, and yet more people try to drive into the City Centre by car. Each seeks priority for himself and while some may achieve some priority they may perhaps must occupy access or street space which makes it less possible for other road users to enjoy and convenience at all.

The private car occupies so much space for such a long time that soon there will be a basic need to examine whether other forms of transport might be equally, or nearly as convenient as the car and yet occupies less space or space for a shorter period than the car.

Apart from the dangers that pedestrian face, in the Central Area of Nairobi, in crossing the streets, a greater level of inconvenience is experienced on the pavements (sidewalks) of the streets.

In the older part of the Central Area (east of Tom Kboya Street) there are dangers and inconveniences to pedestrians caused by vehicles which park on the pavements (sidewalks). The pavements (sidewalks) should be exclusively for the use by pedestrians.

The best rule for safety in road traffic is to have different categories of traffic separate, the ideal situation being the provision of a carriage way for motor vehicle, a cycle track for two-wheeled vehicles and the pavements (sidewalks) for pedestrians.

Thus where cars are allowed to park on pavements, the pavement will inevitably be used by vehicles seeking a place to park, so that even where one care is taken, the safety of pedestrians will no longer be ensured and inconvenience will be the end result.

The pavement (sidewalk) is the pedestrians domain and as such should be reserved for the pedestrian exclusively. Parking on the pavement (sidewalk) presents a number of major objectionable features. One of them, relevant to the Central Area, is that it often compels pedestrians to walk on the carriageway thereby very substantially enhancing the danger of collisions between cars and pedestrians and hampering motor traffic.

Sharing of the pavement with parked cars is not the only inconvenience caused to pedestrians by other road users. There are the temporary activities that occupy the pavements (sidewalks) of most streets in the Central Area of Nairobi and these include the following:-

- Watch repair stands;
- Lottery kiosks;
- Newspapers and magazines;
- Shoe-shining, repair boxes;
- Maize roasting on dustbins;
- Selling of old record discs;
- Weight measuring scales; and
- Dustbins.

The presence of these temporary activities is more evident in the older part of the Central Area (east of Tom Mboya Street) although some, like shoe-shining, newspapers and magazines selling and lottery kiosks are also found in the more modern parts of the Central Area (west of Government Road).

A more recent aspect that inconveniences pedestrians a lot, is the current wave of lunch - time 'preachers'. These people having no specific places provided for public speeches and preachings have been forced to conduct their sermons on the pavements of the Streets.

It is common, for example, to find people gathered on the pavements (sidewalks) (of Ronald Ngala Street, Government Road, Aga Khan Walk, Racecourse Road, Tom Mboya and Kenyatta Avenue near the General Post Office and near Kimathi Street Junction) listen to the word of God from these preachers. The presence of such large groups of people on the pavements (sidewalks) do at times cause a lot of inconveniences to other pedestrians, during lunch hour, who are less interested in the preachings and are in hurry to get to the eating establishment from work places or vice versa.

There are certain pavements (sidewalks) that have no any form of protection or shelter against adverse weather conditions such as rainy or sunny days. A typical example is Harambee Avenue. Most streets, in the Central Area, however, do have shelters in form of building canopies above the pavements (sidewalks).

Another inconvenience caused to pedestrians in the Central Area is the delays at crossing points on busy roads such as Uhuru Highway and Haile Selassie Avenue. Such delays usually frustrate the pedestrians as we know frustrated people are notorious for having their judgement impaired hence the danger.

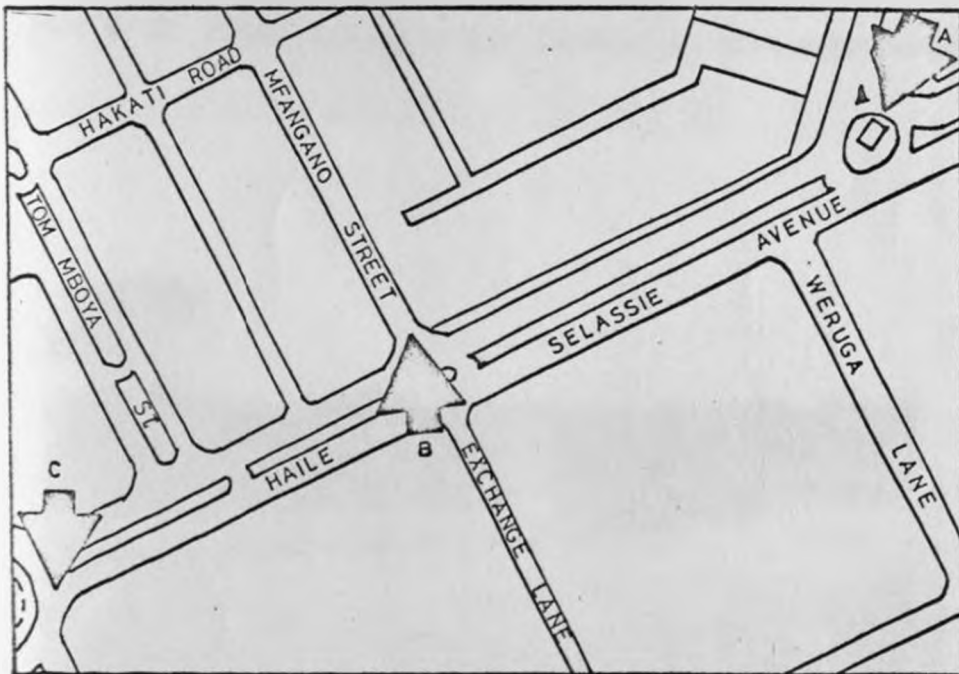
Most streets in the older part of the Central Area of Nairobi (east of Tom Mboya Street) have pavements full of potholes and uneven surfaces. These are naturally sources of discomfort and inconvenience to the many pedestrians that walk on these pavements (sidewalks).

Steps towards reducing the inconveniences caused to pedestrians in the Central Area of Nairobi should include:-

- 1) the absolute prohibition of parking on pavements (sidewalks) by cars by inflicting heavy fines to the offenders.



PLATE-18 Inconvenience to pedestrians:
public toilet on a roundabout



viewpoints of:

A- PLATE 18

B- PLATE 8

C- PLATE 9



PLATE-19 Roads lacking proper pedestrian sidewalk(pavement)



PLATE-20 Absence of crossing facilities
on busy pedestrian commuter
routes

- ii) the prohibition of temporary activities on streets having narrow pavements (sidewalks) and heavy pedestrian flows;
- iii) reducing the delays at busy crossing points by either installing signal controls or grade separated pedestrian facilities; and
- iv) having constant maintenance of pavements especially their surface conditions.

3.4. 3 - VISUAL INTERUSION TO PEDESTRIANS

In dealing with the problem of pedestrian movements in Central Areas, one of the aspect is the capacity (1) of the individual streets which must be considered. The aim here should be to reduce visual intrusion (2) in order to retain the attractiveness of the centre core; to encourage maximum intervisibility between driver and pedestrian (to increase safety of the latter); and where necessary, to increase capacity by promoting better utilization of existing spaces (3).

As noted in the earlier chapters, environmentally, any conditions of congestion are undesirable. The environmental capacity of a street should be lower than the theoretical traffic capacity as this provides adequate time for pedestrians to cross traffic routes and also reduces ambient noise and exhaust pollution levels.

In the foregoing sections of this Chapter it was noted that in 1976, some 59 accidents (4), in Kenya, were caused by people crossing behind stationary vehicles. The assumption here is that there was lack of intervisibility between the driver and the pedestrian which result into an accident.

River Road, in the Central Area of Nairobi, is an example of a road where this problem of visual intrusion is frequently experienced by pedestrians. River Road is principally a service as well as a feeder road to the commercial establishments in this part of the Central Area. This is, basically, why there are so many heavy commercial and private cars using the road at all times during the day. Congestion on this road, is often caused by frequent stoppings by vehicles, on route, wishing to unload or load goods and this forces the vehicles behind them and the on-coming ones to slow down and thus causing congestion. One other factor is that the number of on-street parking lots on River Road are not enough and cannot cope with the demand for parking, as such many motorists decide to park their vehicles, besides (on the carriageway) the already legally parked vehicles and thus partially blocking the road.

Another example of a road where visual intrusion to pedestrians is prominent is Government Road; Government Road is a shopping road with buildings of modest height and capacity; its pavements are barely wide enough to take the volume of pedestrians during the rush hour traffic; it has angle car parking on either side and the residual centre traffic lanes are inadequate to allow of rush hour traffic. The present angle car parking results in the direct loss of traffic lanes because of the constant interference from parking cars. Together with this, is the loading and unloading of vehicles that go on the road even during the rush hours. Here again the intervisibility between the drivers and the pedestrian (the latter when wishing to cross the road) at times is rather minimal because of visual obstruction by vehicles.

The above mentioned roads are not the only cases in the Central Area where the view of the pedestrians is obstructed by vehicles when they (pedestrians) wish to cross the roads.

There are many more roads and streets, especially in the older part of the Central Area (east of Tom Mboya Street), where the combined on-street parking, heavy commercial vehicles and the narrowness (widths) of the streets present problems of visual intrusion and hence constitute danger to pedestrians. The most environmentally defective streets in 1974, in the Central Area, were (apart from Government Road and River Road) Biashara Street, Tom Mboya Street, Muindi Mbingu Street - near the City Market - and Sabera Street (5).

The other form of visual intrusion to pedestrians, is the presence of too many road signs, shop signs, advertising posters and bollards on a street or road. Fortunately, this as yet, is not a serious problem in the Central Area of Nairobi.

3.4.4 - COMMUNITY AWARENESS

People conducting their businesses and other activities within the Central Area of Nairobi come from all walks of life. They range from the young to the old; those literate and illiterate. The population of the Central Area, at any one time is not a homogeneous one.

A major problem is that of ignorance by a majority of people, about traffic conditions and regulations in the Central Area. For instance, the recent installations of signal - controlled at crossing points are still confusing a great number of road users especially the pedestrians. Observations have shown that pedestrians spend some time trying to understand what the various symbols, in the pedestrian phase, mean and most of them therefore never comply with the mandatory requirements at these crossing places.

Road signs are not always understood by many people and sometimes they are directly misunderstood.

Some people, especially the children, believe that the safest way to cross the road is to run. This is a dangerous way of crossing roads.

Whereas many people mistrust the zebra-crossings there are those who think that the zebra is their own part of the road that they can do anything and hence it is not uncommon to find some pedestrians jaywalking on zebra crossings in the Central Area of Nairobi. Jaywalking, however, is common in many cities throughout the world.

Not so many pedestrians, when crossing roads, have the ability to roughly estimate the speed of the approaching vehicles, nor judge their ability in crossing the road ahead, of cars. Some pedestrians have the tendency of crossing the roads without prior warning (or indicative gestures) to the drivers, believing that the motorists can stop their vehicles instantaneously.

Where grade separated pedestrian facilities are provided, as on Haile Selassie Avenue (footbridge) and under Uhuru Highway (pedestrian tunnel near the University) it is found at times there is reluctance by pedestrians to use these under or overpasses preferring to cross the road adjacent to them. What the pedestrians, here, fail to understand is that these grade separated facilities are normally installed at busy crossing points for their (pedestrians) safety. A point worth noting here is that for these grade separated pedestrian facilities, to be fully used and appreciated they have to be in line of the pedestrian routes so that they form a continuation of the pedestrian network.

Unawareness about traffic conditions and especially pedestrian behaviour at crossing points is common among drivers. It appears that most drivers in the Central Area, are not aware that pedestrians on pavements (sidewalks) and roadsides always should be expected to suddenly dash out into the road without warning.

In some situations very few drivers did ^{know} that a horn signal has to be given well in advance of the passing, of a crossing point, if it is going to prevent accidents and in conjunction with the signal the driver has to slow down and be prepared to stop on short notice. Accidents could also result from drivers who sometimes only used their signal lights to warn pedestrians. In such case the motorists must be assuming that the pedestrians have been taught to notice and understand the light signal, which is often not the case.

It is common to find some pedestrians who suddenly change pace or direction while crossing the road and most motorists tend to assume that pedestrians when crossing would be going in the same direction.

Some motorists appear not to be observant in areas where the road is narrow or streets with narrow pavements. Narrow pavements sometimes force pedestrians to walk on the carriageway. An example is the situation that occurs along the Mwanani Road during the evening peak hours when both pedestrian and vehicle traffic is heavy. Then, there are situations whereby if one pedestrian crosses the road and they were in a group, it is most likely that there will be more following who are not going to be looking for traffic. This normally is the case with groups of people who are strangers to the Central Area.

In conclusion it is probable to say that not all pedestrians who come into the Central Area have the same abilities to grasp the total traffic situation at a glance.

In order to achieve a high level of community awareness as regards road traffic and safety there is a need to step in education, enforcement and publicity or propaganda about traffic planning and management. 'The structure of the community needs to be altered in such a way that traffic and transportation will no longer be a handicap for a free, pleasant and safe life for a large percentage of the population, a threat to the well being of a nation' (1).

Footnotes

- (1) V.I. VAN DOES "Changing structure of the community"
 - INTERNATIONAL CONFERENCE OF
 PEDESTRIAN SAFETY, HAIFA, 20 - 23
 DECEMBER, 1976.

3.5 - CONSTRAINTS TO THE PEDESTRIAN POLICY

The major constraint to the pedestrian policy in the Central Area of Nairobi has been the fact that pedestrian and even bicycle travel has not been really incorporated into the transportation planning process used by the City's traffic planners. It appears evident that rather major modifications of present planning methodology and techniques are imperative to deal with the non-motorized transport which account for some 50 to 60 per cent of the total in urban areas (1) of developing countries.

Building room is also another constraint to the pedestrian policy especially in the built up areas of the Central Area. There are areas in the Central where there is not enough building room for either expansion of pavements (sidewalks) or installation of grade-separated pedestrian facilities. This constraint is much so in the older parts of the Central Area (East of Tom Mboya Street) where the pavement widths are rather narrow. For instance at the junction of New Pumani Ring Road, Pumani Road, Landhies Road and Haile Selassie Avenue there is an urgent need for grade-separated pedestrian crossing facilities such as a footbridge or a subway, but there is not enough building room, at present, for such installations, unless some of the structures are demolished and redeveloped.

Another constraint to the pedestrian policy is tied to the financial (costs) aspect of providing the pedestrian facilities especially the grade-separated installations. The costs of installing these facilities would be taxing the City Council of Nairobi with its scarce resources. Table 27 shows the cost of construction (installation) of the various types of pedestrian crossings (worked out for Great Britain)(3).

Finally there are no strong pressure or lobby groups representing the pedestrians (and cyclists). In other European and North American societies, these groups in the form of associations (like the International Federation of Pedestrians, based in Hague, Netherlands) can present the problems faced by pedestrians and demand effective remedial measures from the respective governments or city authorities. This therefore means that such organisations should have full government backing.

There is also the setback in having an effective pedestrian policy for the Central area of Nairobi which is associated with lack or scarcity of data and information on the pedestrian flows, routes and behaviour. This lack of information renders the realisation of pedestrian requirements in terms of movement patterns, activities and physical development a difficult task.

TABLE 27

COST OF CONSTRUCTION (INSTALLATION)

TYPE OF CROSSING	COST OF INSTALLATION
Unaided	Nil
Zebra	£ 640
Give-way	£ 500
Pelican	£ 1,100
Pelican/Cycles	£ 2,000
Footbridge	£310,000
Subway	£250,000
Underpass	£250,000

Source : E. A. Claxton F.I.A. 1976

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CHAPTER 4

TOWARDS A POLICY FOR PEDESTRIAN MOVEMENTS IN THE CENTRAL AREA OF NAIROBI

4.0. INTRODUCTION

The principal function of planning and political policies in the transport field is basically to enable people to get around safely and conveniently.

The motor vehicle, in this respect, is a suitable way of getting around, and given choice, most people prefer to go by car. There are so many advantages that it embraces, that to wish to encourage or persuade people, with choice, to travel by other modes of transport is a difficult task, unless there is far more positive discrimination against the private car. Thus the car has a level of comfort and convenience which surpasses anything that other modes can achieve.

The private car, however, imposes high costs on the community by its noise, pollution, congestions and accidents. There is also the reduction of personal mobility of those without access to a private car. This is evident in the inconveniences imposed on pedestrians (the guard rails that are erected just where they would wish to cross the road: an example in the Central Area of Nairobi, is the recent installation of guard rails along Kenyatta Avenue near its junction with Government Road) and the ways in which they, the pedestrians, are obliged to change level in many cities of the world.

Furthermore, it should be realised that, the pedestrians are far more likely to have a higher proportion of children and old people in their composition, yet they are the groups who are disadvantaged in order to allow the motor traffic to move freely.

Pedestrian planning has not really been incorporated into the transportation planning process used in developed countries and applied without much adaptation to developing countries. Figure 2 shows the pedestrian transport in the generalised transportation planning process (1).

It appears evident that rather major modifications of present transport planning methodology and techniques are imperative to deal with non-motorized transport which accounts for 15 to 35 per cent of the modes of travel in cities of developed countries and which can reach 50 to 60 per cent in Urban areas of developing countries (1).

The three professional groups who are responsible for this situation are the transport planners, the planners themselves and the politicians. All of them appear to have fallen for the myth of universal car ownership. They seem to subscribe to the view that it is only a matter of time before we all have cars and that the only problem, then, would be to build more streets and roads to accommodate the vehicles (2).

The transport planners seem to have been persuaded that the problem of the movement of people is to do with the movement of traffic. They have consequently focussed on those times of the day when traffic volumes are at their peaks. They have attempted by a variety of means to accommodate as many people going to work by car as possible (2).

Thus a decade or two ago, (and still is in some communities, especially in the developing countries) it was common to approach pedestrian planning as follows (3).

- 1 - vehicle circulation is far more important than pedestrian accommodation.. More than 95 per cent of all urban travel is by car. Thus why worry about pedestrians?

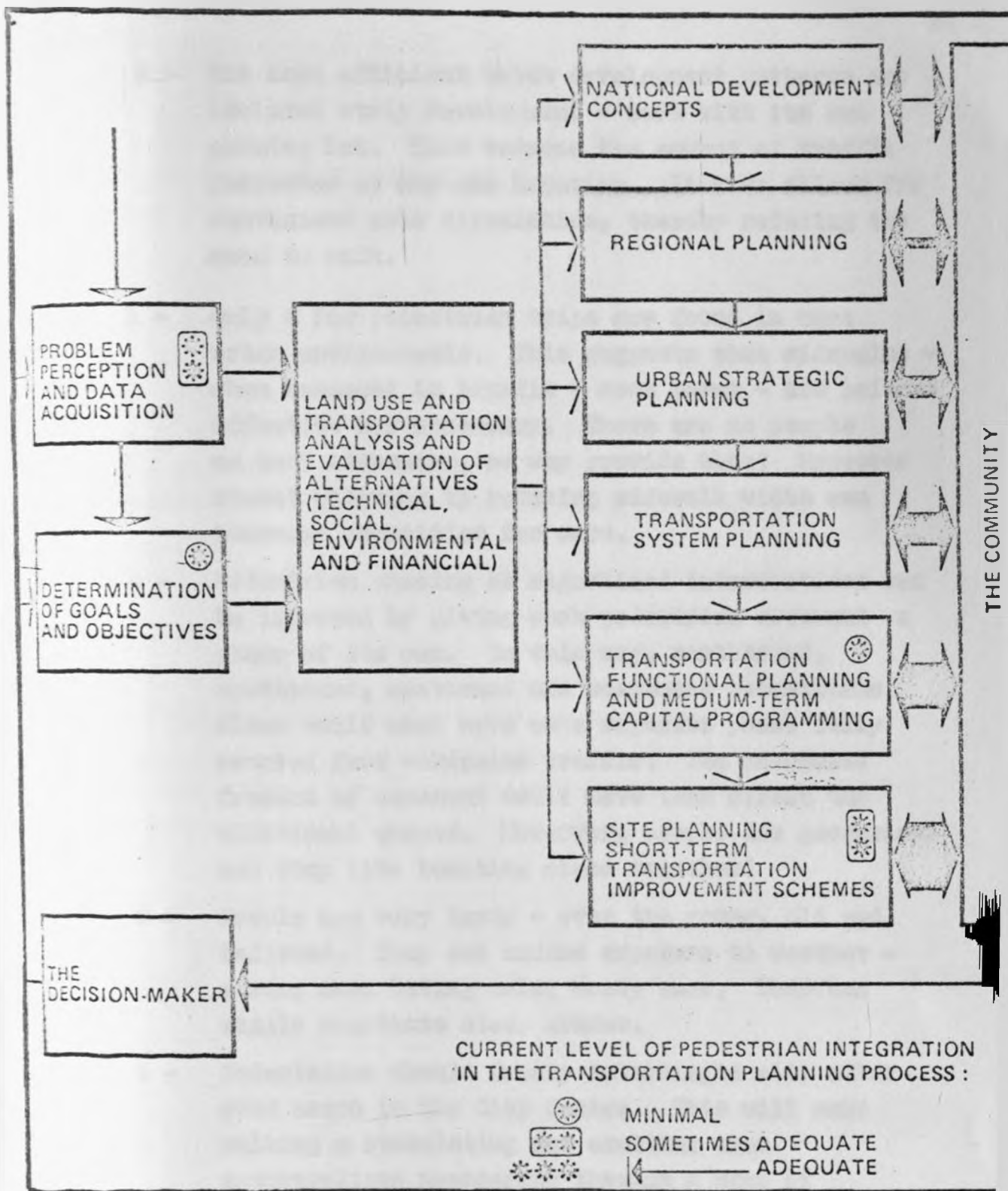


FIGURE 2 Pedestrian transport in the generalized transportation planning process

SOURCE: Bovy, Ph : 1975

- 2 - The most efficient urban development patterns are isolated strip development - each with its own parking lot. This reduces the amount of traffic generated at any one location. It also allows for convenient auto circulation, thereby reducing the need to walk.
- 3 - Only a few pedestrian trips are found in most urban environments. This suggests that sidewalks - when measured in benefit - cost terms - are neither effective nor necessary. There are no people on most sidewalks, so why provide them? Moreover street widening by reducing sidewalk width can increase capacities for cars.
- 4 - Pedestrian phasing at signalized intersections can be improved by giving each pedestrian movement a phase of its own. In this way, northbound, southbound, eastbound and westbound pedestrian flows would each move on a separate phase fully removed from vehicular traffic. The increased freedom of movement would more than offset the additional queues. Moreover, people are gregarious and they like bunching close together!
- 5 - People are very hardy - even the young, old and infirmed. They can endure exposure to weather - strong sun, biting cold, heavy snow. They can easily negotiate steep grades.
- 6 - Pedestrians should freely intermingle with other road users in the City Centre. This will make walking a stimulating and exciting than motorcyclists meandering through a maze of pedestrians - each interacting with the other!
- 7 - The way to improve downtown vitality is quite simple: close a few streets; then create a mall lined with kiosks, posters and trees. The assumption is that these treatment - in themselves - will reverse long term social and economic trends.

These are planning myths that should be set aside.

The politicians role has been in the fiscal and legal measures which again discriminate in favour of motorists. There are the weak and unenforced traffic laws such as the penalties for dangerous driving, whereby only the driving license is taken away for some period.

The solutions to these problems lie in the reversing of priorities so that preference is given to pedestrians and cyclists then to public transport and finally to the other vehicles. Three mode transportation studies (1) (public transport, private transport, and non-motorized transport) should be conducted throughout the analysis sequence and strategic transport plan preparation.

Insertion of non-motorized travel in the transport study process raises the issue of trade-offs (1) of capabilities between rather fine two-modes analysis process and probably coarser three mode approaches. But it is clear that current trends and needs call for decreasing emphasis on modelling sophistication in favours of better communication capabilities with decision - makers and more transparency of the process (1).

A recent C E C D study indicates that pedestrian modelling, which can be handled in similar ways as motorized transport, lends itself to considerable simplifications (4). As a matter of fact, as Bovy, puts it 'the degree of accuracy is not really an issue since it does not have major consequences in the final design. The mere fact of integrating non-motorized transport in the overall transport study process is by itself a safeguard and a major improvement over past practice'.

Whereas the overall goal for a pedestrian policy should be to increase the desirability of pedestrian travel in the Central Area by simultaneously reducing, as much as possible and feasible, the demand for other more disruptive and more expensive forms of transport, the specific objectives should be:-

- (i) to increase safety;
- (ii) to improve network continuity;
- (iii) to focus on network connectivity;
- (iv) to increase network capacity; and
- (v) the improvement of pedestrian quality of service.

The first and most pressing objective for pedestrian planning for the Central Area and Nairobi as a whole should be to increase safety - walking is the least protected type of travel. This is supported by the fact that nearly seventy per cent of the accident casualties in Nairobi involve a pedestrian.

The second objective should deal with restoration and improvement of pedestrian network continuity. This idea was more popular before the motorization age when almost all urban travel were made on foot. But since then, pedestrian footpaths were gradually narrowed, disrupted, cut and relocated with considerable detours around urban blocks and transport barriers. New urban development and rehabilitation should incorporate pedestrian links and connections to facilitate pedestrian movement within and across the areas considered, in this case the Central Area of Nairobi.

There should be a focus on pedestrian network connectivity to all interfaces with public transport system and other land uses in the Central Area, just as there should be an increase of pedestrian network capacity. Many pavements (sidewalks) in the Central Area are under-designed with inadequate capacity. A final objective should be the improvement of pedestrian quality of service, in the Central Area, through urban design and provision for such amenities as landscaping, weather protection for cold and hot seasons.

4.1 - VARIOUS WAYS OF ACHIEVING IMPROVEMENTS

THE PEDESTRIAN MODE OF TRAVEL

There are many ways to improve the convenience, safety and attractiveness of the urban environment for pedestrians. These can be:-

- A - Minor improvements without area modification;
- B - Pedestrian improvements requiring pavement (sidewalk) widening;
- C - Pedestrianized streets (Malls) displacing vehicular traffic partially or totally; and
- D - Major pedestrian improvements with multi-level construction.

Most of the practical schemes available to a city will be found in the list below which gives a systematic approach. The improvements are listed in approximate order of cost and grouped in four major categories (5) as listed above.

A - MINOR PEDESTALIAN IMPROVEMENTS WITHOUT AREA MODIFICATION

- i) Signal timing to favour pedestrians;
- ii) Nightless pedestrian cross walks;
- iii) Parking and truck loading restrictions and enforcement;
- iv) Landscaping including above-grade planters;
- v) Dustbins newsstands, phones and mailboxes;
- vi) Temperature controls, shelters, and music; and
- vii) Shuttle buses or similar services.

**B - PEDESTRIAN IMPROVEMENT REQUIRING
PAYMENT (SIDEWALK) IMPROVEMENTS**

- i) Sidewalk widening at street crossings and bus stops, with midblock short-time loading or parking spaces;
- ii) Building setbacks or arcades;
- iii) Passageway to bisect long blocks;
- iv) Mini-parks on odd lots, courts and rear areas;
- v) Benches, fountains, artwork and accessories;
- vi) Bus shelters; and
- vii) Person conveyance including escalators and moving sidewalks.

**C - PEDESTRIANIZED STREETS (MALLS)
DISPLACING VEHICULAR TRAFFIC PARTIALLY
OR TOTALLY**

- i) Transitway - Exclusively of all vehicles except buses and emergency vehicles, for which special lanes would be built in the pedestrian area;
- ii) Plaza or interrupted mall - mall street reserved for exclusive pedestrian use, with cross streets left open to vehicular traffic; and
- iii) Continuous Mall - pedestrian street extending the full length of a business area without interruptions, excluding all but emergency vehicles.

**DA - MAJOR PEDESTRIAN IMPROVEMENTS WITH
MULTI-LEVEL CONSTRUCTION**

- i) Separate pedestrian underpasses or overpasses across main or side street;

- ii) Large second level crossing combined with concourses above or below full intersections areas;
- iii) Second level pedestrianways along street above or below sidewalk and/or street pavements;
- iv) Second vehicular level above or below street for either:-
 - a) Transit (subway, elevated)
 - b) Automobiles (overpass or underpass)
 - c) Trucks (truck tunnels or ramps)

The definition of a 'mall' is here taken as a permanent pedestrian area on a former street, where vehicular traffic is highly restricted and pedestrian environment is improved.

The above mentioned alternative ways of improving the pedestrian mode of travel are not only useful for the study area of this study, namely the Central Area of Nairobi, but are also useful guidelines for other urban centres in the country that are bound to face similar problem of pedestrian movements.

4.2. - PLANNING STRATEGY

Planning for safety of pedestrians and pedestrian facilities is a longstanding and universal problem. Urban traffic congestion is not unique to any specific geographical location or historical period. It appears in a variety of forms, and its universality suggests underlying factors that are only partially related to modes of transportation. The basic causes of urban traffic congestion appear to be excessive crowding of population and economic activity into small areas of land and a disorderly arrangement of land uses that has maximised transport requirements.

The great bulk and density of buildings and concentration in the Central Area of Nairobi have created a volume of passenger and goods movement that has become increasingly difficult to accommodate effectively regardless of transportation methods.

Today, the Central Area of Nairobi, by its very nature, presents a challenging pedestrian pattern. The densities, diversification and variety of physical development and economic activity provide a mixture of movements, both by foot and wheel, that makes the Central Area configuration a composite of interrelated and interwoven pattern of activity.

This section (4.2 - Planning Strategy) of the study is concerned with delineating the conceptual aspects of planning for pedestrians. The conceptual aspects are not discussed entirely in the context of the Central Area of Nairobi, but in a wider context, with the hope that other urban centres in the country that also experience the problem of pedestrian movements in their Central Areas, may find the useful in the endeavours to solve the problem of pedestrian movements.

4.2.1 - PLANNING STRATEGY

Up to now very little consideration has been given, in the Central Area, to the dominant influence of major pedestrian generators and major transport modes. The pedestrian systems have generally fixed routes imposed by block and building layouts on streets primarily serving vehicles. Thus so far the pedestrian systems have been secondary in importance to vehicular traffic systems.

Pedestrian activities does not constitute a major portion of the movements to all goods and people.

In Central Areas of towns however, pedestrian movement is often the final part of a vehicular journey.

These pedestrian movements are also the most flexible in terms of routes choice and accessibility. Three aspects of pedestrian circulation are:-

- a) the land use function that must be located space;
- b) the transport linkage function connecting transportation nodes and central area functions; and
- c) a means of observing the urban environment for view and vistas.

Thus, the purpose of a pedestrian system must be to move people from origin to destination, and it should not be seen or considered as competitive with other transportation modes but rather complimentary to them.

Figure 2 shows a possible planning framework, developed by Autonica, (6) for examining pedestrian requirements in terms of movement patterns, activities and physical development. The projection of existing conditions and the co-ordination of these three basic requirements will assist in formulating various alternatives so that feasible network can be adopted.

The use of such a framework for the Central Area will naturally require long-term programme including extensive field surveys. Therefore, the form that the pedestrian network will take inside the central area can only be determined by undertaking an extremely detailed study.

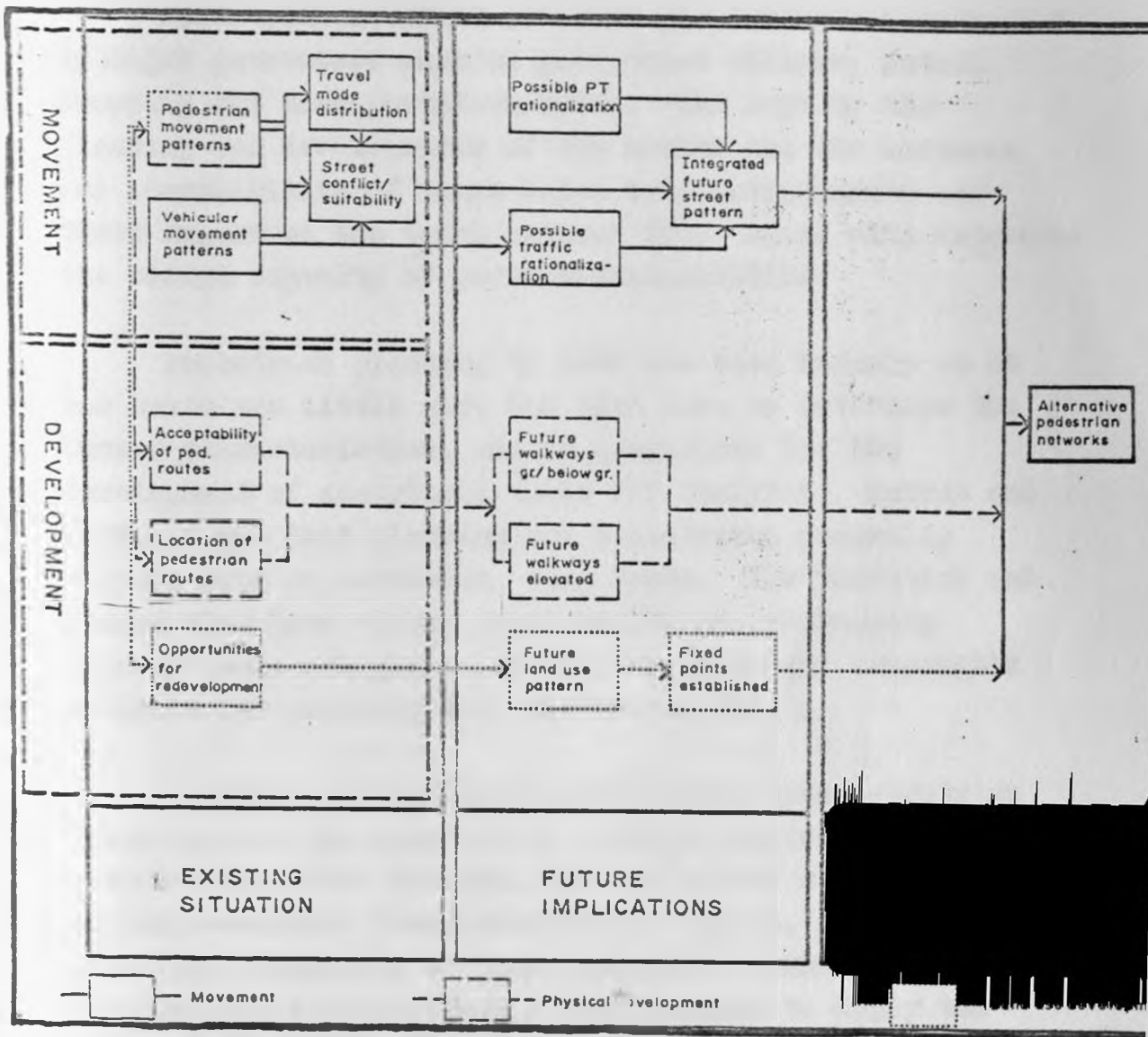


FIGURE 3 Planning framework: pedestrian requirements examined in terms of movement patterns, activities and physical development.

SOURCE: J. Antoniou: 1971

4.2.2. QUANTITATIVE ANALYSIS

Pedestrian movement patterns are determined primarily by major generators such as government offices, retail shopping and transportation nodes. The keys to the planning and developments of the system are the distance and accessibility of these major trip determinants and their impact on the total volumes (7). These will determine the design capacity of pedestrian facilities.

Pedestrian planning to date has been largely on ad hoc basis and little work has been done to determine the demand characteristics, impact generators and the development of analytical tools for analysis. Morris and Kisman argue that planning for pedestrians generally depends more on intuition than facts. The yardstick and gauges that have proved quite useful in determining highway needs are generally useless in making comparable analysis for planning for pedestrians (8).

A number of studies (7) have dealt with pedestrian flows much in the same way as traffic studies, using origin-destination surveys, gravity models and consideration of socio-economic characteristics. Morris, for example, uses four categories of trip purposes - terminal, business, shopping and miscellaneous - and proceeds to apply the gravity model techniques to data collected by regular origin-destination techniques (9). Havin and Wheeler studied pedestrian flow characteristics on sidewalks to find patterns of capacity and use in relation to demand (10). Lyles and Spiller have discussed modal choice as it relates to the pedestrian (11).

To make quantitative analysis more meaningful, Stuart (12) suggests a number of questions that these kinds of data could be directed to answer:-

- 1 - How well are the pedestrian route locations aligned with the directions of heaviest travel demand? Can the need for any new routes be identified?

- 2 - Which pedestrian routes require further development to resolve pedestrian circulation shortcomings.
- 3 - Which sites within the existing pedestrian networks are preferred locations for the development of additional activities that generate pedestrian movements?
- 4 - What will be the amount and directions of pedestrian travel resulting from the development of new generators at alternative locations? Will any adjustments in the pedestrian network be necessary?
- 5 - What will be the volumes and circulation patterns of pedestrian movement expected from alternative land use arrangements? What types of networks will be appropriate?

Thus the methods of data collection may parallel those of origin-destination surveys used in metropolitan traffic studies. But the major concern must be centred on compatible location generators within a given network rather than developing networks for high-capacity, peak-hour operations. In general, the following kinds of information should be sought by pedestrian origin-destination studies:(7)

- a) The location, scale and character of major generators and their relationship to change-of-mode transportation nodes;
- b) The scale, character and purpose of pedestrian trips; and
- c) Identification of route preference, choice and flexibility.

4.2.3. - ENVIRONMENTAL ELEMENTS

The environmental elements that influence the planning and design of pedestrian circulation systems can be grouped into five categories (7).

- A - Movement patterns - safety, comfort and continuity of the pedestrian network and available alternative route choices;
- B - Location of major trip generators - interconnections between the major trip generators themselves and their relationship to the pedestrian network;
- C - Nodal elements - change of node points, such as parking areas, bus stations, bus stops and recreational areas such as squares and parks;
- D - Historical elements - unique landmarks and distinctive assets of history, architecture and even topography; and
- E - Imageability - urban design facade, view of and from the network and vista.

The above five categories broadly represent only two elements:

- a) The relationship of the pedestrian trip generators to the pedestrian network and
- b) the details of urban design along the network and the imageability.

The two basic elements are more or less interrelated. The physical location and the interrelationships of the generators do influence the orientation and dimensions of pedestrian network and to a large extent, determine the essential nature of design details. It should, however, be noted that the planning and location of the pedestrian network itself will influence further opportunities for location and relocation of important trip generators.

These environmental elements relate to the scale sensitivity and subtleness of those who are to move along the pedestrian networks at a flexible speed with a number of route choices open to them. Physical and biological detail of the urban scene comes into its own for the pedestrian as he moves along his path. This basic structure of the formation of pedestrian spaces contributes significantly to visual diversity. Major elements, either man-made or natural, within the pedestrian systems make possible a differentiation among subareas of the environment (13). This is an important determinant of the environmental character of the pedestrian network itself.

4.2.4. - SEGREGATED / MIXED

The costs, benefits and community consequences of providing viable and aesthetic pedestrian circulation systems should be evaluated within the framework of the total transportation system. The cost-benefit criteria must also be based on systems alternatives, not on the evaluation of single elements of the system. For instance, the segregation of vehicles and pedestrians will obviously result either in higher motor vehicle handling capacity in the existing streets or in higher comfort and safety both to motorists and pedestrians.

To date many of the major segregated pedestrian circulation systems in developed countries have been developed in conjunction with major private urban developments. This private-public interaction, as in United States and Canada (7), has been limited to design standards and, to a small degree attempts to make possible the development part of an overall pedestrian system. Most arrangements for cost sharing between private and public enterprise have been ad hoc based on circumstantial expediency in which approval or disapproval of the proposed major urban development has been the prime objective.

It is therefore necessary to evolve methods of cost-benefit analysis that would include an analysis of socio-economic and environmental consequences within the overall planning framework of the total transportation system. Thus the City Council of Nairobi must take the initiative in developing and evolving plans for a total transportation system for the Central Area.

Separation of pedestrian facilities from the vehicular traffic often involves substantial additional costs, and the questions of who benefits and who should pay are difficult to resolve. Both the pedestrians and the motorists who use the systems and the planners can easily see the benefits and change in comfort, safety, aesthetics and may be traffic efficiency in central areas. These are elements that encourage and justify the development of pedestrian systems in conjunction with major urban developments.

It is also argued that pecuniary benefits do accrue to commercial establishments, whether existing or proposed, due to greater pedestrian access that results in increased patronage. This is more so in pedestrianised shopping streets.

In order to make it possible to effectively develop a total pedestrian circulation system, some control must be exercised over the location and development of major pedestrian trip generators that in turn affect route choices, patterns, and linkages and to a large extent determine pedestrian volumes. The planners should, therefore, coordinate these developments to the extent that the proposed pedestrian system and the locational characteristics of the major developments are mutually compatible and enhance environmental quality.

4.2. 5. - LIMITATIONS

Whether the pedestrian is going to be below or above the level of the vehicles is going to be influenced not only by cost-benefit analysis but also by other limiting factors such as:

- i) Topography;
- ii) Existing building design;
- iii) Geology;
- iv) Excavation costs;
- v) Cost of relocation of facilities;
- vi) Groundwater levels;
- vii) Aesthetic surrounding;
- viii) Pedestrian behaviour (psychology);
- ix) Accessibility levels; and
- x) Climate and surrounding vista.

All of these choice factors must be a part of the systems analysis that precedes the design and development of a pedestrian network.

4.2. 6. - DESIGN ASPECTS

Although the study of pedestrian traffic is receiving growing attention (14), there is still little knowledge about pedestrian design standards. An attempt is made here to record a range of requirements which can be used for the Central Area or can be adjusted to local circumstances and situations.

In providing a pedestrian network (walkway) system in the Central Area, the general aim should be:-

- a) to express a uniform design identity throughout, in terms of function and visual quality; and
- b) to aid the pedestrian to orientate himself and be aware of his right to such areas.

There is, therefore, a need to incorporate a variety of spatial experiences which are urban in character and scale.

The overall pedestrian walkway system must be direct and easy to comprehend and should avoid repeated changes in direction.

The basic elements of a pedestrian walkway system are the various paths and nodes involving activity concentrations, intersections, or vertical access to footbridges or tunnels (subways).

4.2.6. 1. - PATH WIDTHS AND WIDTHS

The actual widths of paths should be related to the particular pedestrian flows which operate. For instance, the capacity of a path used primarily at peak hours (essentially one-way traffic) may be quite different from the casual requirements from shoppers (pedestrians moving in different directions).

The capacity of paths may be taken to vary between 10 and 15 persons per foot width of pavement per minute (15) after deducting 1.5 feet dead width (3.0 feet in shopping areas).

Thus the actual width of pavements (sidewalks) will be subject to variations in detail planning in the action areas.

However using the above mentioned capacities, it is possible to distinguish between three broad categories of walkway paths (16)

i) Main (primary) path, with a minimum width of 23.0 feet. This should have a throughfare capacity of 12,900 persons per hour and a shopping capacity of 12,000 persons per hour.

ii) The secondary path, with a clear width of 11.5 feet such a width can hold a throughfare capacity of 5,900 persons per hour and shopping capacity of 4,500 persons per hour.

iii) Minor paths used for access only, with a minimum width of 6.5 feet and this has a throughfare capacity of 3,000 persons per hour.

an area will determine the size and layout of particular nodes in the Central Area. At the intersections of an activity node a minimum width of 31.0 feet will need to be considered to allow for window shopping, variations in walking speeds, and convenience in movements.

At intersection nodes, pedestrian movements are likely to be the heaviest, converging from various directions. Therefore, a wider area than the recommended path will be required. Such nodes must be primarily designed for the public purpose of accommodating intensive pedestrian travel and must allow for orientation and directional changes (16).

4.2.6. 2. - CHANGES IN LEVEL

At times it may be necessary to link various parts of the walkway system by change in level. For instance, where buildings have been adopted (or new developments have been constructed)

to accommodate a pedestrian path on a different level connections should be made with the rest of the system and with adjoining public transport facilities at street or subway level.

The advantage of linking walkways over vehicles is that the bridge over a road does not unduly disturb the traffic or the services below.

Pedestrians, generally, use what seems to be the shortest and most convenient route. There, is, therefore, a disadvantage in having to negotiate a climb of some 20.0 feet, that is three flights of sixteen steps, or a ramp about 250.0 feet long (17). Convenience must therefore, be related to the extent of the walkway at the higher level (for example, by connection with built developments incorporating pedestrian decks, or by taking into account natural changes in topography) (17).

Subways (tunnels), on the other part, require a minimum change of level of only two flights of some twelve steps (or a ramp about 125.0 feet long) (16). The disadvantage here is that below the surface on most streets there are network of services and ducts which may need to be diverted at great financial costs. Pedestrians, too, are normally discouraged from using subways (tunnels) with long and tortuous ramps often leading to uninviting and unattractive tunnels.

4.2.6.3. FACILITIES FOR PEDESTRIANS

Assuming the walkway system has been laid out it will also be necessary to revise the location and provision of public facilities. Many of these could be included in the choice of alignment, but some will have to be located, or newly provided, at prominent and convenient positions along the network.

Based on expected flow patterns within the nodes and adjacent private areas, a number of essential features should be provided primarily on the network. These should include public conveniences, public telephones and mailboxes (the latter should be located relatively close to vehicular access for easy collection) and first aid facilities.

4.3. - P E D E S T R I A N I S A T I O N

In planning a pedestrianised street (mall), the following principles should be observed: (5)

- i) - Merchants (traders) should be in hearty accord with the proposal;
- ii) - Adequate off-street parking facilities should be available or contemplated close to the prime generators on the mall. Ideally, shoppers should not have to walk more than 400 feet;
- iii) - Access to transit service should be convenient;
- iv) - There should be pick-up and delivery points close to the retail area for taxi and automobile passengers;
- v) - The plan should not seriously increase traffic congestion elsewhere in the Central Area;
- vi) - Pedestrians should be able to walk from shop to shop with little or no interference from vehicles;
- vii) - If transit vehicles are to be used on the pedestrianised street (mall), they should be of the type that would stimulate true 'shopping' activities;
- viii) - Provision must be made for adequate police and fire protection, for efficient maintenance of street lights and other public utilities, and for handling emergencies;
- ix) - The programme should contemplate a continuing series of promotional events such as temporary exhibits and special entertainment;
- x) - The pedestrianised street (mall) should contain carefully selected features, sidewalk cafes exhibits;
- xi) - Overall design and the treatment of details must be of high quality and in good taste. This applies particularly to signs, shop fronts, Street furniture and minor structures;

- xii) - Consideration should be given to protecting pedestrian from adverse weather while retaining natural sunlight in good weather;
- xiii) - The plan should provide for the efficient handling of goods to and from the various building along the pedestrianised street (mall);
- xiv) - Modifications of existing structures should recognise the needs of present and possible future merchandising practices. The programme should not require costly changes in existing structures or in present merchandising techniques;
- xv) - Consideration should be given to the requirements of the non-retail occupants of the upper floors of the commercial-cum-residential buildings;
- xvi) - Attention should be given to the effect the pedestrianised street would have on retail shops not located on the pedestrianised street;
- xvii) - The plan should be flexible enough to permit modifications if and when conditions change;
- xviii) - A programme, to be successful, must be capable of being accomplished in terms of:
 - a) Reasonable chance of agreement as to need among affected property owners and their tenants;
 - b) Broad recognition of the objectives as being of community-wide interest;
 - c) Specific recognition by the central area community of the mutual interest of retail business and other core activities;
 - d) Compliance with legal limitations and requirements;

- e) Economic feasibility of bearing public and private costs;
- f) Physical feasibility; and
- g) Compatibility with the overall central area plan.

It should, however, be noted that an overall master transportation plan should be prepared for the central area, or else changes designed to improve the system for one function might disrupt other operations.

Beautification features on the pedestrianised street should be relatively easy and inexpensive to maintain. Displays that are interesting and/or educational and which are rotated or changed periodically are some aspects that would attract visitors to a pedestrianised street.

The following procedures (5) would be useful, once the City Council authorities have decided to pedestrianise a particular street in the Central Area:-

- 1 - Define the principles and techniques for the improvement. The study should be undertaken with the knowledge and assistance of planning section, to aid in determination of the projects relationship to comprehensive plan. It should, therefore, include:
 - a) A detailed examination of existing conditions and review of data available through the Chief Planning Officer and other relevant sections in the City Engineer's department;
 - b) Analysis of the function of similar and comparable schemes in other cities;

- d) Development of a set of basic principles and series of alternative approaches although no definite recommendation should be made at this stage as to a specific preference for one type of treatment for a pedestrianised street.
- 2 - City officials and (where possible) the central area traders should determine which of the several alternative courses of action they desire to embark on;
 - 3 - The preferred approach for the development should be selected;
 - 4 - A second study should then be made:
 - a) to prepare a general plan for the reconstruction of the street as a circulation facility, emphasizing the desired types of movement;
 - b) to prepare geometric plans for circulation facilities;
 - c) to define design objectives; and
 - d) to make preliminary estimate of cost.
 - 5 - Further discussions should be held and decisions reached among all interested parties.
 - 6 - The final step should be the preparation of engineering and architectural construction drawings, specifications and cost estimate for the selected improvement.

4.4. - EDUCATION, ENFORCEMENT AND PROPAGANDA

Traffic safety measures are still characterized by conservative view. Traffic education, in many countries, attempt to teach pedestrians how they should behave in traffic; bicyclists how they are to obey the rules; motorcyclists, mopedists and car drivers what rules apply to them. Thus most countries lack systematized traffic education and as such a road user, be it a pedestrian or a motorist, is never informed about the problems that other road user face apart from his own.

There is, therefore, a necessity for traffic education to be coordinated into a system that begins in the pre-primary school extending through all the education levels and grades and ending with the driving schools. This kind of education would provide road users with the knowledge and awareness of the elements that are involved in the traffic complex. From this an improved basis for traffic safety can be built in the future generations.

Enforcement - the legal position of the pedestrian as the majority group in traffic has to be enforced. At present the reaction of the judicial system is too mild. Legal actions and measures must have power to safeguard the position of the pedestrian and thereby protect the safety of traffic as a whole. For instance, in the judicial field:- (18)

- a) It should be compulsory for drivers backing their vehicle without a clear view to the back, to have a second person waiting behind the vehicle if all is safe;
- b) Overtaking a slowly approaching or standing vehicle at a pedestrian - crossing is forbidden in most countries, but enforcement is often too inadequate. This manoeuvre is one of the most dangerous in traffic;

- c) Speed limits should be checked in the central area. These are of great importance for accident prevention. Assessing distances and speeds of oncoming traffic correctly is too difficult for the pedestrians.

There is also a need for a vigorous campaign and propaganda for road safety. Nairobi has all the facilities necessary for improving road safety for pedestrians. The safety campaign for pedestrians should be carried by both the mass media and the daily press.

4.5. - RECOMMENDATIONS

In general, the study recommends that the Nairobi City Authorities should, with some urgency, include the pedestrian travel into its overall transportation planning process.

The study further propagates the human idea that the safety of the pedestrian (as a vulnerable road user) should have priority over the present idea of searching for a smooth throughflow of motorized traffic.

While on the subject of safety, it is the opinion of this study that from an accident point of view, the faulty actions of the pedestrian are only of secondary interest and that the primary cause is that the traffic environment offers situations, where faulty actions give rise to accidents.

Therefore, any future proposals by the Nairobi City authorities for the betterment of pedestrian travel, should be done so with an aim to improve and ensure:

- Safety
- Convenience

- Security
- Continuity
- Comfort
- Attractiveness

In order to ease the problem of pedestrian movements in the Central Area of Nairobi, the following proposals are deemed necessary by the study:-

- i) Reduction of the volume of motorized traffic going into the Central Area;
- ii) Identify the existing major pedestrian routes in the Central Area and upgrade the facilities along them;
- iii) Connect the pedestrian routes to the major land-uses in the Central Area;
- iv) Intensify campaigns for road safety education in a wider frame.

Map 23 shows the recommended transport network in the Central Area. The concept behind the map is that the motor vehicles should be restricted to only a few roads leaving a number of pockets in the Central Area that should then be improved in favour of pedestrian mode of travel when the need for redevelopment of these areas arises. As such this study has not worked out any detailed action plans (for these pocketed areas) to show how the pedestrian travel should be given priority owing to time and financial limitations that has, throughout, determined the scope of this study. Figure 4 shows the conceptualisation behind the recommendations made in Map 23.

The study agrees with the finds of a report (19) on Central Area's pedestrian traffic.

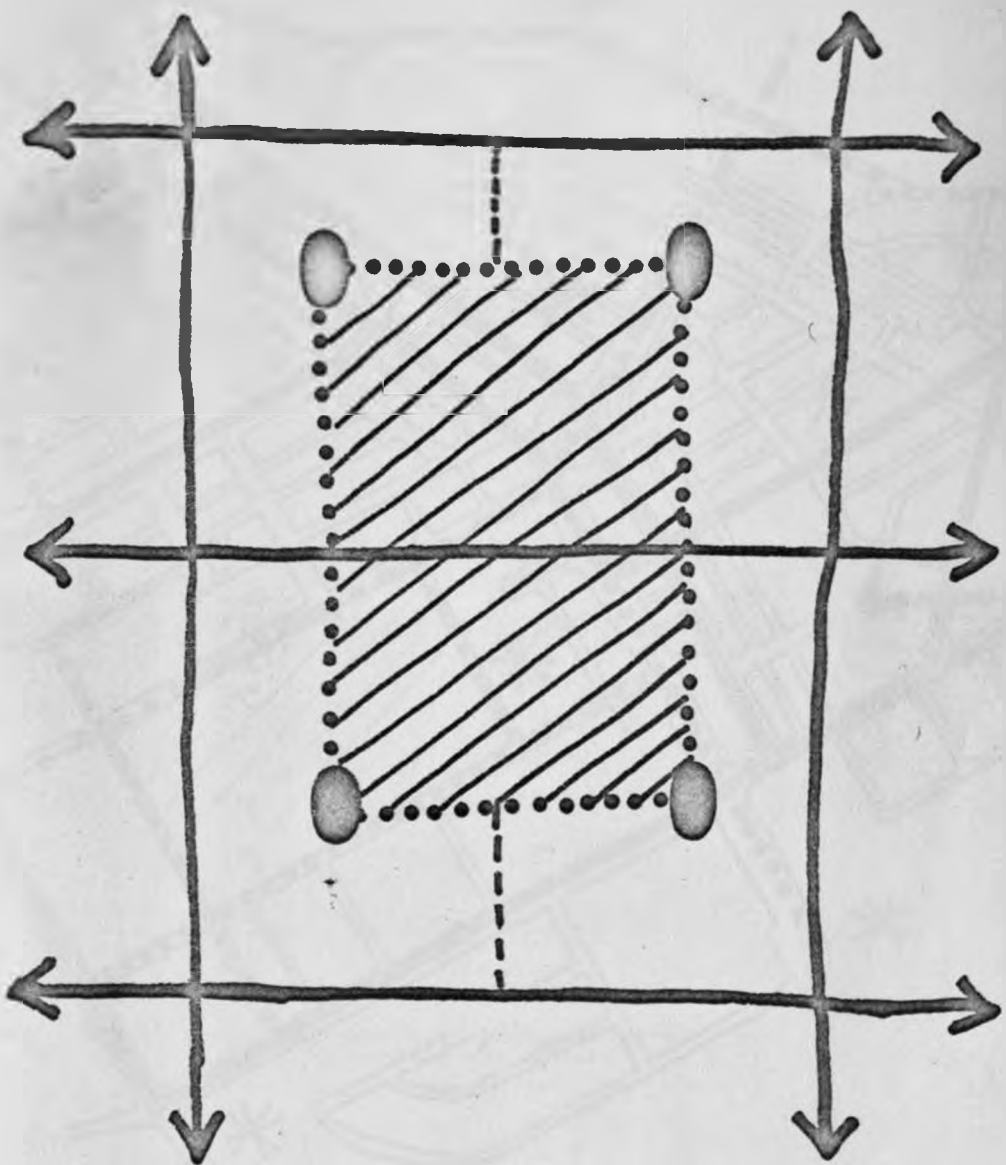


FIGURE 4 BASIC CONCEPT: Pedestrian planning: Central Area



Public transport and heavy vehicles



Service and light vehicles



Parking (off street)

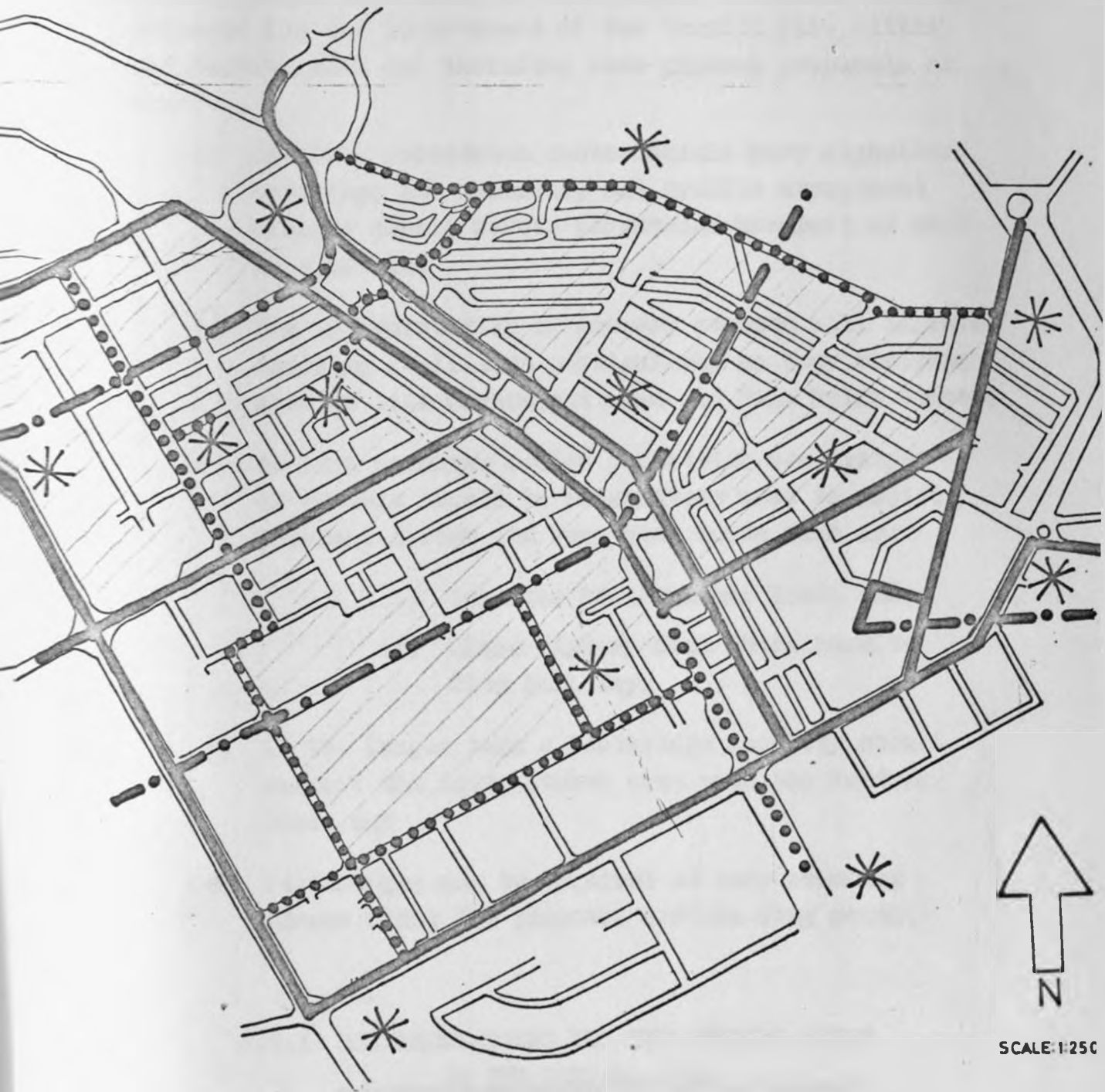


Pedestrian links








Pedestrian travel priority area

CENTRAL AREA — NAIROBI



MAP-23 Recommended transport network

-  PUBLIC AND PRIVATE
-  BUSWAY ONLY
-  PRIVATE
-  SITE FOR FUTURE CAR PARKS
-  AREAS WHERE PEDESTRIAN TRAVEL SHOULD BE GIVEN PRIORITY WHEN REDEVELOPMENT OCCURS

It is evident that there are no radical solutions that are proposed for the improvement of the traffic flow within the Central Area and therefore some general proposals are that:-

- a) All busy pedestrian routes should have signalized crossings and generally all traffic management schemes should favour pedestrian movement as much as possible;
- b) The implementation of one-way streets will improve crossing facilities particularly on busy shopping streets like Government Road and Mama Ngina Street;
- c) On main commuter routes pedestrian overbridges or tunnels should be extensively used to assist movement across the busy ring roads such as:
 - i) Landhies Road/Tumwani Road; and
 - ii) Uhuru Highway from Uhuru Park to City Hall way.
- d) In the longer term a footbridge facility should connect the Loita Street area with the Central Park; and
- e) Footbridges may be required at busy crossing places along the proposed eastern ring route.

4.6.1 RECOMMENDATIONS FOR THE STUDIED SITES IN THE CENTRAL AREA

1 - UHURU HIGHWAY UNCONTROLLED CROSSING (3.3.1)

A zebra crossing on this site, given the traffic lights and the huge volume of traffic flow would certainly serve no useful purpose. The only solution is to have a grade separated pedestrian facility across the Highway.

This study recommends that a footbridge across the highway would serve a useful cause in ensuring pedestrian safety.

This study further supports the efforts that the City Engineer's Department, in Nairobi City Council, made in 1971 in designing a footbridge to carry pedestrians Uhuru Highway from City Hall Way to Uhuru Park. It is reliably understood that the City Council authorities had to postpone, indefinitely, the building of the footbridge for financial reasons, but this study feels that the time has come for the relevant authorities to install the bridge considering that the issue of safety is of paramount importance in any community.

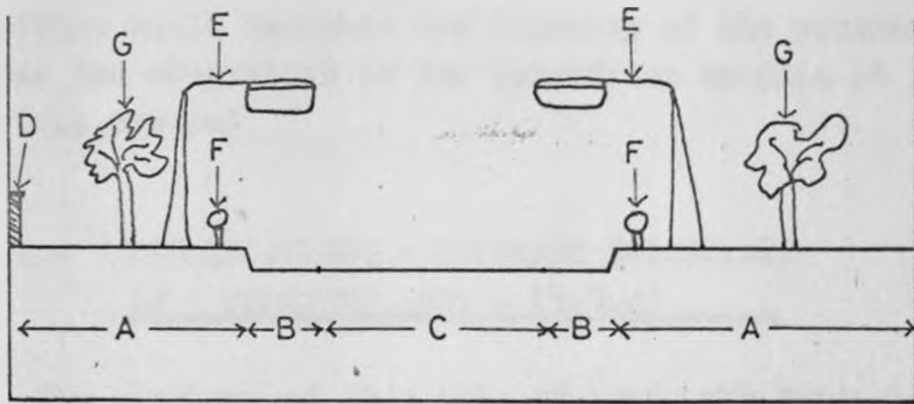
2 - SEBRA CROSSING - HALLS BRASSIE AVENUE NEAR
LAWSON ROAD BRIDGEHEAD - (3.3.2)

From the observations made during the field survey of the study, it is quite evident that the present simple sebra crossing at the site of study is not satisfactory especially at such a crossing where there is a high pedestrian flow to and fro the Central Area and the eastern residential suburbs.

This study, therefore, recommends that a signalized crossing would be a useful temporary solution to be ultimately replaced by complete segregation by either a subway or a footbridge.

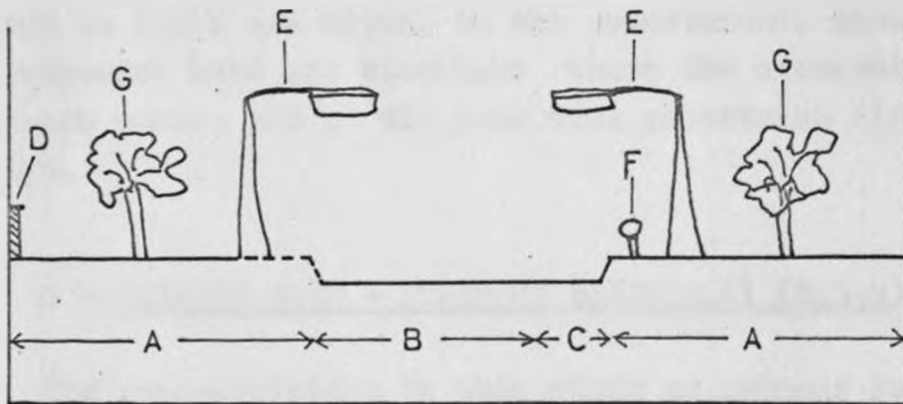
3 - SEBRA CROSSING - HALLS BRASSIE AVENUE NEAR
LAWSON ROAD BRIDGEHEAD - (3.3.3)

The problem here, to the pedestrian movements is brought about by the narrowness of the pavement. A probable solution would be, to do away with the present parking space and then extend the width of the pavement to occupy the present parking area.



PRESENT SITUATION

- A - Pedestrian pavement
- B - Parking
- C - Carriageway
- D - Iron fence
- E - Street light
- F - Parking metre
- G - Flowering tree



PROPOSED SITUATION

- A - Pedestrian pavement (extended)
- B - Carriageway
- C - Parking
- D - Iron fence
- E - Street light
- F - Parking metre
- G - Flowering tree

FIGURE 5 A SKETCH MAP OF A CROSS SECTION OF
HARAMBEE AVENUE
(Near Jogoo House)

Map not drawn to scale

This action would increase the capacity of the pavement and ease the congestion in the pedestrian traffic at peak hours (see sketch)

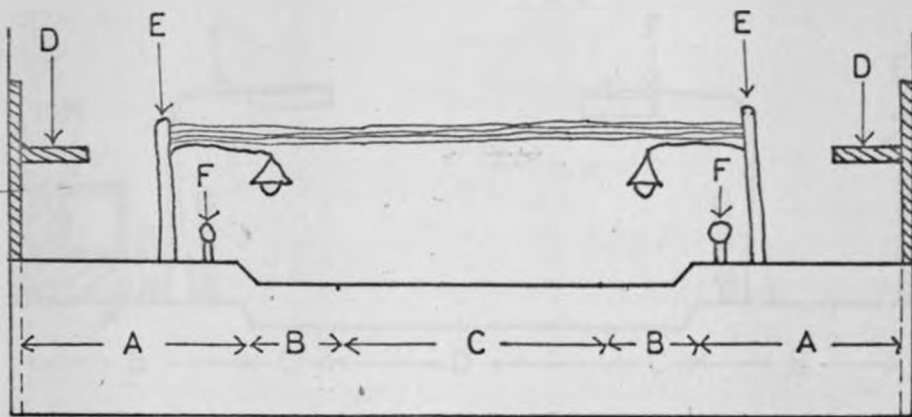
4.- LUTHULI AVENUE - PAVEMENT (SIDEWALK)
IN A PROBLEM AREA - (3.3.4)

The problems of this site of study are typical of most problem areas in the older part of the Central Area (east of Tom Mboya Street), where the room left for pedestrian movements on the pavements (sidewalks) is relatively small.

The solution to the problem of pedestrian movements on this site (and elsewhere in the Central Area with similar conditions) would be to abolish the present parking space and extend the width of the pavement. The temporary activities that operate on the pavement, although at times are useful to the pedestrians, should be discouraged here and elsewhere where the pavement widths are narrow and at the same time pedestrian flows are high.

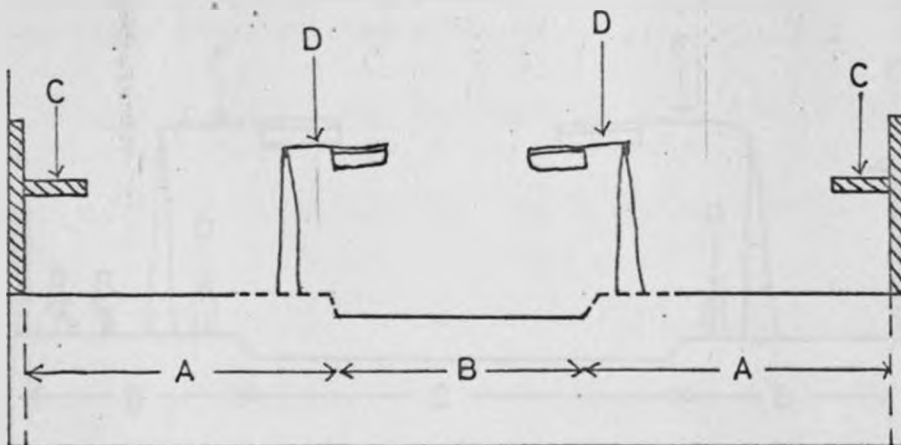
5 - WINDHOLE ROAD - PAVEMENT (SIDEWALK) (3.3.5)

The recommendation by this study as regards such a problem area, is that the Nairobi City authorities should, with immediate effect remove the shanty kiosks that, at present, do occupy quite a substantial width of the pavement. The pavement should then be properly levelled and concrete slabs to be placed (with some attractive design touch) on the pavement. This would erase the numerous pot holes that are prominent feature on this pavement (sidewalk).



PRESENT SITUATION

- A - Pedestrian pavement
- B - Parking
- C - Carriageway
- D - Building
- E - Street light
- F - Parking metre

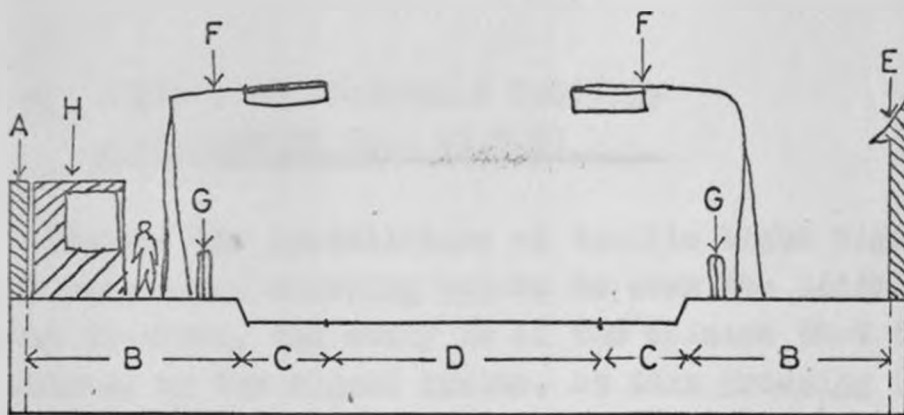


PROPOSED SITUATION

- A - Pedestrian pavement (extended)
- B - Carriageway
- C - Building
- D - Street light

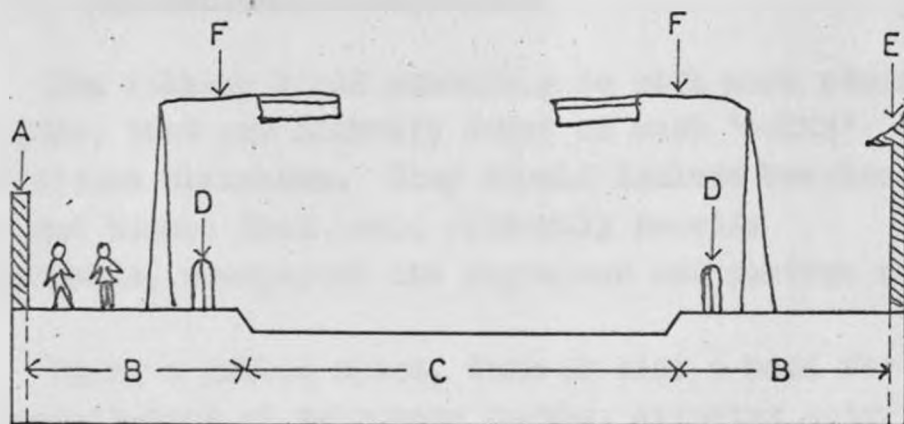
FIGURE 6 A SKETCH MAP OF A CROSS SECTION OF LUTHULI AVENUE

Map not drawn to scale



PRESENT SITUATION

- A-Wall fence
- B-Pedestrian pavement
- C-Parking
- D-Carriageway
- E-Wall (retail market)
- F-Street light
- G-Guard rail
- H-Shanty kiosks



PROPOSED SITUATION

- A-Wall fence
- B-New pedestrian pavement
- C-Carriageway
- D-Guard rail
- E-Wall (retail market)
- F-Street light

FIGURE 7 A SKETCH MAP OF A CROSS SECTION OF PUMWANI ROAD

6 - SIGNALIZED PEDESTRIAN CROSSING
- AGA KHAN WALK (3.3.6)

Whereas the installation of traffic light signals at busy pedestrian crossing points do ease the pedestrian movement problems, the study is of the opinion that the time allowed in the signal cycles, at this crossing (and elsewhere) should be much longer and scattered.

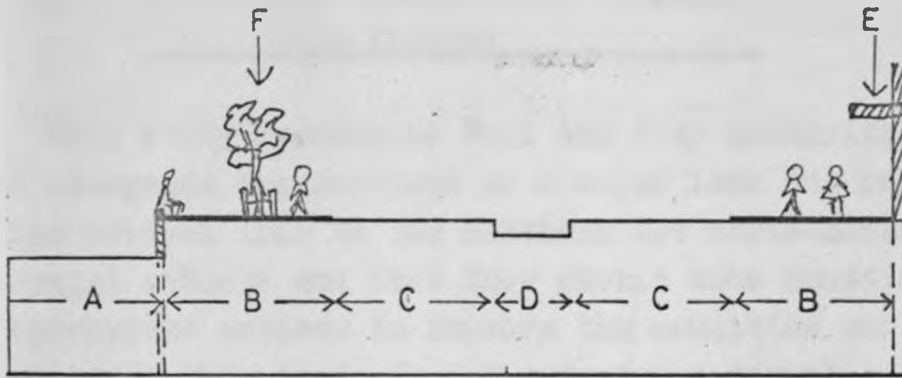
There is also a need to give more publicity campaigns on how these signals controls operate and how they should be followed and obeyed by both the pedestrian and the motorist. This could be facilitated through radio and television programmes, cinema theatres, schools and other public places and functions.

7 - THE AGA KHAN WALK (3.3.7)

The Walkway could certainly do with more street furniture, that are normally found on such 'walks' in other cities elsewhere. They should include benches, seats and kiosks that would primarily provide refreshments, newspapers and magazines and postage stamps.

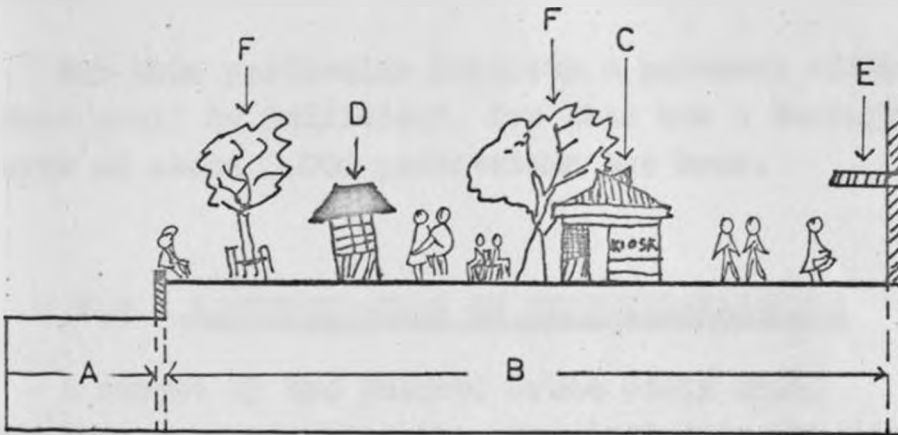
Being a public space, there is also a need for the installation of telephone booths, drinking water fountains and a public toilet. More attention should be given to the floor treatment of the Walkway. This Walkway is a routeway that people should pass through while shopping or tourists lingering about. An attractive floor treatment is therefore essential on this site, for it is estimated* that when in motion two-thirds of the field of vision, of a person, is occupied by the surface which is being walked and therefore the texture, colour and materials used as floor treatment on pedestrian paths and walkways such as the Aga Khan Walk should be in line with this fact.

* J. ANTONIOU - "Environmental Management"
 Planning for Traffic : 1971
 McGraw-Hill : pp.87



PRESENT SITUATION

- A- Off street car park
- B- Paved area (concrete)
- C- Murrum surfaced area
- D- Open surface drainage
- E- Building
- F- Flowering tree



PROPOSED SITUATION

- A- Off street car park
- B- Paved area
- C- Kiosk
- D- Telephone booth
- E- Building
- F- Flowering tree

FIGURE 8 A SKETCH MAP OF A CROSS SECTION OF AGA KHAN WALK

Map not drawn to scale

8 - PEDESTRIAN FOOTPATH OFF KIRINYAGA ROAD (3.5.81)

This study recommends that the City authorities should recognize the footpath as a major link and outlet from the Central Area to the northern and north-eastern residential suburbs and that they should take immediate and appropriate actions to improve the condition and facilities on this footpath for pedestrian travel.

The improvement package should include the provision of a concrete pavement up to the footbridge across the Nairobi River. The actual width of the pavement should be related to the pedestrian flow which operate along the footpath. The capacity for the pavement could be based on 12 persons per width of the pavement after deducting about 1.5 ft. dead width for shoppers*.

For this particular footpath a pavement width of 3 metres would be sufficient, for this has a throughfare capacity of about 5,000 pedestrians per hour.

4.6.2 - REDEVELOPMENT OF PEDESTRIANIZATION

A report by the Nairobi Urban Study Group (NUSG)(19) suggests that the area including the City Market, the Mosque and MacMillan Library could, if comprehensively redeveloped, form an ideal site for a completely pedestrianized shopping and environmental area. To achieve this, the report adds, part of Muindi Mbingu Street could be closed to traffic. All the necessary off-street parking to support the shopping area could be incorporated within the redeveloped plots or within a single large multi-storey Car Park on the Kigali Street Car Park site.

* Ministry of Transport : "Roads in Urban Areas" HMSO 1966

The report recommends that a redevelopment for the plan for this area be carried out as a matter of priority and that emphasis should be placed on the problems of access to various off-street car-parks and to any proposed commercial development.

This study is in agreement with the noble idea of turning some parts of the Central Area into pedestrian precincts. The study, does not however, support the area chosen by the report (19) for pedestrianisation. The area is not a major centre of activities and is not in line with the major pedestrian routes.

This study proposes there should be a long-term plan to pedestrianise the following streets in the Central Area:-

- a) One side of the Landhies Road (near Salvation Army Headquarters and along where it forms a junction with Temple Lane and Ronald Ngala Street);
- b) River Road;
- c) Biashara Street;
- d) Muindi Kbingu Street (part of it from intersection with Biashara Street and Banda Street);
- e) Banda Street; and
- f) Kimathi Street.

Most of these streets (proposed for pedestrianisation) fall within the areas proposed by a City Council report (19) as areas that would be, from redevelopment and environmental point of view, a useful exercise to carry out studies on the redevelopment potential.

The areas selected by the report for further model studies are:-

- a) Area around Biashara Street bounded by Maindi Mbingu Street, Government Road, Njugu Lane and Tubman Street;
- b) Area bounded by Tom Mboya Street, River Road, Latema Road and Acora Road; and
- c) Area bounded by Government Road, Kinathi Street, Tubman Road and Kenyatta Avenue.

Langhies Road is a major pedestrian route to the eastern suburbs of the City, while River Road, Biashara Street, Maindi Mbingu Street and Kinathi Street are major shopping areas. Kinathi Street as a busy pedestrian route links with City Hall way (through the Hilton Arcade) and eventually to the Aga Khan Walk.

The study suggests that where complete pedestrianisation of a street is not possible, owing to the problem of vehicular (present) circulation system, a time separation system could be adopted whereby vehicles would be allowed into the pedestrianised street at specified times.

CHAPTER 4

APPENDICES

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In Nairobi (with a population of about 750,000 people), walking trips for all purposes emerges as the predominant mode of travel over all the other modes of transport like transport, private cars and cycling.

From the accident statistics shown in this study it is evident that quite a large percentage (about 40% in Kenya and 70% in Nairobi) of the road accidents, involve a pedestrian. Road accidents, as such, are costly and if an appraisal is done in terms of assessing the estimate of the resource costs of medical treatment, funeral costs, damage to vehicles and other property, administration cost, gross losses of future output and other non-resources cost, such as suffering and bereavement, it will be found that a country spends a substantial amount of its GDP on road accidents.

SUMMARY AND CONCLUSIONS

The overall objective of this study has been to define and examine the problem of pedestrian movements in the Central Area of Nairobi. This has been done without the use of detailed quantitative analysis, but rather by use of descriptive method which concentrate on exposing the problems in order to come to viable and implementable solutions to the problems.

Walking as a mode of travel forms a vital part in the transportation system of any community, yet in the developing countries, little attention is paid to it. We are normally quite aware of the conflict between the pedestrian and the motor vehicles, but unfortunately most of our studies and researches have tended to concentrate on the vehicles rather than the pedestrians.

The problem of pedestrian movements, especially in terms of safety, therefore calls for an attack on the harmful side effect of the motor vehicles. Because of his vulnerability, the pedestrian needs to be protected against his other road users.

Pedestrian planning in the Nairobi Central Area has not yet been given priority let alone being incorporated fully into the City's transportation planning process. This study notes that as the conflict between pedestrians and vehicles continue to reach unproportional levels in the Central Area and as the number of fatal and serious accident casualties also increases year by year, there is a need for a specialized approach to the urban traffic problems so as to gain safety, comfort and convenience for the pedestrians as well as the motorists.

The study, has, therefore, recommended that the pedestrian mode of travel should be included in the overall transportation planning process and that the humanitarian idea of safety and convenience of pedestrians should have priority over the current tendency, among the City's transportation planners, of aspiring, too much, to achieve a smooth throughflow of motorized traffic at the expense of pedestrian travel.

SCOPE FOR FURTHER RESEARCH

This study has not, by any means, exhausted the research aspects of the pedestrian mode of travel. Owing to the already mentioned limitations the study has thus only concentrated on a small section of Nairobi City, namely the Central Area.

From all this one may well conclude that more research is definitely needed on the characteristics of pedestrian traffic. To enable the planners to make fair comparisons between the results of various surveys, pedestrian data should preferably be accompanied with such particulars, such as pedestrians age limit, street characteristics and weather conditions.

More research is still needed in the field of pedestrian planning for children, the old and the handicapped.

There is also the need for research in the unique needs and conditions of pedestrians in each geographical area before any large programmes of standardisation are initiated. This type of research should include psychological and perceptual analysis and testing.

Not least in importance, is the need for further research so that most the effective methods of promoting road safety education in a much wider frame can be achieved.

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A P P E N D I X

- Appendix 1 - Mean relative impact: Speeds**
- Appendix 2 - Proposed Footbridge Uhuru highway
near City Hallway**
- Appendix 3 - Pedestrianway: Floor treatment
(plate 21)**
- Appendix 4 - Pedestrianway: Enviromental quality
(plate 22)**
- Appendix 5 - Adequate pedestrian pavement (sidewalk)
width (plate 23)**

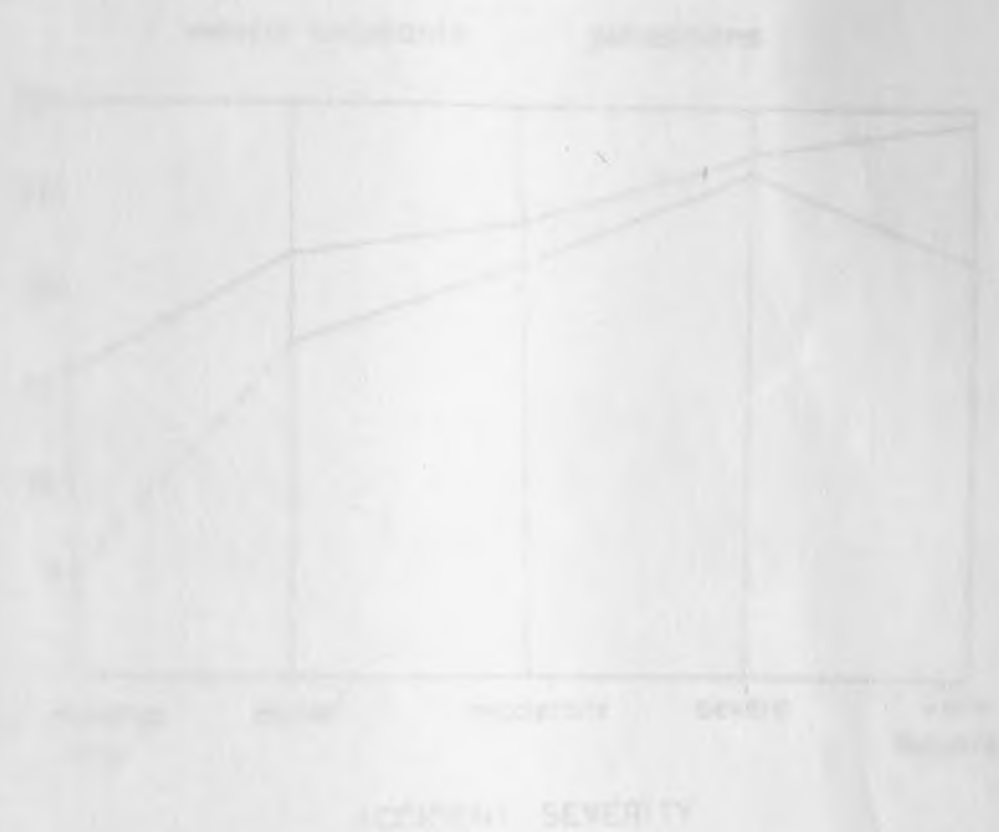
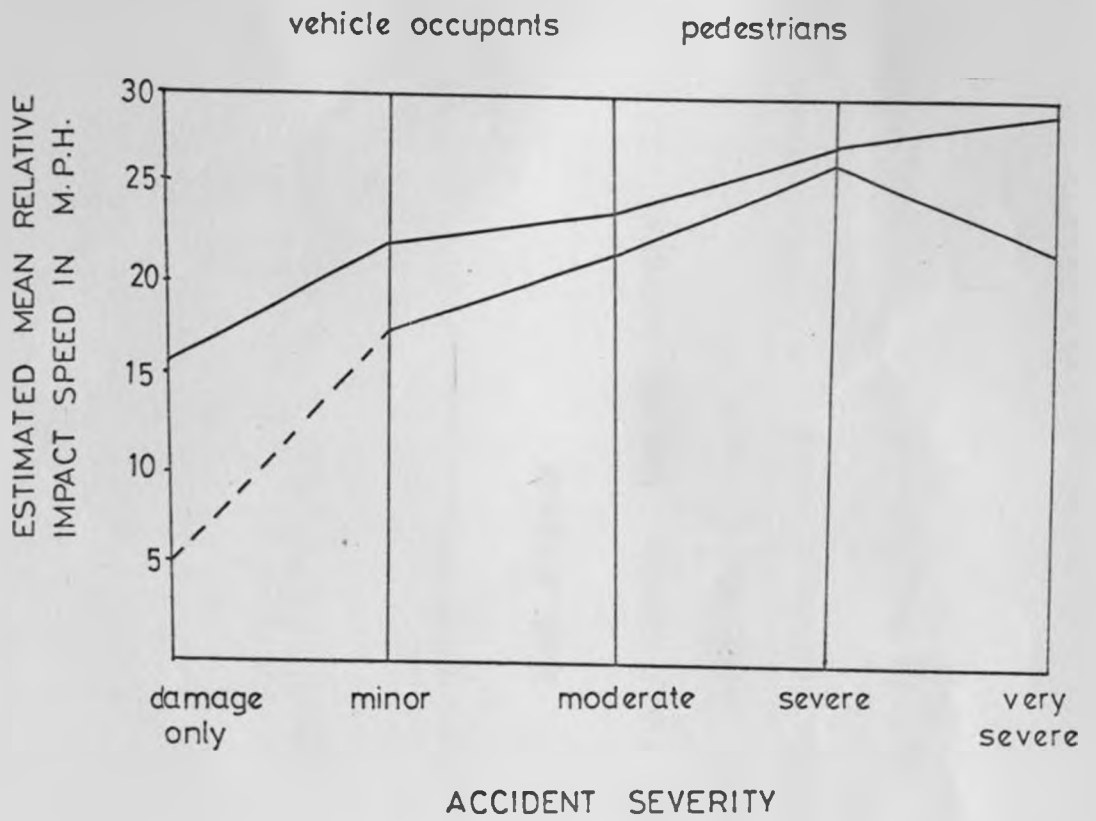


Figure 1. MEAN RELATIVE IMPACT SPEEDS

SOURCE: Voice of the Motorist IV
congressional report TSP
1975



Appendix 1 MEAN RELATIVE IMPACT SPEEDS

SOURCE: Voice of Pedestrian IV
 congress report FLP
 1975

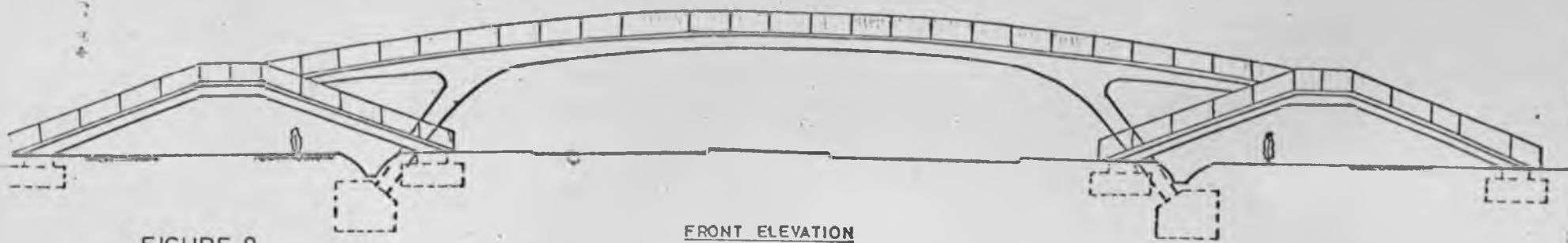


FIGURE 9

FRONT ELEVATION

PROPOSED FOOTBRIDGE UHURU HIGHWAY
NEAR CITY HALL WAY
NAIROBI CENTRAL AREA

Appendix 2

Source: Kristian S. Jagden

Appendix 3



PLATE 21 Pedestrianway: floor treatment



PLATE 22 Pedestrianway : enviromental quality

Appendix 4



PLATE 23

Adequate pedestrian pavement (sidewalk) width

Appendix 5