

PLANNING FOR THE PROVISION OF
PARKING FACILITIES IN THE C.B.D OF KANO

BY

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PLANNING FOR THE PROVISION OF PARKING FACILITIES
IN THE CENTRAL BUSINESS DISTRICT OF KANO

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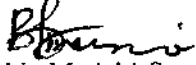
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degree of Master of Science, Urban and Regional Planning.

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August, 1998

DECLARATION

I hereby declare that the thesis has been composed by myself and that it is the outcome of my research work. It has not been accepted in any previous application for a higher degree. All sources of information are specifically acknowledged by means of reference.


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CERTIFICATION

This thesis entitled:

PLANNING FOR THE PROVISION OF PARKING FACILITIES IN THE
CENTRAL BUSINESS DISTRICT OF KANO by BASHIR MADAKI SUNUSI, meets
the regulations governing the award of the degree of Master of Science of Ahmadu
Bello University, and is approved for its contribution to knowledge and literary
presentation.

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August, 1998.

DEDICATION

To my mother Mrs. RAMATU SUNUSI, she is a mother unparalleled. She lives universally esteemed and will die universally lamented, for her place can never be filled. This thesis is also dedicated to my late Father, Alhaji SUNUSI and to my sisters - Binta, Zainab and especially, Hajiya Aishatu Sunusi Sadiq for her untiring assistance and lastly to my fiancée Zainab Mustapha, for the love and assistance rendered me during the course of my study.

ABSTRACT

Parking spaces are areas for terminal stations of road traffic. Their location can have a considerable effect on the free movement of vehicular traffic. Adequate provision of off-street parking spaces is necessary in order to allow road space for moving traffic.

Kano Central Business District is the most important area with its dominating position as the seat of public authorities, administration, Business and Shops. Also the C.B.D. is the origin and destination of most vehicular traffic. It is here that the traffic problems are greatest including on street parking and inadequate parking facilities.

The Thesis in this study is that Adequate Planning policies and actions are needed to minimise the traffic problems on a sustained basis. Specific solutions that have preferred include the provision of multi-storey parking, surface parking, relocations of singer warehouse and Intra state park in the CBD.

It is considered that these design and Management proposals, in addition to solving the traffic problems will reduce the present frustration experienced by motorists in Kano CBD.

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CHAPTER ONE
DESIGN OF THE STUDY

1.1 INTRODUCTION

Despite attempts in major city centres to ensure free-flow of vehicular traffic and to encourage more people to take public transport, the parking of motor vehicles remains a major urban transport problem.

The Central Business District (CBD) is the heart and socio-economic nerve centre of the city, which is considered as the most vital, delicate and most problematic area of the city. As a result of numerous activities in the CBD, which attracts population more than any other part of the city, a high level of traffic is also attracted as people penetrate every part of the CBD on various transport modes. This gives rise to complex traffic problems in the CBD. These problems can only be solved through appropriate and well articulated planning policies and actions on a sustained basis.

1.2 THE RESEARCH PROBLEM

The efficiency of any CBD depends to a great extent on the availability of vehicular parking and pedestrian facilities. Failure to supply suitable terminal facilities for expected and allowable demand result in congestion. This in turn leads to decline in quality and functionality of such area.

The level of vehicular traffic in the CBD of Kano far over stretches the available terminal facilities. This is attributed to increase in density of population coupled with

increase in vehicle ownership level. Hence, there is traffic congestion, which is made worse by on street parking, which is manifested in reduction of road capacity, as a result of inadequate parking facilities.

As far as CBD will retain its multiple functions (political, social and economic) and its nature in the context of urban setting, there would be problems in such as the misuse of space, pedestrian movement problems accidents and conflict as a result of inadequate parking space and ineffective traffic management measure. Most previous studies on parking in CBDs were carried out in places outside Kano, despite the peculiar role of Kano City on Commercial and related activities in Nigeria. This is the focus of the study to establish the validity of findings of previous studies which cover principally the parking in less comprehensively delineated CBD's

1.3 **AIM AND OBJECTIVES**

1.3.1 **AIM**

The aim of the study is to investigate the problems of parking in the CBD of Kano, with a view to evolving planning proposals towards solving the problems.

1.3.2 **OBJECTIVES**

The study seeks to achieve the above aim through the following objectives.

- 1 To review the concepts and determinants of parking demand and supply.
- 2 To Delineate Kano CBD and measure existing demand for parking facilities in the CBD
- 3 To examine the scope and nature of existing parking policies and

programmes in Kano CBD

- 4 To make projections and recommend some planning proposals for the adequate provision and well-managed parking facilities at the CBD of Kano.

1.4 **SCOPE AND LIMITATION**

The study covers field measurements taken within the Kano CBD as evaluated through delineation techniques. The analysis of parking demand is limited to the aggregate level taken on the basis of various Landuse sector in the CBD taken on the basis of the various landuse sector in the CBD.

1.5 **METHODOLOGY**

The primary source of data for this study is field measurement. The cordon count method is used to obtain data on parking accumulation at the different sectors of the CBD. This involved identifying the primary roads that connect the CBD to other parts of the town. Survey stations were then set at points of entry for survey of vehicles as they cross the cordon (CBD - boundary). The survey assistants at each station were involved in counting vehicles of various categories as they enter or leave the CBD.

The Direct Interview Method was used to collect information on the motorists' destination within the CBD, purpose of the visit, parking preference, parking problems regularly encountered e.t.c. These were conducted by the assistants at the stations using formatted interview schedules and based on 1% systematic sampling of motorists.

The patrol survey method was also used to obtain information on the type, nature and adequacy of parking facilities, e.t.c in the different sectors of the CBD.

The surveys were conducted from 7a.m to 8p.m in order to cover traffic associated with the CBD activities, including those in the evening like recreation and entertainment within the CBD. The field study lasted for seven days in August/September 1997. That is, the peculiarities of normal works days and weekends are adequately taken care of.

Various statistical methods were used for the data analysis. The results are presented as graphs and tables. Inferences were drawn for the explanations and conclusion were also drawn in the study, Secondary sources of data were also used. They include documents and maps as well as informal interview of government officials.

1.6 **THE PARAMETERS OF PARKING**

The parameters of parking considered in the study include parking accumulation, parking duration, parking volume and parking index. First, parking accumulation refers to the total number of vehicles parked in a given area at a given time. It is expressed as vehicles per given time period. Second, parking duration is the period (minutes or hour) that a vehicle is parked in a specified area. The average parking duration in an area would be the average time period for all vehicles parked in an area, within a specified time cell, usually a day. Also, in general the parking duration is less for on-street parking than that of off-street parking.

Third, parking volume is the total number of vehicles parked in a parking area within a time period, usually a day. That is, work areas have lower parking volumes as the parking capacity is often largely taken up by long-term parkers.

Fourth, parking index is a measure of the intensity of use of parking spaces, expressed in percentage of the theoretically available space.

CHAPTER TWO

THEORETICAL REVIEW AND REVIEW OF RESEARCH WORKS

2.1 PARKING DEMAND AND SUPPLY: A REVIEW OF CONCEPTS AND METHODS

2.1.1 The Need for Parking

Parking areas are the terminal stations of road traffic in a region and/or settlement. However, with urban growth since more on-street parking spaces must be removed in order to gain additional areas for moving traffic (Leibbrand 1970).

Paterson (1970) viewed that "United States has taken the lead in the production of motor vehicles, so it has been the first continent to create a network of roads designed specially for this form of transport. Around such cities as New York and Los Angeles, the congestion of arterial roads is becoming intense, and finding space for these broad highways is a great problem. Meanwhile the centres of cities have become virtually impassable and the significant feature of the motor age is the parking facility.

It can be observed that the central areas of most towns experience land shortage because of the importance of those areas as traffic generators. This land shortage results in inadequate parking facilities resulting in congestion and conflict between the vehicles and the pedestrians.

The problems and chaos that uncontrolled parked vehicles created in our large cities/towns, holiday resorts, trading estates etc. are now for every one to see (IRSTR, 1972). This is due to increased motorization which leads to parking problems in built

up areas.

Parking demand is generated according to the distribution and type of land uses in an area, together with levels of accessibility provided by competing modes of transport. Under an auto dominated transportation system, stores, office buildings and Industrial plants are often faced with the necessity of parking purposes for customers and employees who arrive by automobile. Often these service is provided at no cost or less than the fully allocated cost of providing this service. "Yet to the extent that customers and employees utilize mass transit, employers and merchants escape the necessity of providing expensive parking facilities" (Anthony, 1983).

Wells (1957), observed that "the purpose for parking is to provide a safe and convenient place for a vehicle to park. Traffic moves towards a destination at which point it must be parked, while some business whether private or public, recreational or servicing is transacted. Failure to supply suitable terminal facilities results in Jams, frustration and confusion". This eventually leads to the decline in importance and value of these areas at present considered most desirable for the day to day business of a city or town.

Leibbrand (1970) opines that "in Balse the future parking needs were determined on the basis of traffic counts and figures for population and employment".

2.1.2 Meeting the Need

Bricley (1972) opines that "Traffic congestion is like a malignant disease which

unless arrested, will surely bring death to the heart of the city". Where there is traffic congestion and lack of car parking facilities in the Centre of cities, Land values will tend to fall. European countries are in the fortunate position of being able to study the traffic problem in American cities where the car/population ratio is perhaps 15 years ahead of Europe. America has resorted to large department store or supermarket establishments in sub-urban areas with extensive surface car parking space immediately around the buildings. This is now beginning to be adopted in Europe.

That is "There appears to be an awakening to the fact that the stationary vehicle must be accommodated at popular terminal and these must be carefully sited, designed and planned with the same care with which we are trying to accommodate the moving vehicles on our roads in both town and country" (IRSTR, 1972). It is completely out of date and inadequate to rely on using undeveloped sites in our cities for car parking which are sacrificed for building development as soon as a favourable offer is received. Adequate, planned and organised car park is essential to the life of our cities as a railway station, an omnibus station, or a department store. The same care thought and consideration should be given to their planning, siting and operation as to other traffic termini.

In Tokyo, the world's second largest city, illegally parked cars can be seen on the street at any time. Parking meters have been tried once and abandoned, and are to be re-introduced. Parking is a problem in West German cities and they look to Britain for new ideas. In Flensburg near Danish frontier, too many parking infringements may cause a motorist to lose his driving licence.

In France, Strasbourg, Wice and Menton have meters, but not Paris 950,000 cars enter the city every day, and the police has a strong case for introduction meters but the authorities will not have them. In their place they have the "blue-zone" where discs are rised, but there is a formidable backlog of uncollected fines.

Similarly, In London, where meters are used, the chances of avoiding a fine for street parking are increasing every day. In other cases discs have been introduced in a few gentle towns such as Cheltenham, Derizes, Harrogate and Ruislip. There are also cities which have set their face against parking meters. Cardiff is one, Swansea, Exeter and Leicester are others. On the other hand, many of the largest cities in Britain have introduced meters with varying degrees of success (Sunday Times London).

The siting of car parks is an essential part of town planning, and this cannot be done effectively until a comprehensive parking policy has been defined. Therefore, It is necessary to adopt a parking policy before completing a town plan (HMSO 1965).

Brierley (1970), opines that "Reduction of Traffic and parking in a central area by means of a decentralization policy is a long term policy even when there is a large scale redevelopment contemplated". This does not mean that a policy of decentralization should not be pursued.

Leibbrand (1970), viewed that, "Incininnati, America, The following principles were adopted in 1948, regarding the provision of parking spaces in order to meet the need for

parking.

1. Parking sapce should be provided outside the CBD, but immediately adjacent to it.
2. Within the CBD the existing parking spaces should be gradually removed and the building of new garages prevented.
3. An inner ring of garages meter parking to serve short-period parkers should be provided at the edge of the CBD.
4. Further out there should be a ring of parking lots on cheap ground, permitting cheap rates for long-period parkers.

Barker and Funaro (1970) observed that "Having discounted all through traffic, the remainder gives an indication of the minimum present parking demand. This demand should be set side by side with the inventory of existing space to give a rough calculation of the immediate deficit or surplus in parking space".

Conclusively, Leibbrand (1970) observed that "the parking demand/needs in all the countries of the world can be met by either parking lanes on streets, off-street car parks or parking garages depending on their resources".

2.2 CONCEPT OF PARKING

Human activities involve among other things, the movement of people and goods. When the means of transport are not in use they are parked. That is, parking is the temporary storage of vehicle between trips or at the end of trips (Abraham, 1971). There are two basic types of parking: off-street and on-street parking.

2.3 PARKING DEMAND

2.3.1 CONCEPT OF PARKING DEMAND

The demand for parking is the expressed need by motorists for facilities to store vehicles on a temporary basis. The demand is a derived demand because it arises from the need for journeys for various purposes. Parking demand is therefore directly affected by landuse. Also, it has a time frame work. First parking may either be short term when vehicles are parked for only a few minutes as 10-15 minutes, or long term when they are parked for many hours in the day. Second, for any particular area, the demand for parking may vary at different times of the day in terms of the collective need expressed by motorists.

Parking demand has spatial dimensions as it varies from one part of the town to another, being generally higher at the CBD and other commercial areas compared to residential areas. Is the major activity areas of the town which attract a high volume of traffic have higher parking demand. Additionally the demand for parking is effective if it is backed by the ability to pay in money terms where it is charged. It may also be in terms of motorists willingness to take the risk of parking other vehicles at a parking area.

2.3.2 DETERMINANTS OF PARKING DEMAND

Several factors affect the demand for parking facilities. There are those with a direct effect while others exert an indirect effect on parking demand. The direct effects determinants include, first, landuse. Different landuses attract different level of traffic and some extent different types of vehicles. This places different parking

demand situations for different landuses in the city. Commercial landuses like banks, market, departmental stores, e.t.c are known to attract more visitors than other landuses especially, at peak hours. Therefore, the demand for parking is expected to be higher in the CBD of Kano, particularly some sectors of the CBD which have concentration of commercial, public and semi-public uses. Public uses like government offices, institutions, e.t.c. are also places that attract large number of visitors and therefore a high level of parking demand.

Second, urban activity pattern change with time. That is, time of day is a determinants of the level of parking demand. For instance for areas with a concentration of public uses, the demand is higher during hours of work on weekdays while in the night record negligible levels of parking demand. Similar situations occur in traditional urban markets which here fixed daily closing times.

Third, vehicle usage affects the level of parking demand in a city. It refers to the mileage covered by vehicles in a town. It has been established that the higher the rate of vehicle usage, that is when it is widely distributed, leads to rising parking demand. In Nigeria, for example, the rise in income especially during the oil boom period and the public sector vehicles loan policy, led to increase in vehicular ownership. This has been associated with the high demand for parking facilities especially in the larger towns with higher income basis.

2.3.3 METHODS OF MEASURING PARKING DEMANDS

Several methods have been formulated for determining the demand for parking

as a basis for providing adequate parking spaces in a city. These are parking surveys, use of standards, and use of vehicle ownership data.

The common survey techniques used in the measurement of parking demand include the following.

A. **CORDON COUNT**

The method involves using a cordon line which delineate the study area. Counting stations are established at points on all roads that cross the line. At the stations, separate counts are made up of various types of vehicles entering and leaving the study area. The difference between the number of vehicles entering and those leaving the area gives the accumulation of vehicles in the area. The accumulation is equivalent to the number of vehicles parked and needing to be parked in the study area. When the accumulation is related to the supply for parking existing in the area, the requirement of parking facilities is obtained.

There are various techniques of counting vehicles for this and other purposes. They include the use of automatic counting devices and manual counting.

B. **DIRECT INTERVIEW**

For the purpose of obtaining data which enrich the quantitative measure of accumulation, the direct interview is also used in the survey. This involves stopping a sample of motorists and questioning them about their purpose of trip, their parking problems and preferences, e.t.c. In this way, the share of accumulation taken by different activity areas within the study area and the particular problems of parking can be determined. These are indeed aspects of parking demand.

C. PATROL SURVEY

In this technique of parking survey to determine demand, the study area is divided into manageable sections that can be covered by interviewers in reasonable time intervals like 30 minutes, one hour e.t.c. Interviewer are given specific street stretches to keep under surveillance and the number of parked vehicles in particular places are counted. Based on the time units taken for the survey, the number of parked vehicles per time cell may be computed. Statistics like the registration numbers, vehicle types, parking duration, form of parking, nature of parking whether legal or illegal, kerbside, off-streets, e.t.c maybe recorded. The qualitative characteristics of the parking facilities are also recorded by the surveyors on patrol.

For the results to be reliable the sections should be such that kerbside patrols can be covered by the interviewer(s) walking to and fro in the stipulated time interval. Patrol in vehicles will however enable larger sections to be covered. This supports the computation of operating turnover of parking facilities, the characteristics of existing facilities and their usage in various parts of the study area.

D. OTHER METHODS DEPEND ON USE OF STANDARDS

Studies that detail out existing situation at specific landuses in various urban contexts form the basis of deriving planning standards. The detail situation for parking, would involve deriving standards for different landuses. As for other aspects of planning, the existing situation is set against the patterns of use of the parking facilities are observed over a reasonable period of time to rationalise the standards for operational purposes. This means that the parking standards may be used to estimate

the level of parking demand when various facilities are in an area (e.g markets, banks, e.t.c) are known as the specific requirements in the activity areas maybe summed up to closely represent the level of parking demand in the study area. A plus or minus margin may be allowed to adjust for validity of standards being used, record of parking facilities in the area e.t.c.

The outcome of the computations would represent the parking demand only to the extent that the standards used are appropriate for the particular urban context. This is because standards are place specific. That is, using standards derived from developed countries may produce rather generous parking demand estimates and vice-versa. Nevertheless the use of parking demand as earlier explained.

Vehicle ownership may be used for establishing parking demand. This can be determined by using records of ownership in an urban area. These records are often available from vehicle licensing offices. The records are only proxy of the true measure of vehicle population in a town, though in view of the fact of residential mobility of vehicle owners. Nevertheless the principle is that increase in vehicle ownership is directly associated with an increase in parking demand. Details of vehicular ownership like class of people owning vehicles or amongst whom the change is occurring as well as their travel characteristics need to be known to enhance results of determination of parking demand. When it is widely distributed, leads to rising parking demand. In Nigeria, for example, the rise in income especially during the oil boom period and the public sector vehicles loan policy, led to increase in vehicular ownership. This has been associated with the high demand for parking facilities

especially in the larger towns with higher income basis.

2.4 PARKING SUPPLY

2.4.1 CONCEPT OF PARKING SUPPLY

Parking supply is the provision of facilities for the temporary storage of vehicles. The type and level of availability and location of the parking facilities should be on a planned basis so that it is adequately related to factors such as the demand, land use policy and economics of land in any urban centres.

All or some of the following facilities may be associated with planned parking. These are covered garages, paved or unpaved spaces marked lots, security units, shade trees and coin boxes. On-street parking is the storage at Kerbs on road right of ways. Parking shed and shade trees provide protection for vehicles from the sun, rain or snow which have destructive effect on vehicles and causes discomfort to motorists. They also protect against vehicle breakage from children's play or even against vehicle theft. Security facilities (offices and staff), are necessary feature of vehicle parks for safety reasons. Also revenue offices or revenue collection facilities like coin boxes are required in some parks where fees are charged for parking as in developed countries. The more often vehicle owners use their vehicles, the higher will be the demand for parking facilities. Each time a trip is made, vehicle owners have to park at any intervening and terminal destinations.

Fourth, the type of vehicles that are most dominant in a city (or part of a city) affects parking demand in terms of the space requirement which is smaller for cycles and larger for trucks. Where there is a poor mass transit system, as in most Nigerian

urban centres including Kano, the use of private vehicles will be higher leading to higher demand for parking facilities.

Fifth, the rate of parking demand is affected by the rate of vehicular ownership. It has been established that the higher the rate of vehicle ownership, the higher the rate of demand for parking facilities, that is given equal vehicle usage.

The factors which indirectly affect the rate of parking demand include, first, the parking policy as it relates to charges for parking as well as other controls often introduced to improve traffic management especially in the CBD. This is because as city size increases land values rise and consequently parking has to be charged for or even restricted into parts of the CBD. In some cities of the most developed countries where this policy has been applied, it has led to constraint on the rate of parking demand in those areas.

Second, population growth. Increase in a town's population leads to rise in parking demand as more trips and trip markers result from population increase. This is even more so when population increase goes with a third factor, viz, increase in income. The latter especially there are standards that are used to determine the space requirement for different urban land uses as well as standards for parking spaces and lot sizes. For example; in a developed country like Britain where two out of every five (5) families have cars, the following standards are widely used. For residential areas, the standard is one parking lot per dwelling for offices and banks, one lot for every 35m² of gross floor space. For shops and industrial establishments, it is one lot per

50m² of gross floor space. And, for uses such as hotels, hospitals and restaurants, it is one parking lot per three and twelve bedrooms, respectively and one parking lot per 10 seats for restaurants (Keeble, 1969)

2.4.2 **DETERMINANTS OF PARKING SUPPLY**

Data is required to ensure planned physical growth and development of towns. One aspect of this is data to make correct estimates of parking demand, location and type of parking facilities that may be provided. In Nigerian urban centres including Kano these data are lacking. So the limited planning for parking and supply of the parking facilities are done arbitrarily. The aspects of data required include the number of trip makers to the CBD for different purposes, the level of supply and use of the existing parking facilities.

Another determinant is land value. The provision of parking facilities involves the acquisition and use of land. City centres like that of Kano are areas of high land values. Since parking is not a profit yielding activity and therefore does not bring direct economic returns, even if fees are charged, the restriction on its demand on land in the CBD is indeed a determinant of supply of parking facilities.

Availability of finance is also determinant of the supply of parking facilities. Funds to provide parking facilities such as underground, roof-top or mechanized garages are not readily available. Spending on parking is generally not considered economically acceptable as it is not a profitable venture for both the public and private sectors. Only in an indirect way it is considered important for the private commercial

sector. For example it gives the convenience that attracts trip makers. Also, it is only seen as a service as it is related to the solution of urban transport problems although it promotes economic activity and produce cuts in costs of urban activities. In the less developed countries where the relationships are not understood or other political priorities are taken, it largely accounts for the deficiency of parking facilities.

2.5 TRAFFIC MANAGEMENT CONCEPT

Hobbs, (1979) defines traffic management as ways, means, tools of maximizing the use of existing transport infrastructure. Road safety, he contended, can be improved without impairing environmental quality. He further postulates that the implementation of management strategies can provide for reduced travel time, costs, reduced air problem and improved road safety.

Deducing from Hobbs, one can safely say that a traffic management scheme should reflect the following:-

1. Enhancement and protection of the environmental quality
2. Improvement of the capacities of existing transport facilities.
3. Reduction of accident rates
4. Should be able to generate adequate economic/social benefits to justify implementation
5. It should be inexpensive.

Traffic management system goes further to control demand for transport by spreading the demand over time through workable schedule or spreading it over space by re-routing or spreading it over mode by promoting the use of a particular mode

usually buses.

2.6 TRAFFIC MANAGEMENT MEASURES

Management measures relate to specific traffic category. For example Lorries, buses, cars or pedestrians. The measure can however, be directed to mixed traffic. The sketch below is a diagrammatic representation of one transportation system management. The various types of traffic management measure are:

2.6.1 TRAFFIC OPERATIONS MANAGEMENT: In this approach direction of traffic from a specific area at various periods of the day is the means used to reduce traffic problem. The traffic operations movement is made up of four methods discussed below:

a. Traffic Engineering Improvements

This is achieved through any of the three ways below:

- i. Limiting selected turning movement at inter-section. This is diversion of traffic either to the left or right direction as the case might be. Alternative routes to be taken are always indicated.
- ii. Provision of extra guide and control measure like signs, Zebra crossing, pedestrian lighting.
- iii. Provision of bus bays or alteration of intersection (Hobbs 1979).

In this approach, there may be limited space for expansion. It is however, a quick way of solving congestion.

b. Reversible traffic lanes or fidel flow

Additional lanes are created mainly for commercial vehicles (Buses &

Taxis). These reversible lanes are only opened during peak hours to cater for the high traffic flow, and reduce congestion (K.R. & Clark J.D 1982) opined that reversible traffic lanes can increase the volume of peak direction by 17 to 22%. This they confirmed through their research on Queensway Mersey Road tunnel, revealed that there was an increase in the volume of peak direction by 17% to 22%. These was decreased travel time, reduced accident rates, less fuel consumption and even delays in crossing the roads.

c. Traffic channelization

This involves directing of traffic into special lanes so as to reduce potential traffic hazards to both drivers and pedestrians. This method is mainly used in British towns. It involves the use of physical barriers in some cases to separate both pedestrian and vehicles. Island and pavement markings to show directions are used (Roads in urban areas, HSMO, 1963).

The main disadvantage is that all routes with road markings must be lit at night to be meaningful. It adds beauty to the roads during the day as they look like decorations.

d. One-way Street

In this method selected route are picked out to carry traffic only in one direction. The main advantage of this approach is that vehicular conflicts are reduced at inter-section. There is increased traffic safety and smoother flow. There is an effective use of road capacity. This method was used early in the 50's in Britain. it is practiced in some

Nigerian towns, but Jos is noted to have it at a larger scale, probably because of the terrain of the area. In Reading and Berkshire, where transportation studies were carried out between 1968 and 1970, traffic flow improved and journey times reduced on some routes.

The obvious disadvantage of this method is that visitors are sometimes caught for breaking the law and journey times are increased in some places. There is difficulty of routing traffic through an area. Loss of amenity for some residents, environmental deterioration, increased walking distances for public transport passengers and increased traffic volume on parts of the network leading to more turning traffic and end points are other disadvantages associated with one-way streets.

As regards the advantages, there are fewer pedestrian and vehicular conflict points. There is potential increase in capacity at and between junctions and also possible improvements in traffic distribution. There is also improved utilization of roads with odd numbers of lanes. There is less accidents of head on collision.

2.7.0 **PREFERENTIAL TREATMENT APPROACH**

In this method which is made up of four techniques, preference is given to vehicles with high occupancy rate. This is because the vehicles help to reduce the would-be number of vehicles that should have been on the road and more people carried within the same period. This approach is made up of the following techniques:-

A - BUS

KASHIM KASHIM R1

i. Purpose-built busways

This approach is adopted mainly in the new towns in Britain. It is geared to building an efficient, reliable and aesthetic public transport system. The routes are built specially for buses with lay-byes at convenient walking distances for residents, shoppers and other classes of users. Runcorn which was designated as a new town in April, 1964 was designed in a way such that each resident walks within 5 minutes to the nearest bus stop or had a bus stop located 500 yards away. Secondly, busway stops were located around environmental areas like educational, cultural, shopping, and social centres within the various neighbourhoods. The above areas are linked by special bus-routes to the central area. Bus stations are segregated from all types of traffic. Lastly, industries are linked to the bus ways so as to encourage workers to travel more by bus. Where the busway cross conventional roads, priority is given to the buses.

ii. Bus lanes & Bus-only streets

In this technique, special lanes and routes used by other category of traffic are reserved for buses. There are two types:-

With Flow bus lanes: Buses by-pass queue of vehicles to their reserved lane. The flow is usually towards the same direction. Usually the lane next to the Kerb. It is used in Manchester, London and Sheffield. In London this technique is used on Vauxhall Bridge road, on a bus lane of 950 metres long. The route is opened between 0.8.00am to 0.9.00am.

Contra-flow bus lanes: Buses are permitted to flow in opposite direction of all other traffic. It is practiced in London, Reading and Derby.

This technique is however, only worthwhile under specific conditions. First the with-flow bus-lanes can only be appreciated where the degree of saturation is more than 90% before installing the lane. In situations where the flow does not justify a bus lane, the lane can be diverted to any other category of traffic that would ease traffic flow. Effects of the contra flow can be minimized by building roundabouts or channelization of flows. Only bus actuated traffic lights would be of use if traffic light is to be used. Any other measure would reduce the capacity of the junctions.

Priority at Junctions & traffic signals: The aim of this technique is to reduce delay at junctions for buses. They are exempted from making left or right turns at junctions. Special loops are installed which are activated by an on-board bus signal generator. By this operation cross-flow is discontinued or the green time extended for the buses to pass on. This technique is used in Leicester. For this technique to be very effective through high patronage, it is usually linked with park and ride facilities (Hobbs 1977).

CONTRA FLOW

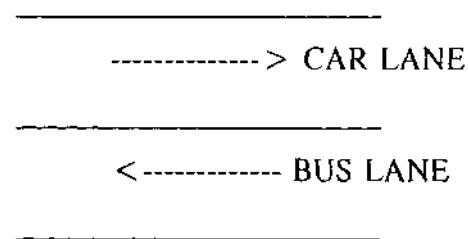


Fig: 2.7.1

SOURCE: Hobbs, F.D (1979)

Traffic planning and Engineering, Pergamon Press

WITH FLOW

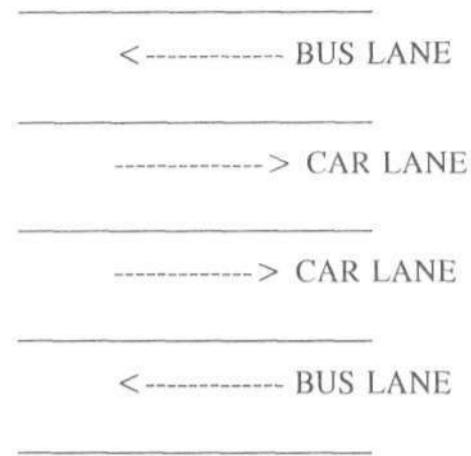


Fig: 2.7.2

Source: Hobbs F.D. (1979) Traffic, Planning and Engineering, Pergamon Press page 204.

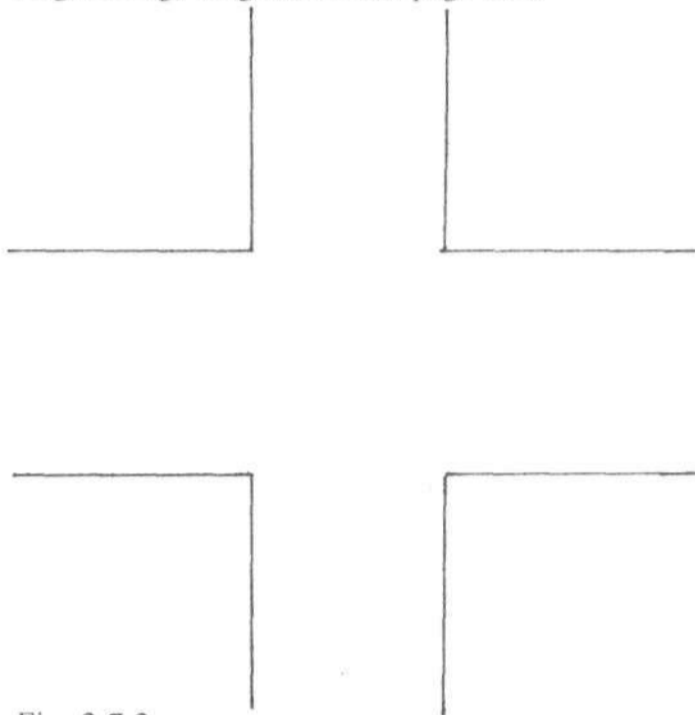


Fig: 2.7.3

Source: Hobbs F.D (1979) Traffic, Planning and Engineering, Pergamon Press, page 204.

B. Car Pool Lanes: In this type of preferential approach, private vehicles

with high occupancy rates are allowed to use the separate lane at a token fee. This is practiced in San Francisco Bay and Minneapolis in the United States of America.

C. Parking Control: This is to allow for smooth flow of traffic through the following methods: (i) No Parking area designation (ii) Waiting for loading and after loading area within stipulated time and areas designated as parking areas but with pay.

Parking control measure can be used on long or short term basis. The coordination of the parking areas known as integrated parking strategy can be used in central areas to reduce the rate of private car parking. In Leeds where this is in practice, long term multi storey car parks are provided around the fringe of the central area close to the major entry points. The short stay car parks are within the central area. Maximum time for parking on short term basis is 2.5hrs at any one place. The shortfall of this technique is that visitors would not find it easy identifying which is long or short term parking areas. Secondly, a wide area would be needed since there are various classes of parking areas.

D. Toll Policies and area Licensing Scheme

This technique discourages certain classes of vehicle carrying few number of persons from entering the central area or any given part of the town at given periods of the day. Singapore charges about 60k per private car for going into the central area during peak hour. This has helped to reduce traffic in the area by about 75%. (Doe 1973) in study carried out in London shire that a rate of 60p to #1 per vehicle per day

would cause a 37% reduction vehicles plying the central area and a 40% increase in peak hour traffic speed.

2.7.1 TRAFFIC SIGNALIZATION

Traffic signal control has been discovered over the years to be the best form of traffic control to improve safety at road intersections. Road efficiency is improved and capacity use maximised. The capacity is however, reduced by on-street parking. The effect of a parked vehicle at 2ft from the intersection stop line has been calculated by the British Institute of Transportation Engineers as width reduction equaling.

$$W^l = 5.5 - \frac{0.9 (Z - Z_s)}{G}$$

Where:

W^l = width loss caused by parked vehicle.

Z = Clear distance between stop line and parked vehicle (ft)

G = Green time (sec).

2.8 REVIEW OF RESEARCH WORKS

The rapid growth of population coupled with the numerous economic activities in a spheres of life continue to play an important role in the rapid growth of motor vehicles fleet, which is one of the primary factors causing traffic problems in our urban centres, especially the central business districts. The increase in traffic problems in CBDs, which is manifest in inadequate parking space/facilities is one of the burning issues in the present society, which relies heavily on the use of private vehicles.

Previous studies on parking in central business districts were carried out in places outside Kano, like Kaduna, Adamawa and Jos whose urban structure and functions differ in part from that of Kano.

Haruna (1993), examined the parking Demand and Supply in Kaduna CBD. The study observed that vehicular parking is an integral part of road system. Due to the peculiar nature of city centre, the study concerned has addressed the issue of parking, that it cannot be neglected since traffic problem within the CBD is one of the prominent problems. Successive Governments in the State laid emphasis on the promotion of transport policy - Interm of provision of mass transit buses (High occupancy vehicles).

The thinking of successive Governments has been that, with the provision of mass transit buses, traffic problems in CBD of Kaduna, would be minimised without provision of parking facilities.

Similarly, Haruna (1993) proffered, surface parking within the CBD, in an areas designated as parking spaces.

Nyako (1990), studied the parking problems and solutions in Jimeta Central area. The study viewed that the parking problems in Jimeta CBD was as a result of increase in socio-economic activities coupled with increase in vehicle ownership level while the road system and parking facilities largely remained the same. In Jimeta, parking demand continues to be on the increase also most business and commercial

activities are located within its CBD. A greater percentage of the trips, therefore has its destination in the CBD. The State Governments have not taken any tangible steps to minimise the traffic problems within the CBD. The study proferred that the solution to parking problems lies within the CBD, as a result of avilability of vacant land for parking facilities.

Simeon (1991), Studied the Road transport and traffic problems in urban areas with particular reference to Jos. He observed that with the increase population there are corresponding increase in traffic and ciruclation problems. These problems are more pronounced in the Central area of the town as a result of high concentration of economic and commercial activities. Similarly, various attempts have been made over the years to improve the traffic flow in Jos central area, in order to reduce the traffic problems. These attempts include the construction of round abouts, installation of traffic lights, Designation of one-way routes and allocation of bus lanes. These have however, not improved the smooth flow of traffic within the central area.

The study proferred solutions to traffic problems in Jos central area through the provision of surface parks in designated areas within the central area, as a result of vacant available land within the CBD.

It has been observed, that most previous studies on parking in CBDs were carried out without an attempt to establish common experiences or peculiarities towards establishing principles and explanatory factors. That is, the validity of findings of previous studies which cover principally the parking in less comprehensively delineated

CBD's (as stated in Reserch statement) need to be established.

The bulk of parking problems in Kano City stems from the non-availability of spaces in the CBD. This is not because such places are not provided for, but due to the tremendous increase in parking demand.

Surface/multi storey parks are not a highly profitable form of landuse in an area where Land values are high, as for Kano CBD. Therefore, without drastic public action, possibly involving considerable expenditure out of the public purse, no significant remedy is likely to be applied. As a result of non-availability of vacant spaces in the CBD, solution to its parking problem would involve the acquisition and demolition of costly property within and outside the CBD to fulfill its purpose properly.

2.9 SUMMARY

In this chapter, Key concepts in the research were explained as well as the various methods of determining parking demand and, as discussed in chapter one, the parking survey method was used in the collection of data for this study. This was evaluated to give more reliable data for research of this nature especially considering the poor nature of data base in Kano town. Also concept and techniques of traffic management characteristics were discussed.

CHAPTER THREE

DELINEATION OF KANO CBD AND MEASUREMENT OF EXISTING DEMAND FOR PARKING FACILITIES.

3.1 THE STUDY AREA

3.1.1 LOCATION

Kano town is located between latitude 12°03' North and Longitude 8°32' East, still within the geographic centre of the Northern parts of Nigeria. It is also well connected to other parts of the country by road, air and road transport routes.

3.1.2 GROWTH OF KANO

Kano was designated as state capital in 1967. It was also retained as the capital of Kano State in 1991, when Jigawa State was excised from it. Owing to its history as a commercial centre, Kano has experienced tremendous growth in commercial and industrial activity.

Kano has also had a high rate of population growth. It is presently the most populous city in Northern Nigeria. According to the 1991 census, the population is estimated at about 5,632,040. It is linked by trunk "A" road to Maiduguri in the east, Katsina in the west, Kaduna in the south and Jos in the south-east.

3.2 DEFINITION OF CENTRAL BUSINESS DISTRICT

Various alternative terms and definitions of the central business district have been offered. For instance, term such as central area, core area, down town e.t.c have been used. It has been defined as that part of the town in which

are found the central services of the highest order that can be supported by a town of particular category and type (Keeble, 1969). It has also been defined as the chief administrative, business, entertainment and cultural centre, of the town as a whole (Gibberd, 1953). While Keeble's definition lays emphasis on profit-motivated activities like commerce and services, Gibberd's definition include non-profit activities like administrative and cultural activities. It is clear though that the CBD is not simply its geographical centre, rather, it is the place to which the public responds spontaneously on occasions of great urgency or need (Wingo, 1963). In traditional Nigerian Cities, the centre is the focal point of socio-cultural, economic and spiritual activities. That is, the CBD consists of the highest concentration of commercial, civic and mixed residential cum commercial uses.

3.2.1 **KANO CENTRAL BUSINESS DISTRICT**

The metropolitan Kano Twenty years Development Plan 1963-1983 by Travallion identified the present Gyadi-Gyadi area as the city central business district in their proposals, they recommended that Perimeter parking throughout the area leaving the main area for pedestrians only, hence the centre was designed as a series of precincts and squares to give it a sense of enclosure and scale. These proposals were however overtaken by events, and were never implemented.

Kano State Urban Planning and Protection Agency identified the present CBD as delineated by the above agency, as an area bounded by Sarkin Yaki,

road in the Northern, Ibrahim Taiwo road in the South, Tafawa Balewa Way in the East and finally, it is bounded by Katsina/Gwammaja Road in the West.

Kano State Urban Planning and Protection Agency stated the parameters used in the delineation of CBD to include intensity of use (Specifically Commercial) and Land value.

3.2.2 **REDELINEATION OF KANO BUSINESS CENTRAL DISTRICT**

The city centre is a dynamic region that keeps on changing from time to time, not only in the sense that its activities constitute deniable system, but also because the relative importance and spatial extent of these activities change with time.

Progresses in technology in terms of transportation is one of the factors which lead to the appearance of new functions to decline decentralized from the CBD of others. So delineation factors of central area include geographical centrality, accessibility for vehicles and pedestrian and ample parking space and high measure of compactness.

3.2.3 **PARAMETERS FOR REDELINEATION OF KANO CBD**

Although, there exist many parameters, taken into consideration for the delineation of CBD, in some unpublished M.Sc. thesis, by Postgraduate students of urban and regional planning, the parameters used for delineation were well-defined and found suitable to Nigerian context of delineation of CBD and it will be used for this study. The parameters include land value, building height, landuse, traffic flow and population concentration.

KANO MUNICIPALITY

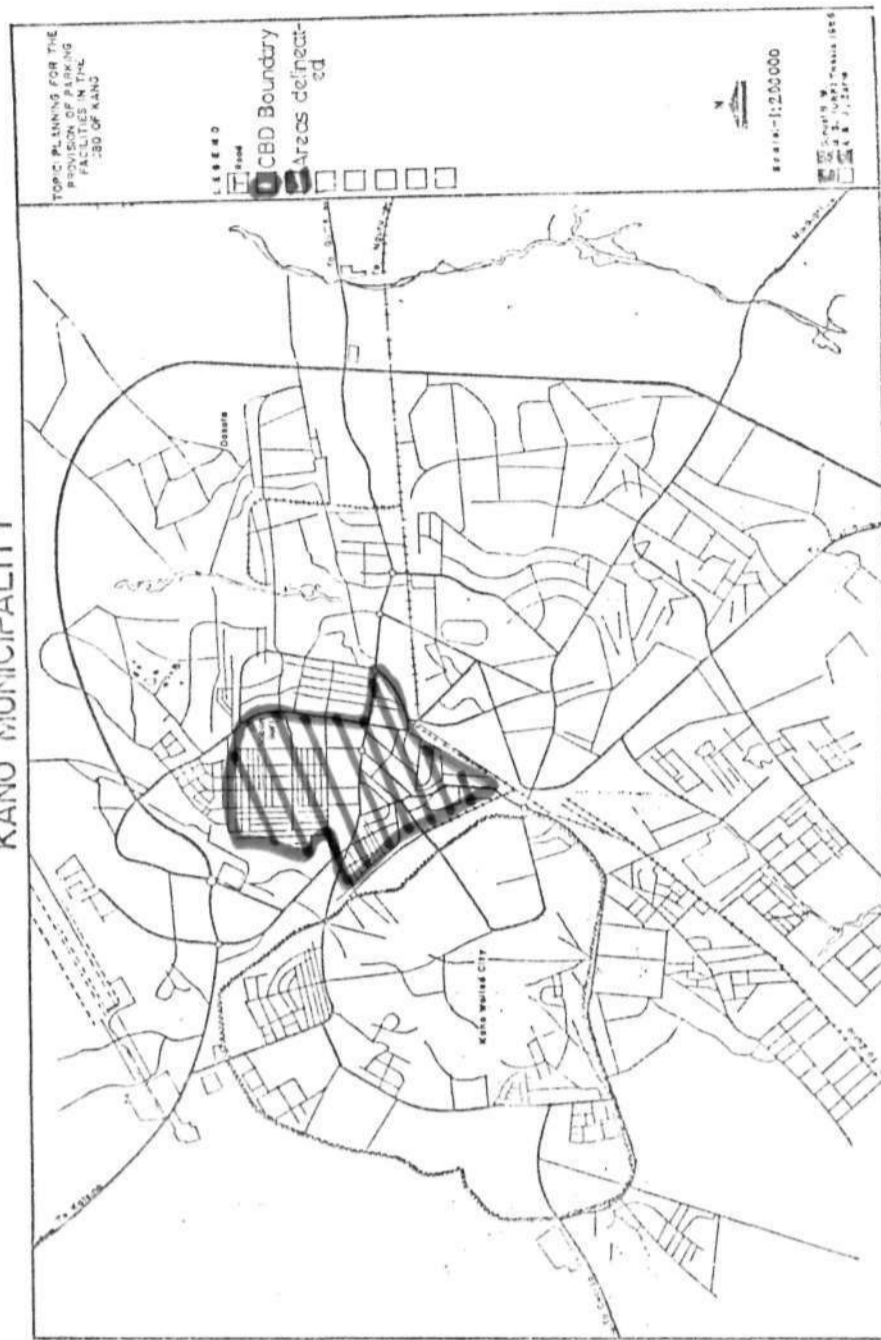


FIG. 3.21: KASEPPA'S DELINEATED CBD OF KANO

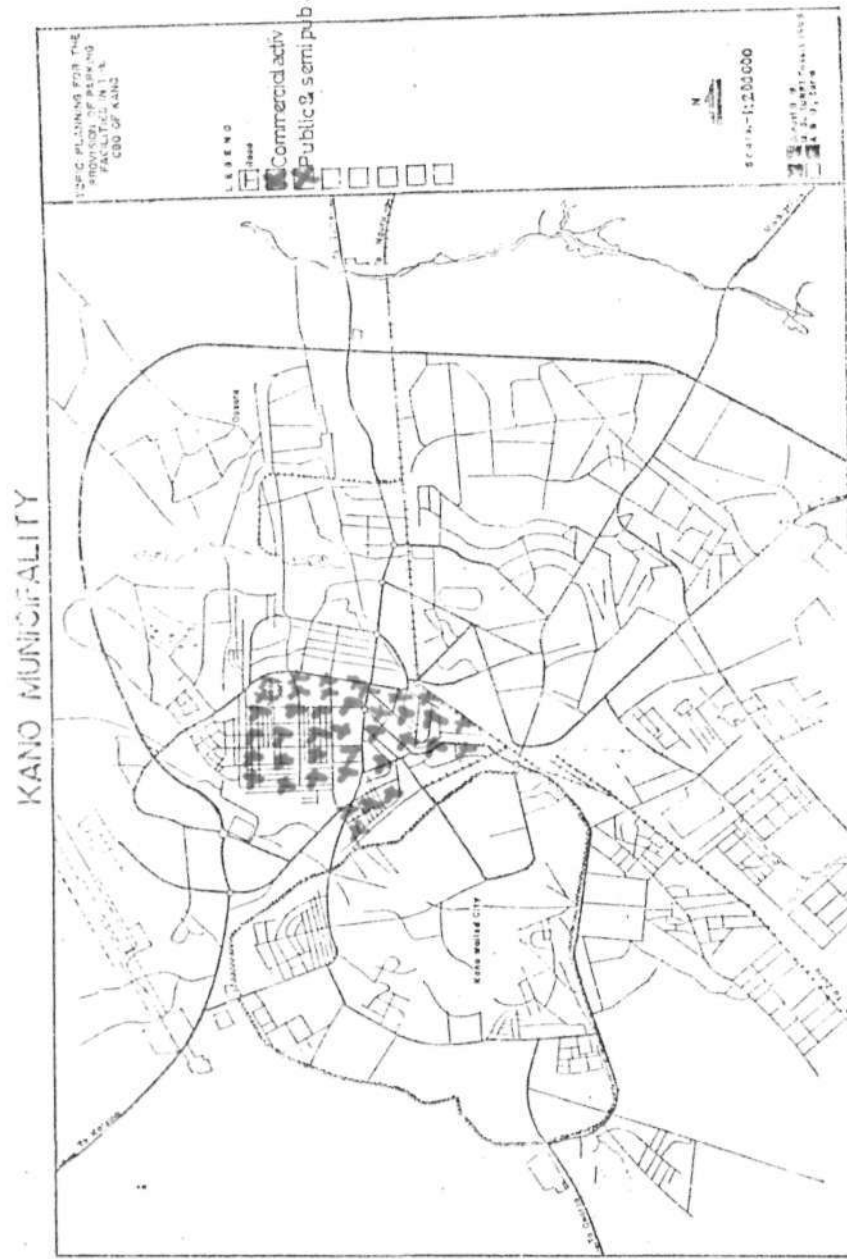


FIG. 3-2-4. PARAMETERS: CONCENTRATION OF COMMERCIAL, PUBLIC & SEMI PUBLIC ACTIVITIES

KANO MUNICIPALITY

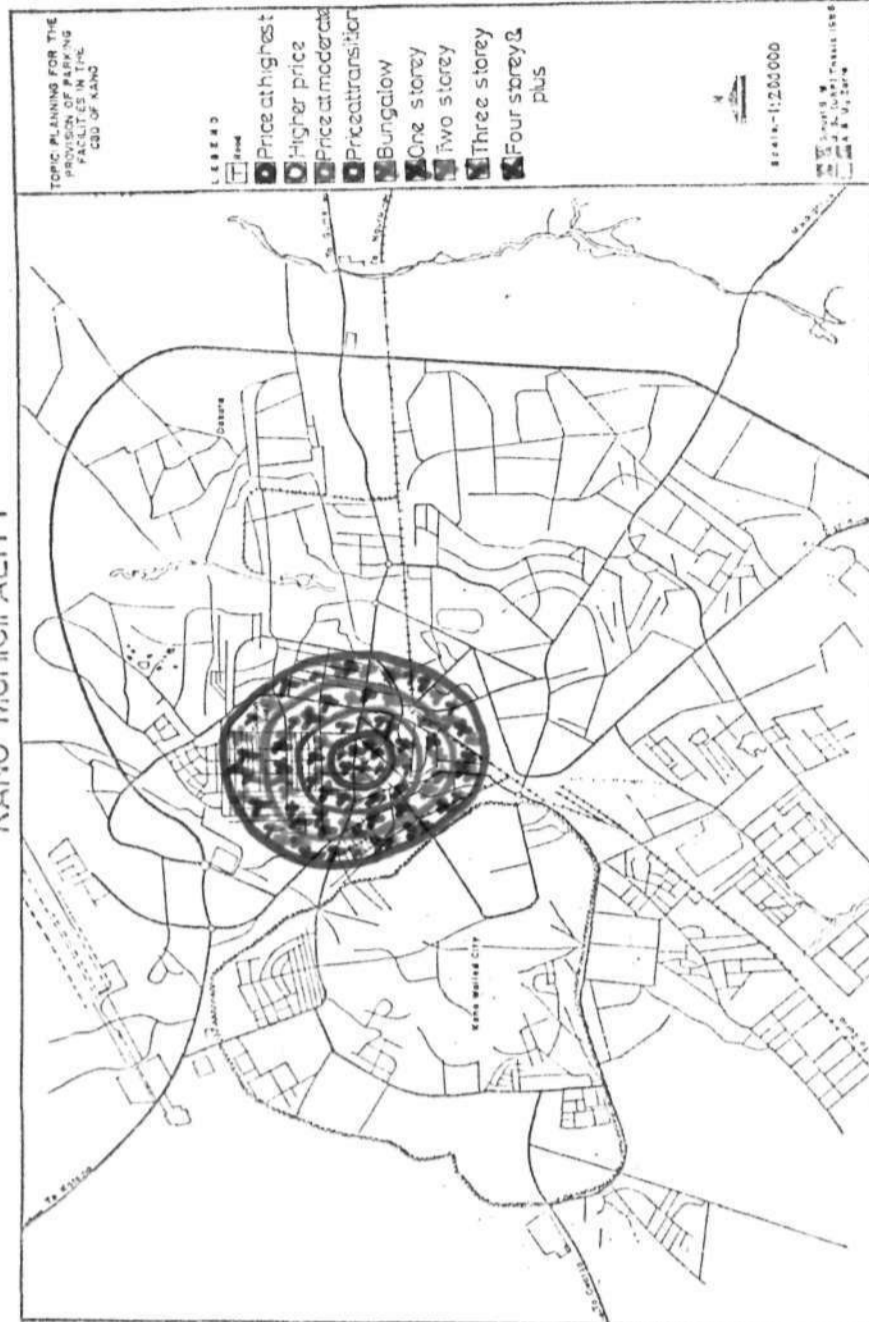


FIG. 3.2.5 DELINEATION OF KANO CBD PARAMETERS : LAND VALUES & BUILDING HEIGHT

3.2.4 (i) LAND USE

One major characteristic of the CBD is that the area is mainly dominated by commercial activities, public and semi-public uses, which are usually used by the population of the city. This can be supported by the definition of Lewis Keeble in his book "principle and practice of town and country planning". That the central area is that part of the town in which the central services of the highest order are located which that particular type of the town can support are found. It was found that the concentration of these (above) landuses are high along Murtala Mohd Way, Ibrahim Taiwo Road, Kofar Mata Road, Civic Centre and Court Road. As one moves outward, the concentration of these uses tend to diminished, until one comes to a point where the uses are the same outside the CBD. Then that point marks the outer boundary of the central area.

3.2.5 (ii) LAND VALUES

The land value is highest at the core of the city centre owing to competition/demand for land and use which is to be put in the central area. This is because everybody wants to get a piece of land to use for commercial activities. This results in buildings by prospective buyers thereby increasing land prices and adding more value to it. It is observed that the value of land tend to diminish as one moves outward in one direction and one will come to a point where the value of land is that same as everywhere else outside the central area, that point of price transition marks the outer boundary of the central area.

Kano CBD is divided into four concentric zones. The distance between the centre that is Sabongari market (front of Bata Shop) to outside boundary I.B.B road (near Kano State Broadcasting Corporation) is less than one kilometre radius each zone represent 250m distance to another. Based on the standard for shop i.e 4m by 5m supplied/gotten from KASEPPA. Each ring represent its own price. The first ring which is the core where the price is at the highest which is 2m followed by the second ring, the price is also higher which is 1.5million. also in the third ring, the price is moderate which is =N=1 million and finally, the fourth ring, the price is at transition which is =N=.8million.

3.2.6 TRAFFIC ACCUMULATION/POPULATION CONCENTRATION

Due to the high concentration of central services in the city, this tends to attract a high turnover of population and vehicles which leads to traffic problems. As one moves out wards in any direction from the city centre, the concentration of traffic and population tend to diminished. It is observed that the weekly traffic flow of Murtala Mohammed way is 20,220 pcu per day, followed by Ibrahim Taiwo Road Weekly traffic flow is 17,540 pcu/per day also Court road weekly traffic flow is 15,650 pcu per day. Lastly Katsina/Gwammaja Weekly traffic flow is 13,250 pcu per day. The population concentration at various sector of CBD of Kano is measured in terms of Daytime Density (Number of people at a certain time and place) and it is observed on weekly basis. The weekly Daytime density at sector one which is shopping indicates that not less than 6000 people patronized the sector. In

sector Two (work) the weekly Daytime density indicates that about 4,000 people patronized the sector. Also sector 3 (Business/residential) the weekly Daytime Density Indicates that about 5,000 people patronized the sector. Lastly, sector four indicates that about 3,000 people patronized the sector. This is due to the intensity of activities taking place and most important is the central market.

3.2.7 **BUILDING HEIGHTS**

There is maximum utilization of land thereby development take place vertically and the floor space index is usually the highest. Because of space constraints, higher land costs and very limited room for horizontal expansion, developers are then compelled to expand vertically. As such the buildings are usually storeyed buildings with highest height. Areas with building heights are identified in terms of Bungalow, one storey two-storey, three storey and four storey and plus. In respect of the primary routes that Link the study area i.e Murtala Mohammed Way, Ibrahim Taiwo Road, Court road and Katsina/Gwammaja road. All the above parameters are used for delineation of the city centre.

3.2.8 **SUPER-IMPOSITION**

After due consideration of all the parameters listed above, they were all brought together and super imposed to curve out what will be the central business district. The procedure was a consideration of places. Whereby the parameters over lap almost twice and it is very close to those places that over lap more than two times. Therefore the redelineated CBD was obtained as can be seen from Fig.3.2.8. Based on this the central business district was obtained

and the topic "planning for the provision of parking facilities in the CBD of Kano", was embarked upon.

The adopted Kano CBD boundary [see fig.3.2.8(i)] spans over a total area of about 220 Ha. To the north, it is bounded by Sarkinyaki road and to the South is bounded by Ibrahim Taiwo road. also to the West is bounded by Airport road and finally, it is bounded by Katsina/Gwammaja road in the East.

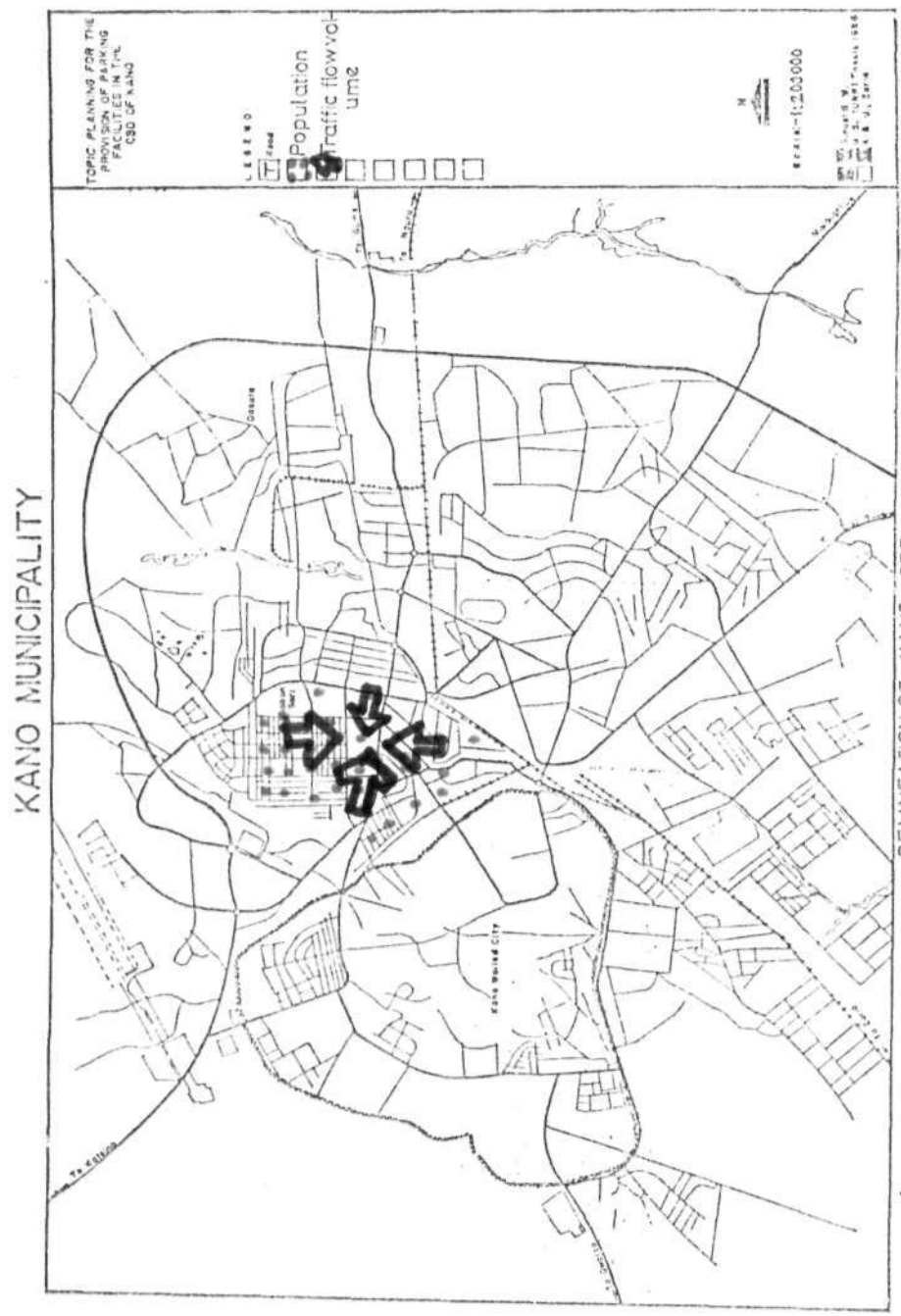


FIG. 3.2.6 DELINEATION OF KANO CBD POPULATION CONCENTRATION & TRAFFIC FLOW VOLUME (PARKING)

TABLE 1: DAYTIME POPULATION DENSITY IN KANO CBD

1.	Sector 1 - Shopping -	6,000 Daytime/Density
2.	Sector 2 - Work -	4,000 " "
3.	Sector 3 - Business/Residential-	5,000 "
4.	Sector 4 - Other -	3,000 Daytime/Density

Source: Field Survey 1997

TABLE 2: TRAFFIC COUNT IN THE CBD

1.	Point 1	Murtala Mohd Way	20,220 pcu per day
2.	Point 2	Ibrahim Taiwo Road	17,540 pcu per day
3.	Point 3	Court Road	15,650 pcu per day
4.	Point 4	Katsina/Gwammaja Road	13,250 pcu par day

Source: Field Survey July 1997

LAND VALUES IN THE CBD OF KANO

In varying price of standard shop in Kano CBD Measuring 4m by 5m in each rings are as follows:

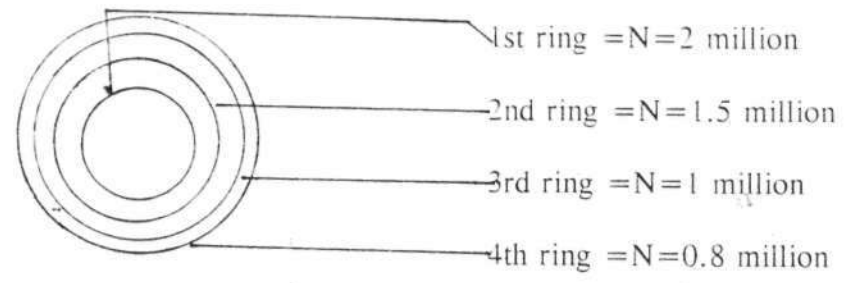
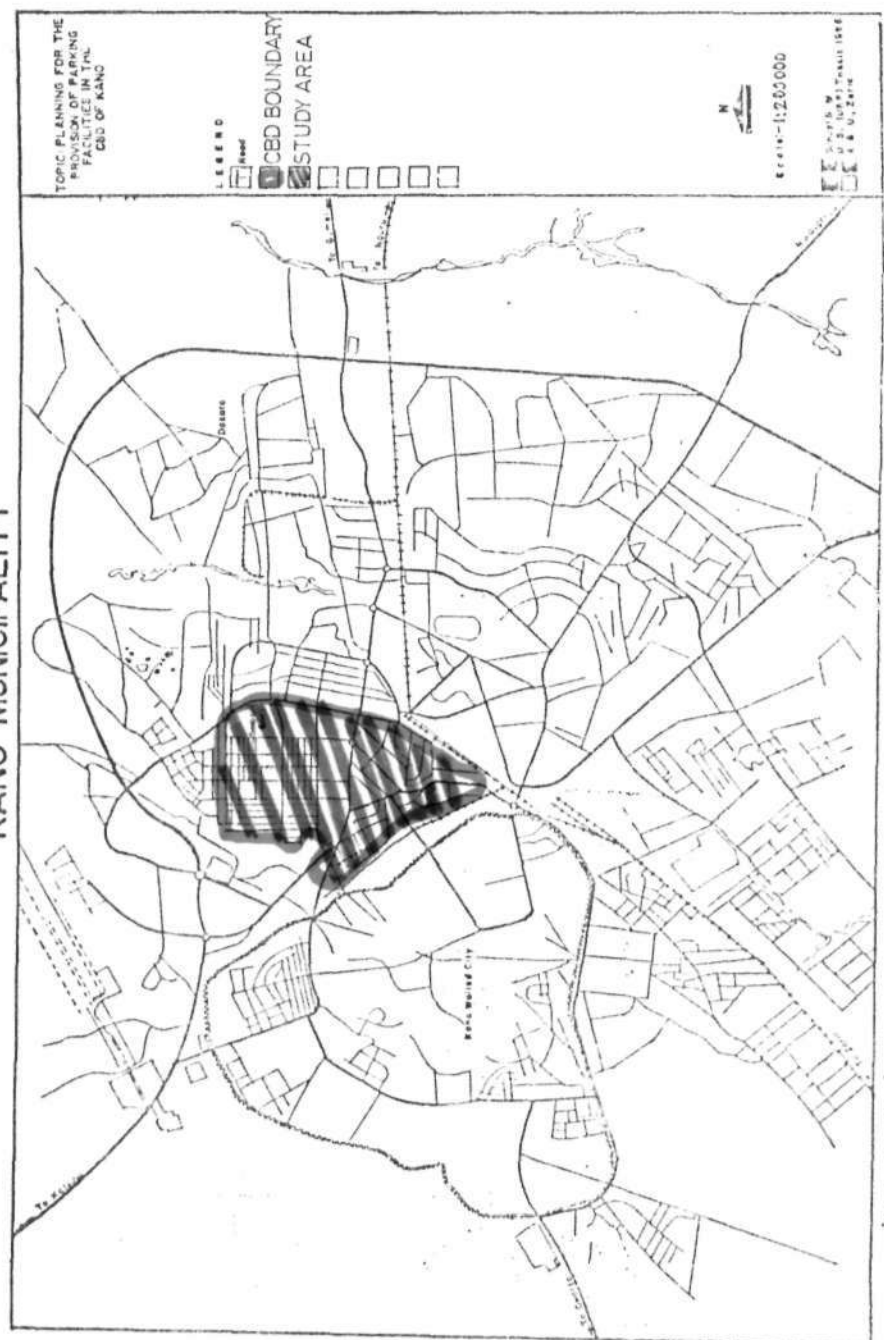


Fig. 3.2.7 Land values in the CBD of Kano.

Source: A KASEPPA, Tunji & Co Estate Surveyor

B Field Survey 1997.

KANO MUNICIPALITY



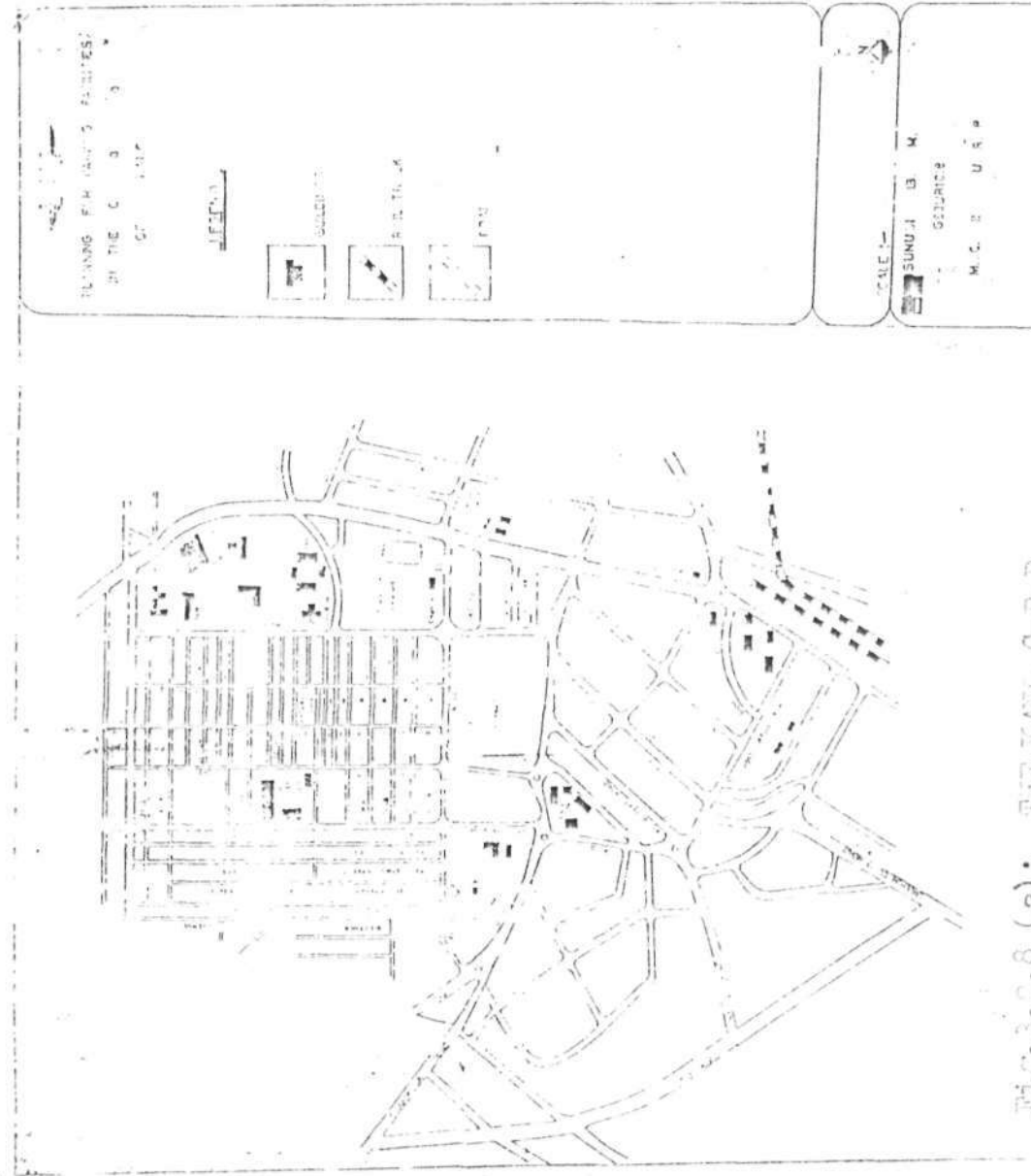
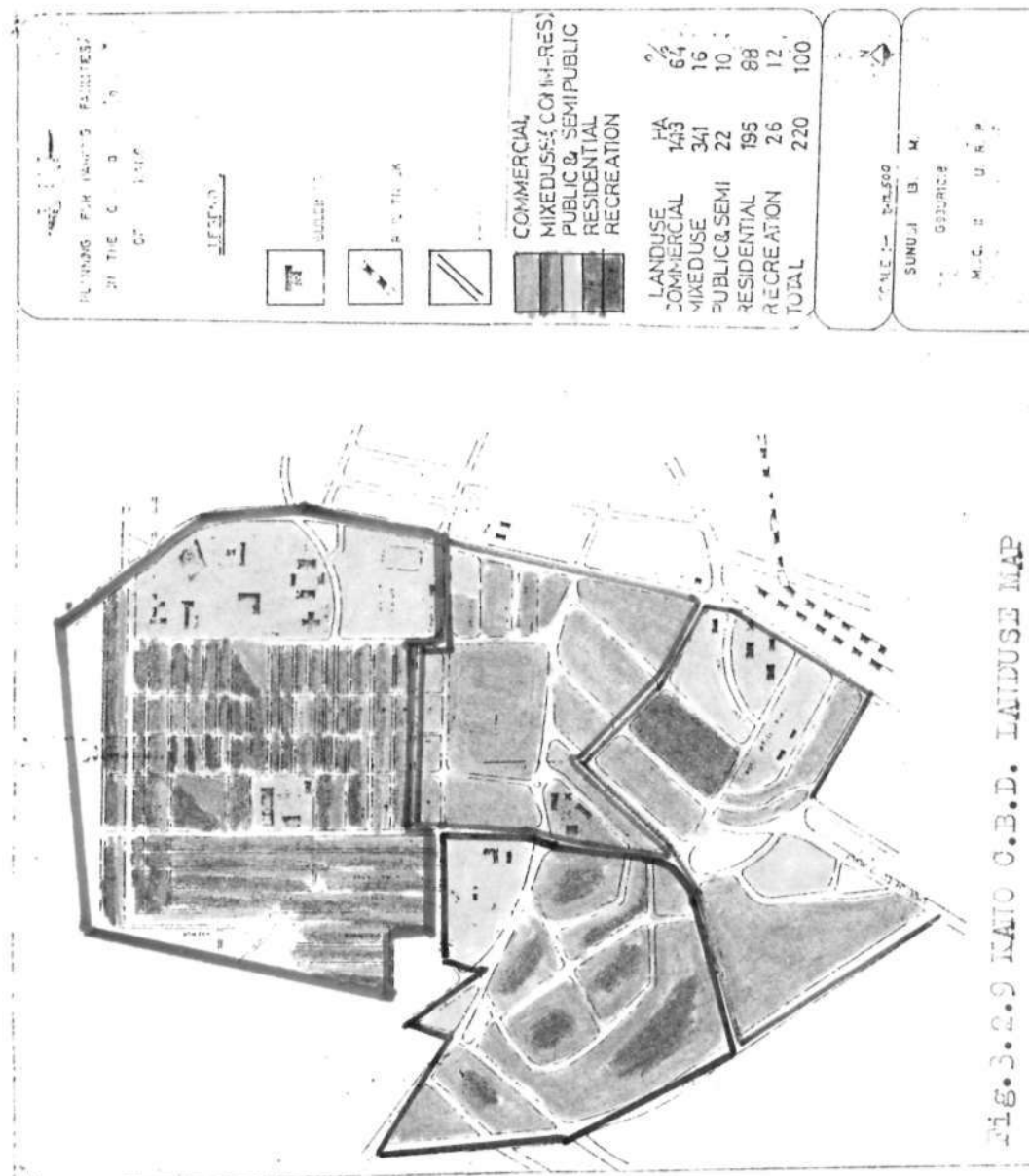
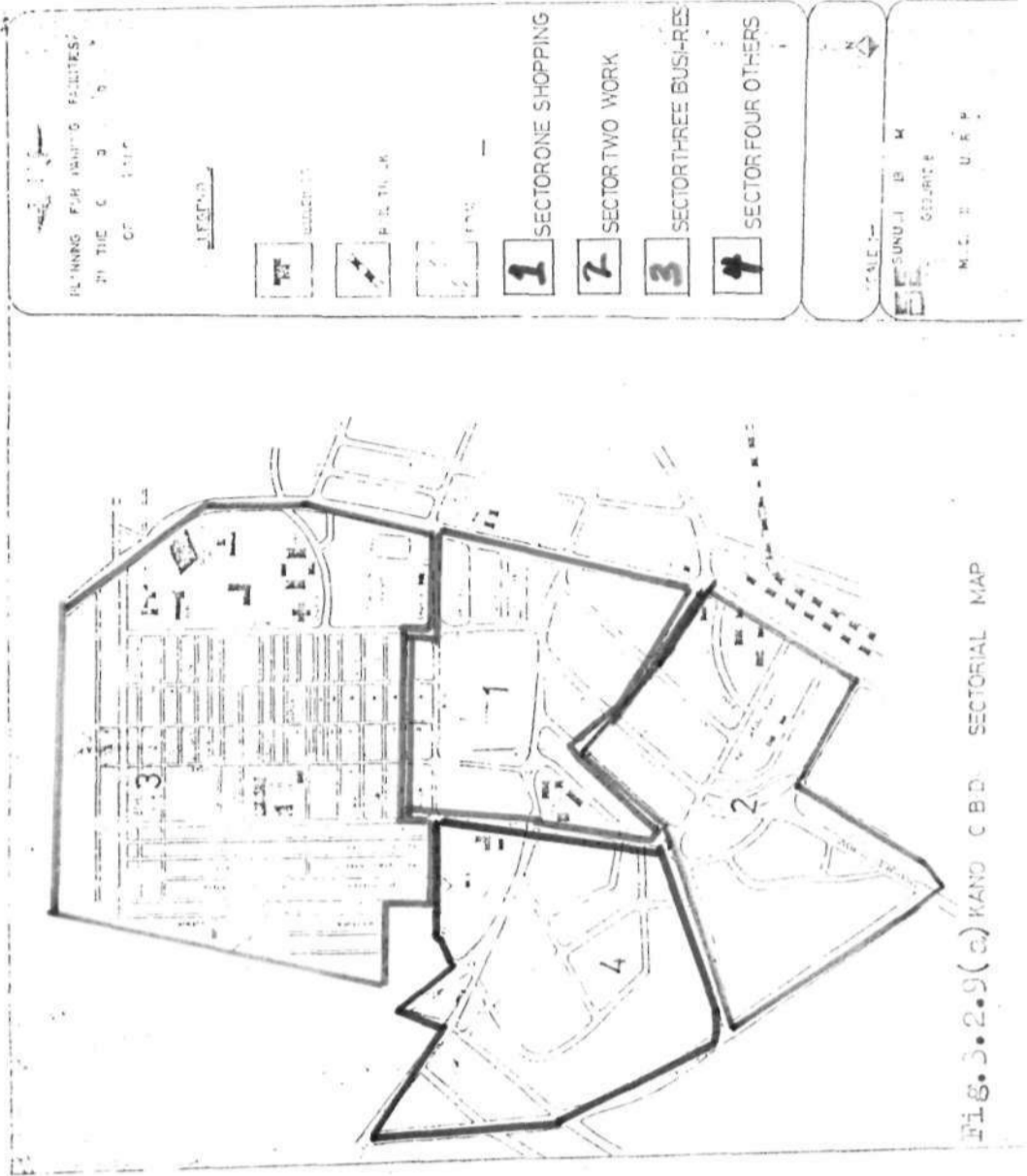


FIG. 3.2.8 (a): THE KANO C.B.D.





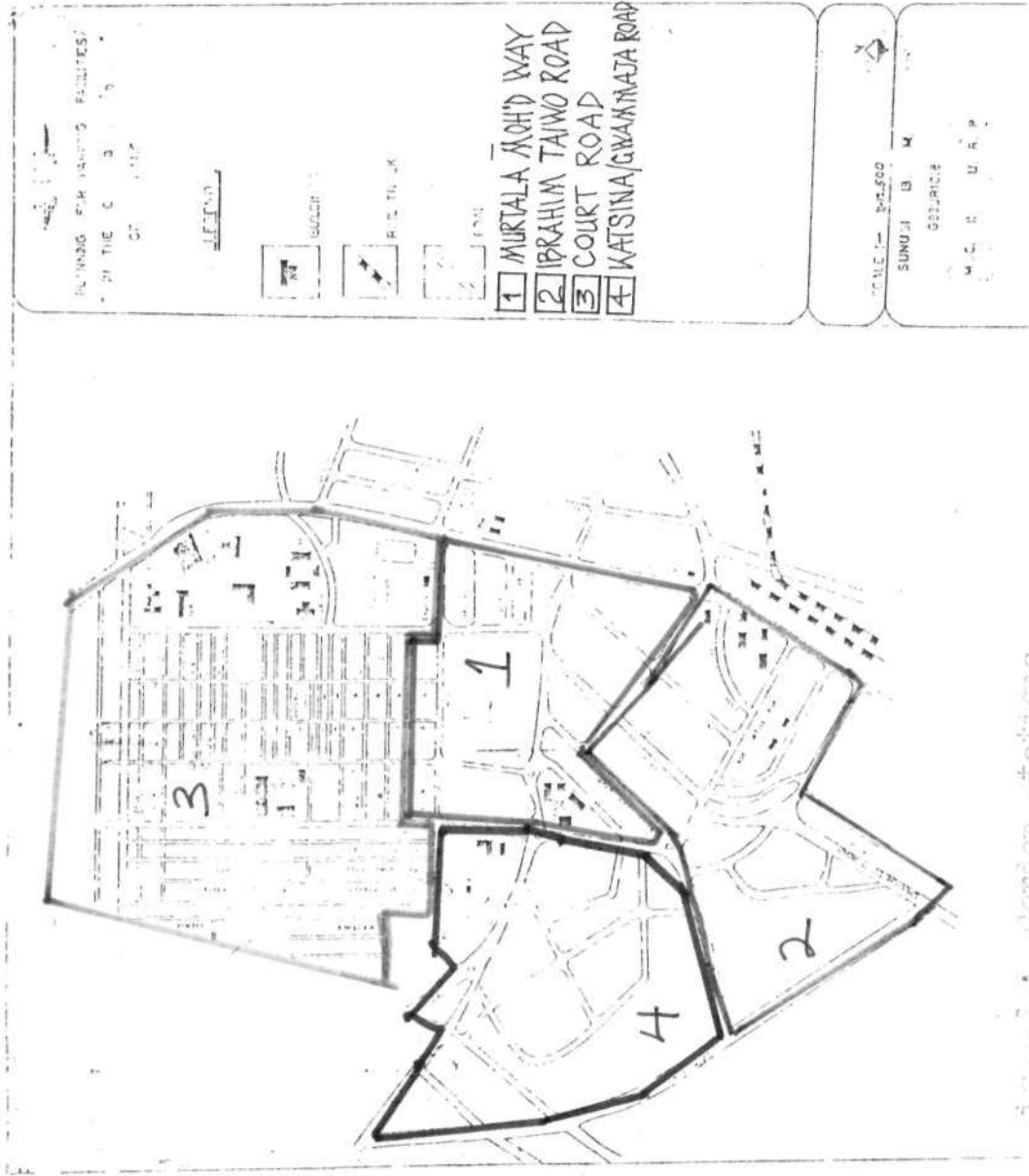


FIG. 3.3: Garden stations

3.2.9 LANDUSE STRUCTURE OF KANO CBD

The details of the characteristic of parking demand and supply within the CBD of Kano is discussed within the framework of its Landuse structure. This section therefore analyses the Landuse in Kano CBD. it reveals that there are four sectors of distinct Landuse concentration (See fig.3.2.9(i)) the sectors are as follows:-

Sector one, is the area around Murtala Mohammed Way, which covers the Central Market. It is basically the commercial area where 90% o the shopping facilities are provided.

Sector two, is the area around Ibrahim Taiwo road stretching up to civic road. It is predominantly a business and public activity area. About 60% of these activities is found in this sector.

Sector three, is basically mixed Landuse i.e Business/Residential use are found along Court road stretching up to Airport road.

Sector four, is a Residential use with few commercial activities and part of Kwari Market.

3.3 PARKING ACCUMULATION IN CBD OF KANO

In this section, it discusses the aggregate characteristics of Parking demand and supply in the CBD and details within different sectors of the CBD.

3.3.1 Aggregate Parking Accumulation

Four (4) stations were chosen along the Cordon line defining the CBD and

cordon count method was used to record the number and type of vehicle going in and out of the study area.

The count at the station along Murtala Mohammed way shows a high incidence of all type of vehicles entering and leaving the station. The accumulation, that is the difference between the incoming and outgoing vehicles at the station, with an average of 1,642 vehicles per day.

A second station is along Ibrahim Taiwo road with an average accumulation of 1,187 vehicle per day. The third station is along Court road, the cordon station at this shows an average of 1,038 vehicles per day, a high percentage of buses and taxis were recorded at this station. The fourth station is along Katsina/Gwammaja road with average accumulation of 362 vehicles per day.

TABLE 3: KANO CBD: ACCUMULATION AT SURVEY STATION

STATION	AGGREGATE PARKING ACCUMULATION VEHICLES/PER DAY	PERCENTAGE
Murtala Mohammed Way	1642	34.7
Ibrahim Taiwo Road	1187	25.2
Court Road	1038	21.9
Katsina/Gwammaja Road	362	18.2
Total	4729	100.00

Source: Field Survey 1997.

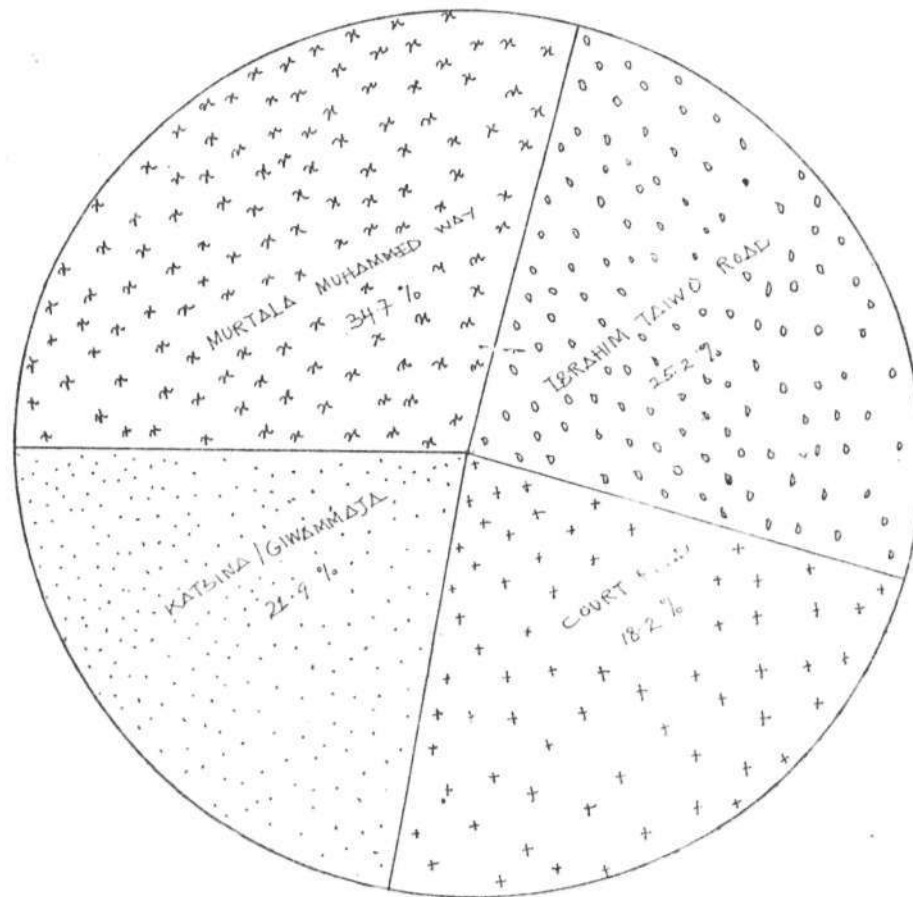





Fig 331 Kano c.b.d. accumulation at survey stations

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Accumulation of Vehicle

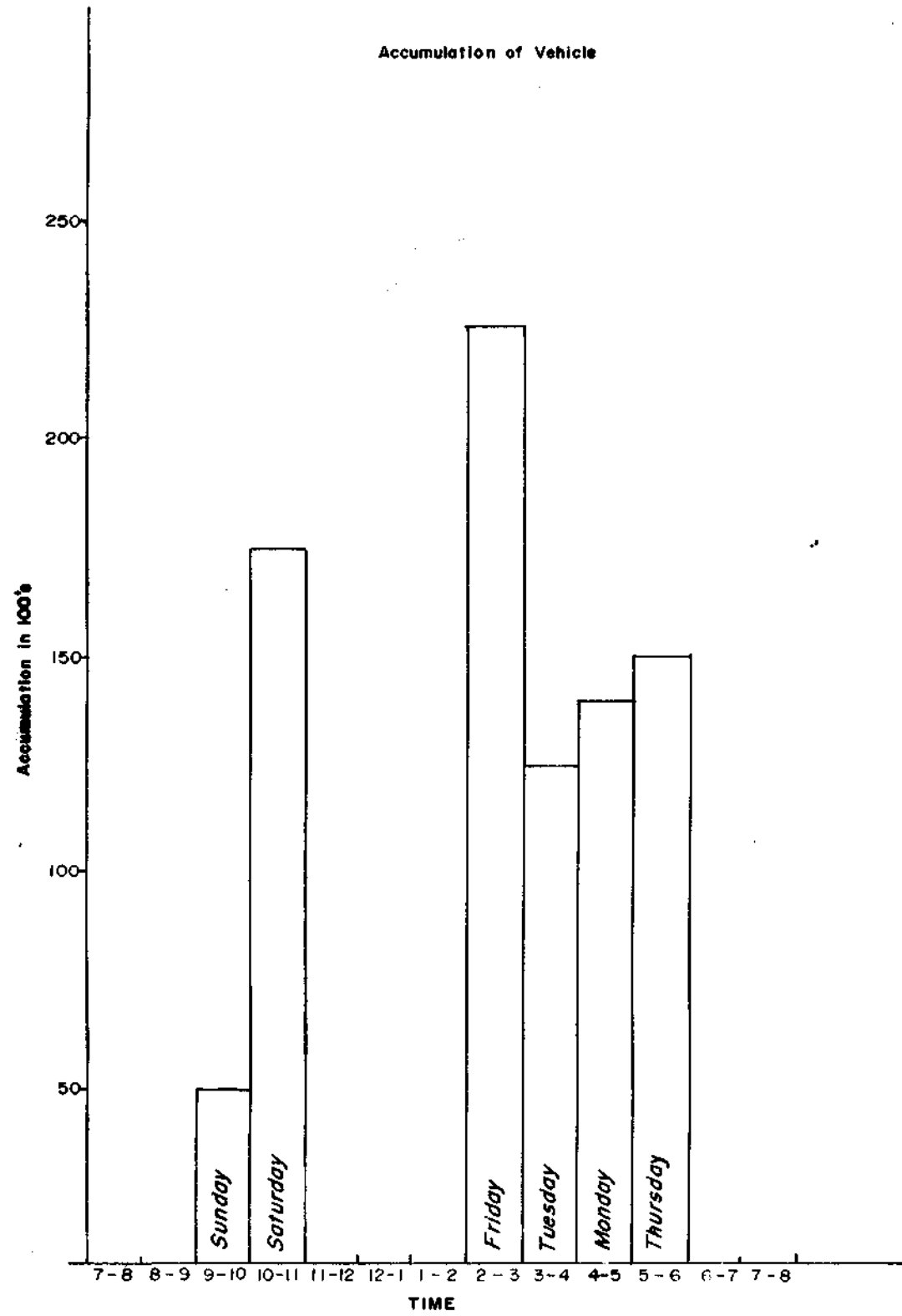


Fig. 334. (a) Daily peak period accumulation. Murtala Muhammed Way (SECTOR I)

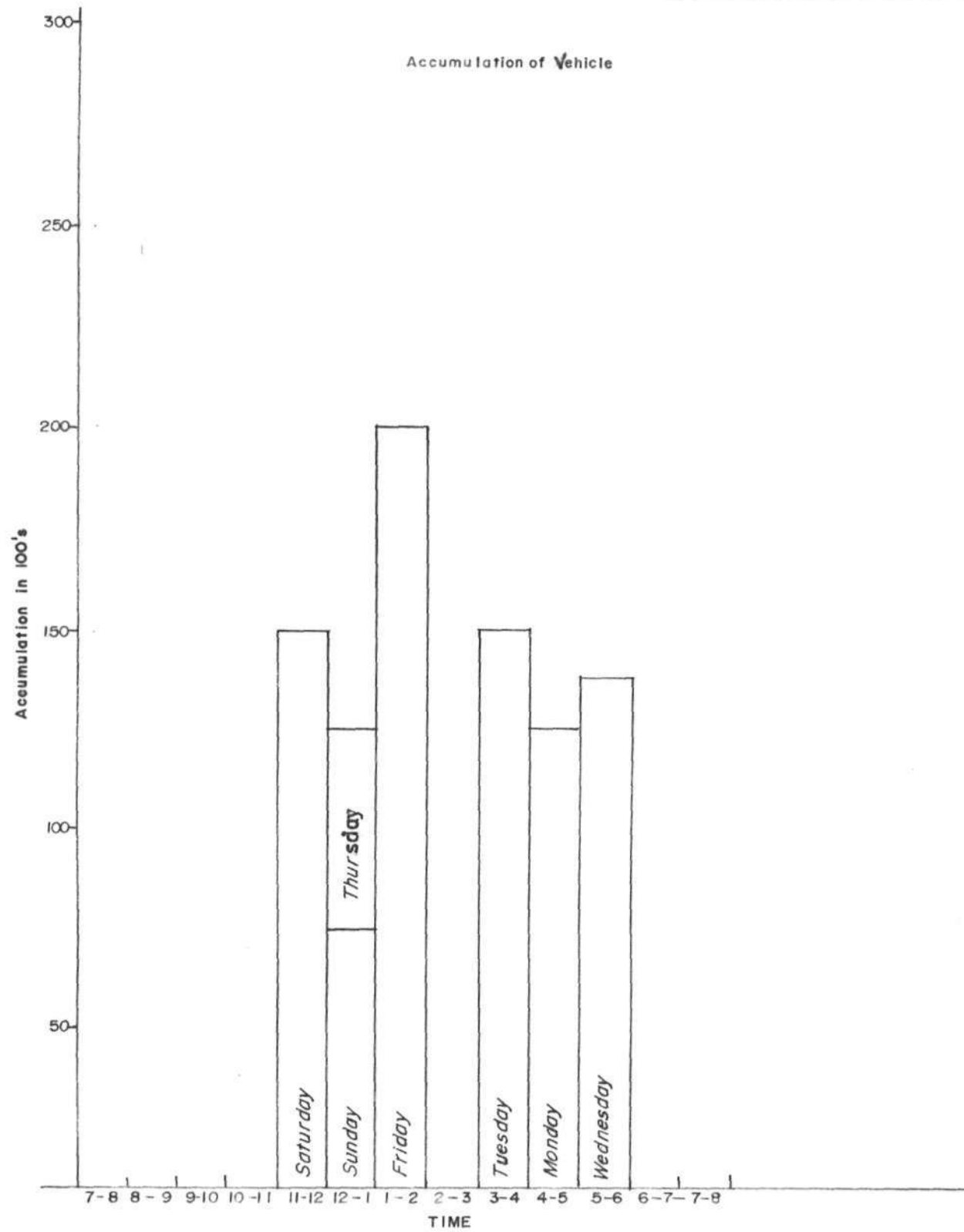


Fig 331 (b) Daily peak period accumulation Ibrahim Taiwo Road (SECTOR 2)

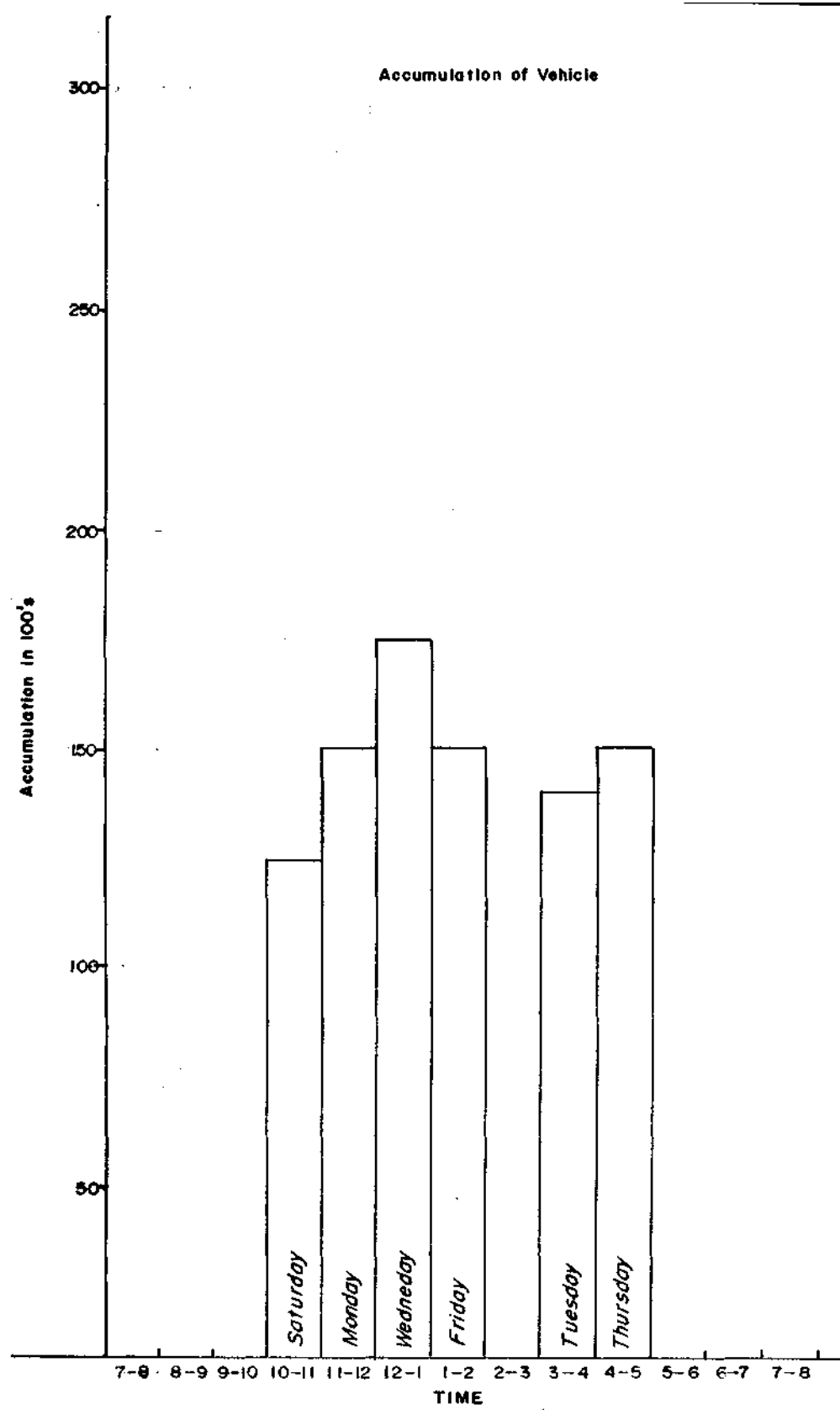


Fig. 3.3.1.(C) Daily peak period accumulation Court Road (SECTOR 3)

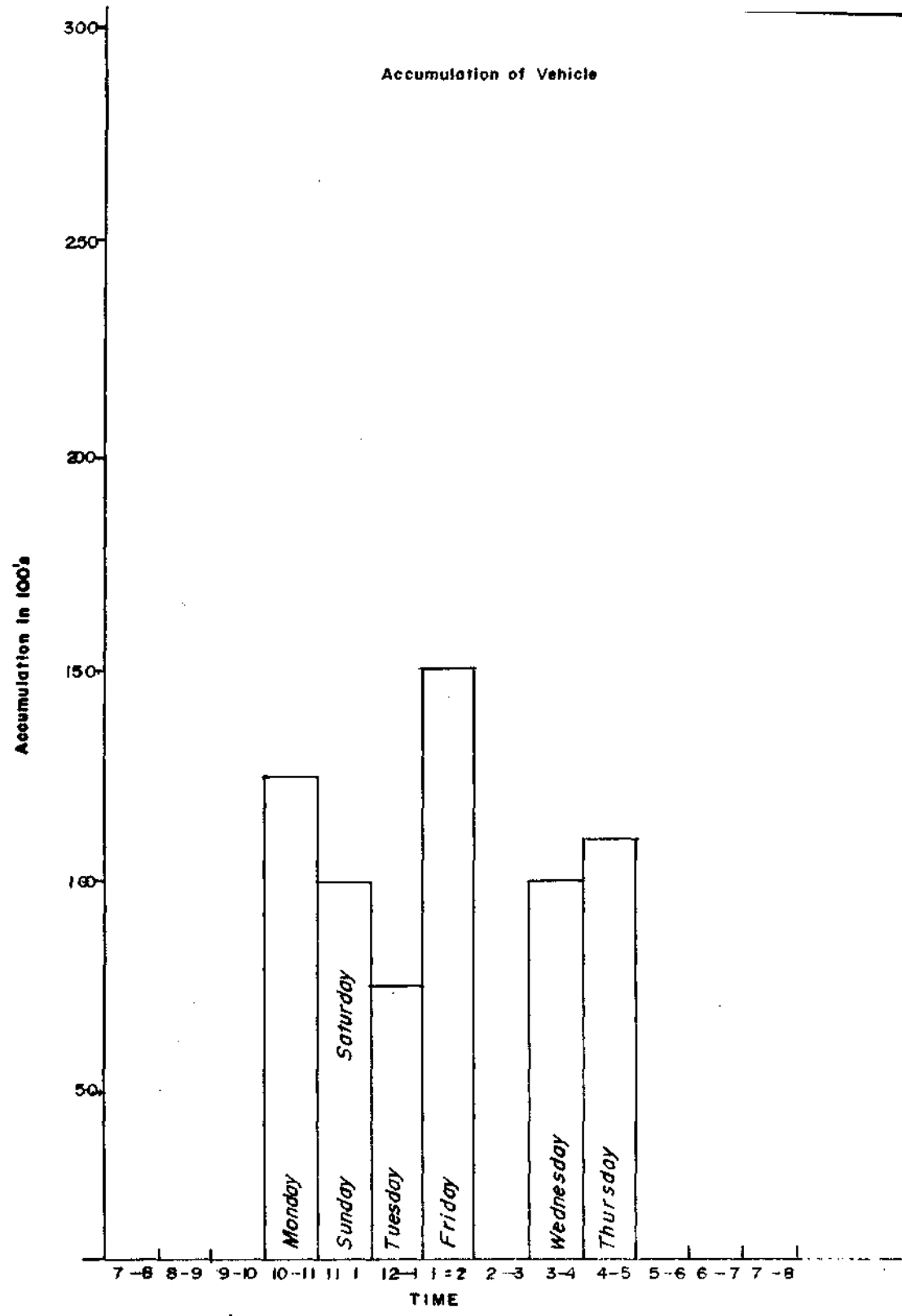


Fig. 3.3.1(d) Daily peak period accumulation Katsina/Gwammaja Road (SECTOR 4)

The average accumulation figure are plotted above, the graph for each station indicate a steady rise at 8 - 9, 9 - 10 a.m and afternoon peak of 4 - 5, 5 - 6 p.m. this is largely due to existence of people moving to their respective homes. Although 1 - 2 p.m afternoon peak is observed only on Friday, because of Jummat Prayer.

3.3.2 Sector Disaggregated Parking Accumulation

Two purpose are used for fashioning parking demand and supply characteristics within the C.B.D. of Kano, which is used to determine the share of aggregate accumulation expected to go to different parts of the CBD with different supply levels of parking facilities. Secondly, it is the Landuse structure of the CBD, because trips are attracted to or emanate from different Land use at varying degrees

TABLE 4: VISITS TO KANO CBD BY PURPOSE

Purpose	No of Motorist Interviewed	% of Total Motorist
Shopping	190	40
Work	128	27
Business/Civic	90	19
Other	70	14
Total	478	100

Source: Field Survey 1997.

These are shown in table 4, above 478 motorists were interviewed to know the purposes of their trips to CBD. It was conducted at survey stations: the results indicated that 40% of the visitors come to the CBD of Kano for the purpose of shopping. This is followed by work purpose with about 27%. Business/Civic represent 19%, while others visits represent 14%.

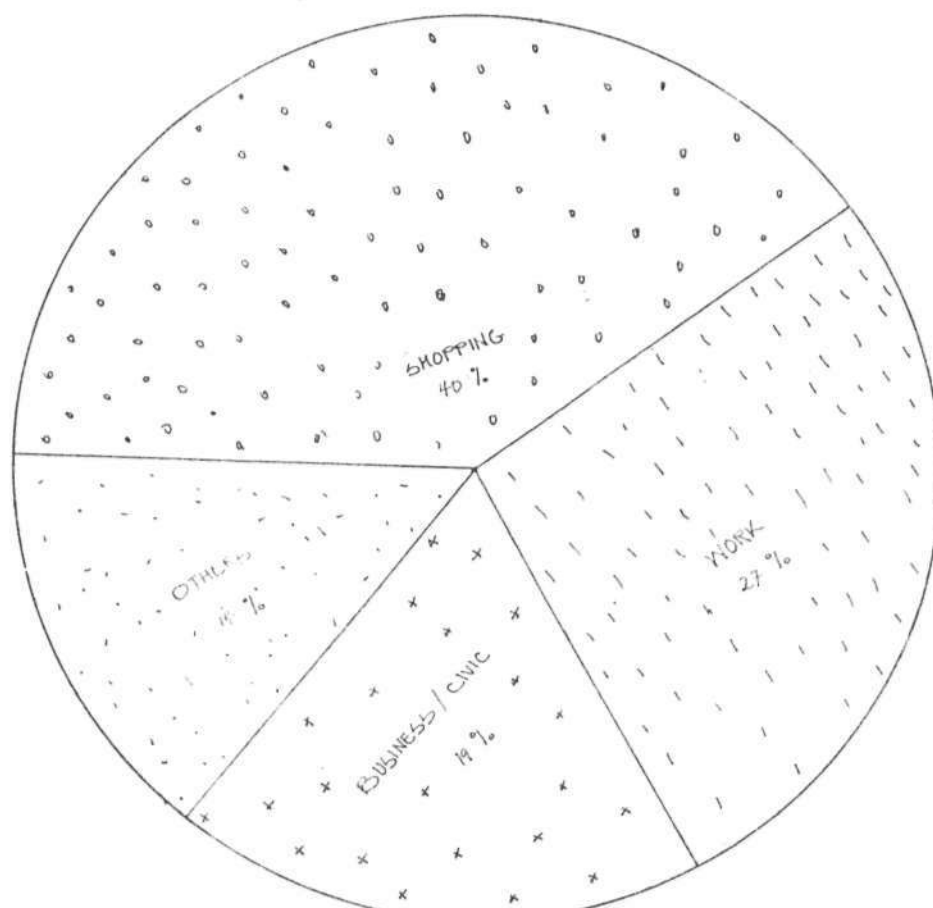


Fig.332: Visits to Kano CBD by purpose

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3.3.3 Average Accumulation by the various Sectors

In applying the distinct sectorial feature of the Landuse of Kano CBD the parking accumulation figure in section 3.21 are distributed on different purpose of visit to the CBD. Thus shopping visits are assigned to the sectors. Work visits are assigned to sector two, Business/civic are assigned to sector three and others visits assigned to sector four.

TABLE 5: KANO CBD: AVERAGE ACCUMULATION BY THE VARIOUS SECTORS

SECTOR	AVERAGE WEEKLY ACCUMULATION AT SECTOR (NO OF VEHICLES)	% OF TOTAL MOTORIST TO CBD AT THE SECTOR
Shopping	11494	34.7
Work	8309	25.2
Business/Civic	7266	21.9
Other	6034	18.2
Total	33,103	100.00

SOURCE: Field Survey 1997

The Table 5 reveals that sector one has an average weekly accumulation of 11,494 of vehicles per week which is higher than other sectors. It is followed by sector two, the work area, which has an average of 83.9 of vehicles per week and sector three is the business/civic with an average weekly accumulation of 7266 vehicles per week and sector four has the least with an average of 6034 vehicles per week.

An aspect/dimension of parking in Kano CBD discussed next is the supply of parking facilities. This measures the extent to which the parking demand, expressed by the accumulation figures are met.

3.4 PROVISION/SUPPLY OF PARKING FACILITIES IN KANO CBD

Quantitative and qualitative aspect of parking provision/supply in Kano CBD are considered and discussed fully in this section. The quantitative dimension relates to the number of parking lots provided and their location, while the qualitative dimension entails the physical conditions of parking spaces with regards to the needs for safe and convenient parking.

3.4.1 QUANTITATIVE ASPECTS OF THE PARKING SUPPLY

Dossier of parking facilities in the CBD of Kano indicates that there are about 6,000 parking lots in about 160 parking areas on - street parking inclusive. Only 3300 of the parking lots about 55% of the total are for long term parking. The remaining 2700, 45% of the total are for short-term parking.

The parking areas in the CBD covers an area of about 12.75 hectares.

Based on inventory of parking facilities in the CBD according to different CBD sectors, it was identified that sector one has a total of 1950 parking lots which represents about 32.5% of the total parking lots in the CBD. Sector Two has about 2350 parking lots or about 39.2%, which has a large number of organized parking spaces because it is a sector that has many Government Institutions and Banks. Sector three has 700 parking lots or 11.6% of the total parking lots and lastly sector four has 1000 parking lots or 16.7% of the total lots in the CBD of Kano.

3.4.2 QUALITATIVE ASPECTS OF THE PARKING FACILITIES

Quality serve as a yardstick in the examination of parking facilities identified. Two criteria used include the services provided and suitability of the parking areas for

vehicle storage. Three different categories of parking spaces were identified first, is the category taken as satisfactory where services are provided such as pavement marking or demarcating of the lots, shades and shades trees, security posts.

TABLE 6: QUALITY OF PARKING FACILITIES IN KANO CBD BY SECTOR

SECTOR	SATISFACTORY		FAIRLY SATISFACTORY		NOT SATISFACTORY	
	LOTS NO	%	LOTS NO	%	LOTS NO	%
1	800	29.6	650	33.3	400	30
2	1500	55.6	850	43.6	150	11
3	200	7.4	100	5.1	500	37
4	200	7.4	350	18	300	22
TOTAL	2700	100	1950	100	1350	100

Source: Field Survey 1997

A total of 3,300 parking lots or 55% of the lots in the CBD were found to be satisfactory. The fairly satisfactory are those that are not paved, marked have inadequate sheds/shade trees and no security posts. A total of 1950 parking lots or 32.5% belong to this category. Those categorised as not satisfactory are not paved, unmarked no shed/shade trees and no security posts. About 750 or 12.5% belongs to this category.

The above table 6 indicate that there are more parking areas in sectors one and two with satisfactory and fairly satisfactory parking facilities. This is because the sectors consist of Institutional buildings: Banks and Departmental Stores, where organized parking is provided for workers and visitors.

Sector three and four have more acute shortage of parking facilities in terms of quality. This is because the sector depends mainly on on-street parking.

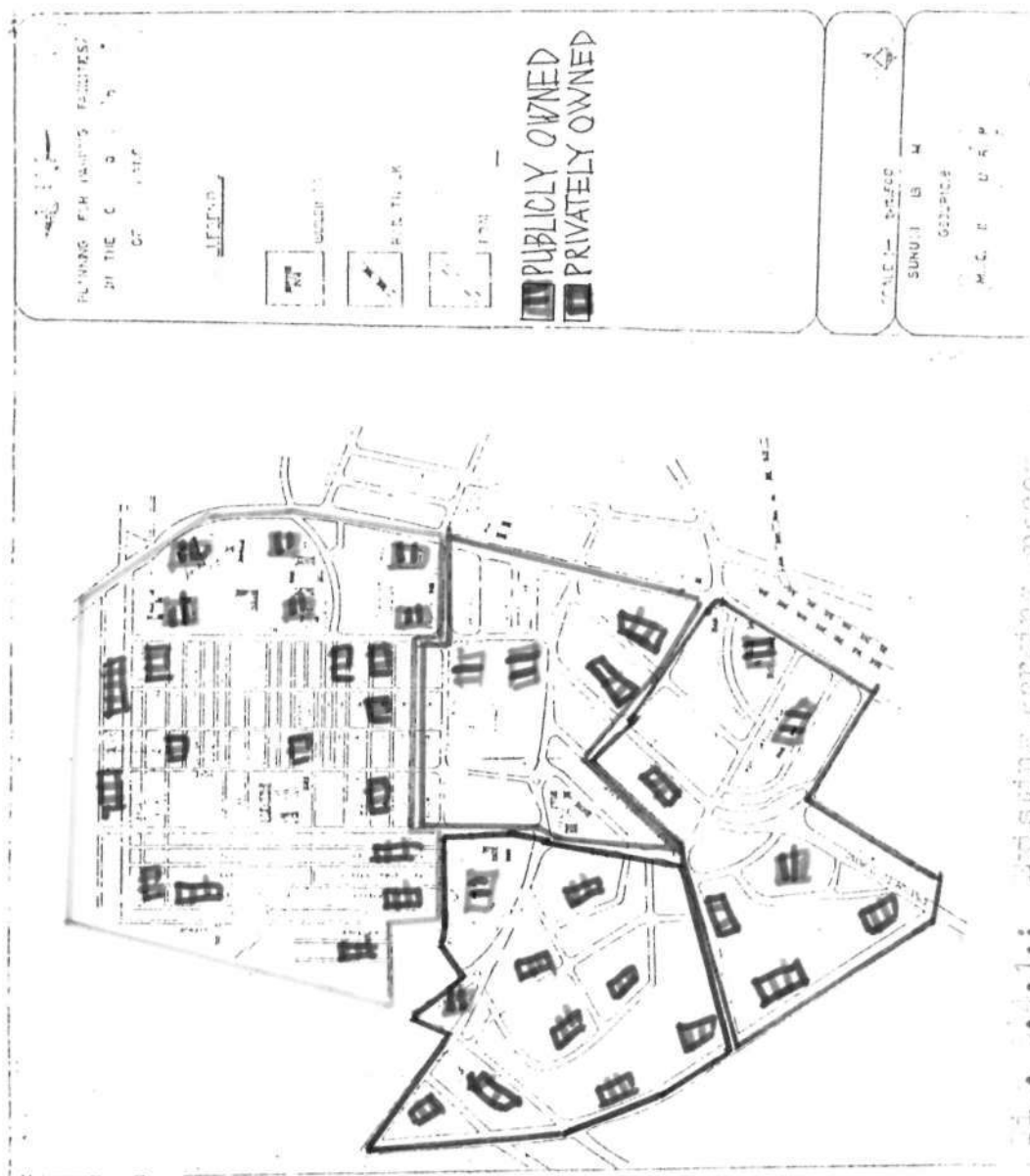


FIG. 3.4.1: Existing zoning areas

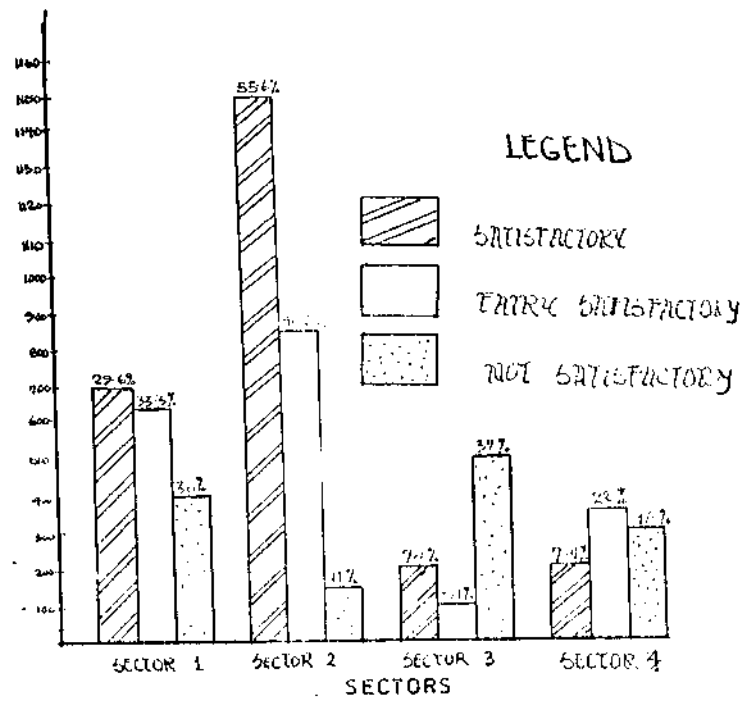


FIG. 34.2. QUALITY OF PARKING FACILITIES IN KANO CBD BY SECTOR

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3.5 PARKING DURATION AT THE KANO CBD

When vehicles arrives at the CBD, they are parked over a period of time. The parking duration in the CBD is discussed on two basic considerations. First, the duration which is officially regarded as short, medium and long terms parking. Second is the parking along selected street which represent the average for different sectors of the CBD to which they belong.

TABLE 7: PARKING DURATION AT VARIOUS SECTOR OF KANO CBD.

SECTOR	DURATION (IN MINUTES)	VEHICLES PARKED (NUMBERS)	% OF MOTORISTS INTERVIEWED
1 SHOPPING	Under 10	140	29
	10-29	30	16.6
	30-59	218	46
	Over 60	40	8.4
	Total	478	100
SECTOR 2 WORK	Under 10	30	32.2
	10-29	27	30.4
	30-59	16	18.3
	Over 60	17	19.1
	Total	90	100
SECTOR 3 BUSINESS/CIVIC	Under 10	54	16.4
	10-29	123	37
	30-59	118	36
	Over 60	35	10.6
	Total	330	100
SECTOR 4 OTHERS	Under 10	57	38
	10-29	59	39
	30-59	16	11
	Over 60	18	12
	Total	150	100

SOURCE: Field Survey 1997

Along Murtala Mohammed Way a total of 498 parked vehicles were surveyed. The result are shown above. They showed that most of the vehicles over 91.6% were

parked for short term basis. i.e between 10-59 minutes and few long time parkers which constitute 8.4%. It shows that the motorists come to the sector for short term shopping.

Many visitors to the Sabon Gari market park along the road. (median and pedestrian walk way/side walk inclusive) due to inadequate parking facilities with the intrusion of taxi and bus drivers contributes to the problem of kerb parking along routes which reduce the effectiveness of the road width, hence result into traffic congestion.

The patrol survey conducted along some stretches of Ibrahim Taiwo road showed that the parking duration in sector two as given in table 5, shows that 90 motorists were interviewed, in this sector, the long term parkers constitute 19.1% and the short and medium term parkers constitute 62.6% and 18.3% respectively. This is largely due to the presence of Government Institutions, Banks and some Departmental stores in this sector.

The survey was also conducted along court road in sector 3. A total of 330 vehicles were observed. The results in Table 5 shows that many of the visitors are for medium term parkers. About 90% of them park for less than one hour. Many of the parked vehicles are buses that queue to wait for passengers. Although off-street parking is pronounced in this sector due to the presence of mixed landuse, some traffic hold-up are experienced along this roads especially during peak hours.

Survey was conducted in sector four along Katsina/Gwammanja road, the result

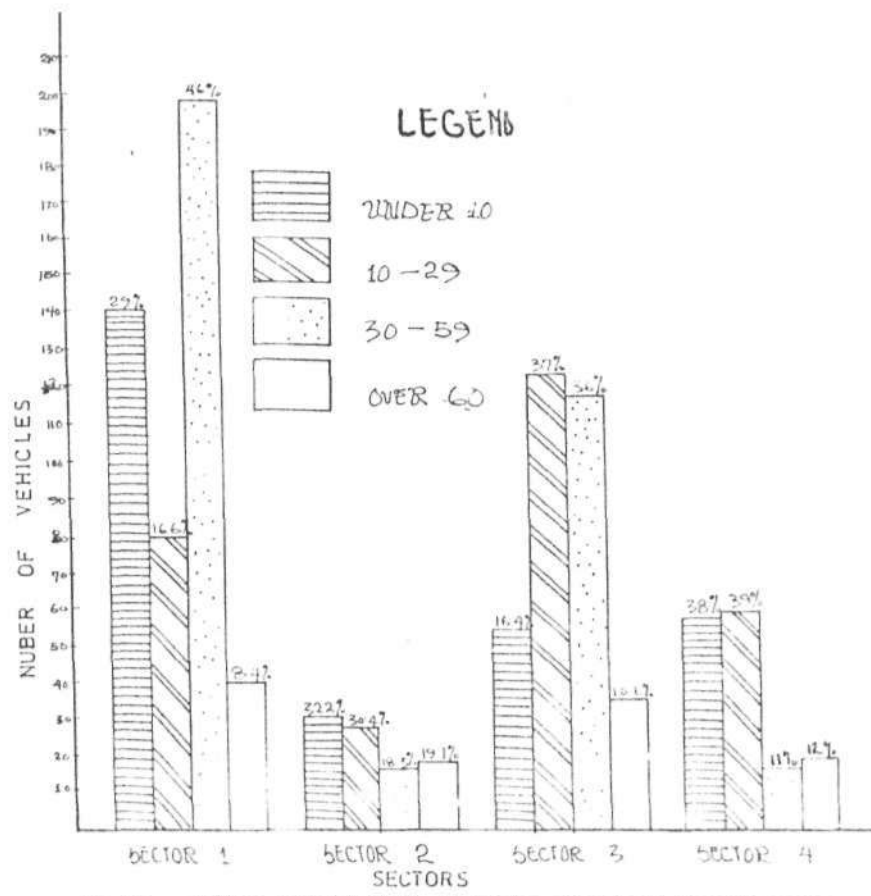


FIG 35. PARKING DURATION AT VARIOUS SECTORS OF KANO C.B.D.

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in Table 7. indicates that many of the vehicles parked are mini-Buses and taxis that brings visitors to the CBD. Over 30% of the total 150 vehicles surveyed parked on short-term basis and only 12% parked on long term basis.

3.6 PARKING PROBLEMS IN KANO CBD

To determine the quantitative problems of existing parking supply, a comparison is made of the average daily accumulation and the parking supply figures. The parking duration data are used to convert the parking accumulation figures in the CBD into number of parking lots needed. Therefore, this section discusses parking demand problems. Also, the levels of deficit and/or surplus parking lots are determined by relating the estimated parking discussed above. The implications for the parking problems of the quantitative nature and type of-parking are also given in this section.

The average daily accumulation of vehicles and average parking duration, also the number of vehicles a parking lots can take in a day is taken into consideration. The average parking duration of 40 minutes in the Kano CBD was used to determine the number of vehicles a parking lot can take in the CBD. The parking average daily accumulation figure for 1997 was converted into total parking lots required (See Appendix 1 for conversion model). It was set against the present level of parking supply to determine the deficits. Table below indicates that there are only deficit at various levels within the different sectors of the CBD. Which indicate the level of the quantitative problems of parking in the CBD.

From Table 8 below, it is clear that there is problem of limited supply of parking facilities in the CBD in relation to the demand level which is applicable to

each sectors, at different levels of inadequacy. Sector one has the highest deficits of 287 parking lots, followed by sector 2, with 208 deficits parking lots, Also sectors 3 and four has the least deficit with 182 and 151 parking lots deficits respectively.

TABLE 8: KANO CBD: EXISTING DEFICITS OF PARKING LOTS

	SECTOR	AVERAGE WEEKLY ACCUMULATION AT EACH SECTORS (NO OF VEHICLES)	EXISTING PARKING LOTS NO.	TOTAL NEED LOTS NO.	DEFICITS
1	Shopping	11494	1950	2237	287
2	Work	8309	2350	2558	208
3	Business/Residential	7266	700	882	182
4	Others	6034	1000	1151	151
	TOTAL	33103	6000	6828	828

Source: Field Computation 1997

CHAPTER FOUR

THE SCOPE AND NATURE OF EXISTING PARKING POLICIES AND PROGRAMMES IN KANO CBD

4.1 EXISTING PARKING POLICIES IN KANO CBD

Parking management strategies are measures taken to alter the supply or cost of parking in order either to reduce congestion or traffic delays. Most policies on parking are geared towards the CBD first, before considering other sectors of the city in view of its importance in the overall urban economy.

Although some policies have been formulated for solving parking problems in Kano CBD, they include the following:

First, Kano State Environmental Planning and Protection Agency directed that all storeyed buildings within the Central area should have a plot development coverage of 45%. In granting planning permission, the agency is to ensure that the ground floor of such buildings are devoted to parking.

Secondly, another policy led to redevelopment project of Sabon Gari market which was aimed at decongesting the market and provide for adequate parking spaces.

Thirdly, further policy was on conversion of use within the CBD. Parking adequacy by developer must be observed before approval is given by the agency.

Existing policies on parking in Kano are adhoc in nature. When work places like markets, banks etc. are built some place is usually reserved for staff and visitors parking.

This is not done, however on the basis of a good understanding of the parking demand and appropriate standards applied.

In parts of the CBD where traffic congestion are recorded, traffic warden and 'No' Parking signs are used to restrict on-street parking without fundamentally solving the problem of parking especially along Bata and Yankura areas.

Attempts was also made by the agency at providing regional park at the periphery of Kano town to decongest the city centre. Example of such places are Unguwa Uku, Yankaba, Mariri and Kofar Wambai parks, which caters for vehicle going to different places in the Country and vis-a-vis. The short coming is the lack of provision for where passengers are to be picked and dropped at various parts of the town. These have been known to be the major causes of traffic hold-up especially along Bata and Yankura areas in the CBD.

4.2 **PROGRAMMES**

The Kano State Government much more recently, precisely in 1981, evolved a plan towards the total reconstruction of the Sabon Gari market which is not only located within the CBD but have a higher propensity, to attract more traffic than most other uses in the CBD. A plan was prepared by the then urban development board now KASEPPA and provision for parking was made in four corners of the market fence along Ibo and France roads. These proposals were not implemented. Instead, high rise shops were built round the market (along its perimeter) while the two corners are retained as parking areas behind these high rise shops. This in essence has led to reduction in the level of parking space provided. Another programme was the provision of surface park beside African International Bank along Ibrahim Taiwo road, also with the sole aim of reducing congestion and traffic delays

around Kantin Kwari market and its environs. but the facilities are not enough to accommodate vehicles. Although individuals/private supplemented Government efforts by making provision for their customers. In essence the short fall of parking spaces contributed to traffic congestion and on-street parking, also pedestrian convenience overtaken by motorists at Kano CBD.

4.3 SOME SALIENT PROBLEMS OF PARKING POLICIES IN KANO CBD

Although parking policies exist, especially for Kano CBD, but some salient problems make it ineffective. They include the following:

1. Increased population density and vehicle ownership levels have increased traffic volumes and parking demand in all areas in the city, especially the CBD, is increasing rapidly because of excessive concentration of work centres and physical limitations of the public transport system.
2. Parking control is effected by collection of parking charges and to some extent separation of exclusive long term and short term parking lots. The parking lots are usually congested without separation of long term parking from short term parking.
3. Parking adequacy assessments are generally not given adequate importance while deciding building intensity and/or approving schemes. Trends in parking demands are usually not kept in view. Frequent violation of building bye-laws leading to conversion of parking space, developing floor area ratio higher than stipulated norms and commercialization of basements is becoming a normal practice.
4. In areas close to the central area and in non-hierarchy and mixed use areas. change in Land-use and building bulk is frequent, with on-street parking

approaching or even exceeding saturation levels.

5. There is general absence of clear cut transport policy and lack of support and acceptance of government actions by the people.

CHAPTER FIVE

5.1 FUTURE DEMAND AND REQUIREMENTS OF PARKING IN THE CBD OF KANO

5.1.1 PROJECTION OF PARKING DEMAND

In order to forecast any urban development including transport and parking facilities/provision, it is important to make projections into the future by establishing the present situation. In this chapter, the current demand for parking is projected to estimate what it would be Ten years time from now. The factors that would be taken into consideration and the results of the projection as well as the space implications are discussed below:

5.1.2 FACTORS CONSIDERED IN THE PROJECTION

Several factors are taken into consideration in forecasting parking provision. Amongst these factors are as follows:

Firstly, Landuse patterns. It is significant to examine policies on future Land use in the study area which in turn affect the results of the projection. In this regard, it was established that the Sabon Gari market would be redeveloped (into a modern market that can compete with any market in the world. (KASEPPA 1985). This means that commercial activity is to be harnessed. As a Landuse that strongly attracts traffic, the growth of parking demand will be faster with such redevelopment. Already the plan suggested that adequate parking space will be provided at the four corners of the market. If the policy is implemented further parking demand will be substantially increased. Although some of the parking space has been converted into perimeter shops.

Secondly, as stated in chapter two, the rate of vehicle ownership will have a direct effect on the amount of parking facilities that would be required. Vehicle ownership is expected to grow at an average rate of 4.0% per annum, during the current National development plan period. Despite the rate is higher in Kano due to the fast growing of the town, this points to a rising rate for parking.

Thirdly, the socio-economic characteristics of the people is a reckoned factor in making projection. It is related to the aspect of vehicle ownership and parking is rising due to the above factor. Although there is decline in average income of people in Kano. Although, the income and vehicle ownership of people will rise at faster rate before the end of the decade.

Fourthly, some locational decisions and planning programme have effect on channelling traffic for specific places leading to increase in parking demand in the places for instance, the commercial layout around Zaria road and the city Centre have implications for the direction and rate of physical growth of Kano and consequently the pattern and levels of parking the whole city including the CBD.

Within the limits of available data these factors are considered in the projections of parking demand given below.

5.1.3 FUTURE PARKING DEMAND IN KANO CBD.

As explained in chapter three the average CBD accumulation figure for 1997 is set side by side with existing parking facilities supplied to determine the deficits or surpluses. In this section, the parking demand the deficit as at 1997) are projected to a ten year period.

The computations are made at aggregate level for the whole CBD and for the different sectors of the CBD for the years 2002 and 2007 from that of 1997 which is the base year. There is no known and official growth rate for vehicle ownership in Kano, but 4.6% growth rates for vehicle ownership could be used for parking demand rate. This was determined from the vehicle registration figures for Kano which are shown in Appendix 2.

The geometric progression method was used to make the projections because it fits situations of limited data base of this nature.

Thus:

$$P_o = P_i (1+r)^n$$

Where P_o = Projected demand

P_i = demand at the base year

r = rate of growth of vehicle ownership of parking demand

n = number of years the projection is made.

The projection is made for the first five years, 1997 to 2002. For parking studies this is a short term period in which result is expected to be more reliable and actions based or if more appropriate. If the determinants of the growth rate of parking demand remain stable, the longterm term (2002 to 2007) projection results will equally be a valid frame work for action.

With a deficit demand figure of 828 parking lots in 1997, the 2002 deficit level would be $P_o = 828 (1+0.046)^5$ which is 1036 and 1295 in the year 2007.

Table 9: **KANO CBD: PRESENT AND PROJECTED LEVELS OF PARKING DEFICIT**

SECTOR	Weekly Accumulation (No. of Vehicles)	Existing Parking lots No.	Total need lots No.	Projected 1997	2002	Deficit 2007
1	11494	1950	2237	287	359	449
2	8309	2350	2558	208	260	325
3	7266	700	882	182	228	285
4	6034	1000	1151	151	189	236
TOTAL	33103	6000	6828	828	1036	1295

SOURCE: Field Survey (Computation) 1997.

The table 9 above indicates the computation for various sector projected deficit from 1997 to 2002 and 2007 respectively. Sector one has a present deficit of 287 with projected deficits of 359 and 449 lots in 2002 and 2007 years respectively. Sector two has a present deficit of 208 lots in the year 2002 of 260 parking lot deficit and expected to rise to 325 parking lots deficits in the year 2007. Sector three has a present deficit of 182 lots with a projected deficit of 220 lots in the year 2002 and expected to rise to 285 parking lots deficit in 2007. Sector four has a present deficit of 151 lots with projected deficit of 189 lots in 2002 and which is expected to rise to 236 lots in the year 2007 respectively.

5.1.4. THE REQUIREMENTS FOR PARKING FACILITIES

The computed parking demand and projected deficits in terms of parking lots needed to meet daily parking needs in the CBD of Kano and also the implication of qualitative aspect of parking in terms of the following:

- (a) Land required to meet the parking demand in terms of the provision
- (b) Action required for improvement of parking facilities.

The above provide the basis for making recommendation and planning proposals.

5.1.5 LAND REQUIREMENTS

Outcome of this project indicates that there is need for the provision of more parking space and facilities in the Kano CBD, in terms of quantity and quality from the figure above on parking deficits by 2002 about 1036 lots are needed and about 1295 lots are needed by 2007 respectively. This is best appreciated when those number of parking lots are converted into space requirements.

Using average size of 21.25m² for 90° parking lot, including aisle, the present parking 6000 parking lots in the CBD occupies 12.7 hectares of land, which includes both organized and unorganized parking areas. Assuming this would remain under parking, the additional land requirements for parking up to the year 2007 is given in Table 8 below:

TABLE 10: SPACE REQUIREMENTS FOR PARKING IN KANO

SECTOR	EXISTING LOTS NO	SPACE HA USED FOR EXISTING LOTS	REQUIRED SPACE 1997 HA	SPACE TO 2002 HA	ADD 2007 HA
1	1950	4.1	4.5	0.4	0.5
2	2350	5.0	5.3	0.4	0.4
3	700	1.5	1.8	0.4	0.5
4	1000	2.1	2.4	0.4	0.5
TOTAL	6000	12.7	14.0	1.6	1.9

SOURCE: Computed Field Work 1997.

The figure above indicates that large amount of spaces needs to be devoted to parking in order to fully meet the demand for parking. However, if the current level of deficits is met, then smaller amounts of land will be required for 2002 and 2007 i.e, 1.6Ha. and 1.9 Ha respectively.

5.1.6 QUALITATIVE ASPECTS OF THE PARKING REQUIREMENTS

Qualitative problem were identified in chapter three (see section 3.4.2) These need to be addressed. Also, it is done in terms of the future consideration of the requirements as well as development. Provision of certain facilities are necessary for convenient and secure vehicle storage.

In Kano CBD, it was observed in chapter 3 (section 3.3.2) that sectors one and two has the highest satisfactory quality of existing parking facilities. These are sectors with Departmental Stores, Banks and some Government Institutions where exclusive parking as provided. However, the situation in sector three and four require a lot of improvements to bring the existing parking facilities to desirable standards. This include the provision of security post, shade/shed trees, permanent marking in order to demarcate the lots.

5.1.7 INVENTORY OF SPACE IN KANO CBD

The space covered by parking at the time of our survey is given according to the various sectors of the CBD (see Table 10, in Chapter 5). The land requirements based on the accumulation figures, obtained from field survey are shown. Also the amount of parking space required to be added to accommodate the projected levels of parking demand is also given in Table 9.

From the field survey, currently 12.7 hectares or 5.8% of the total land area of Kano CBD is for parking. The projected amount of additional requirement for 100% off-street surface parking in the year 2002 is 1.6 hectares and in the year 2007, it will rise to 1.9 hectares. Within the context of the CBD area totalling 220 hectares and the intensity of development of Land under various central functions, this constitutes a planning challenge. These challenge remains in view of the fact, that very limited availability of vacant Land in the CBD exists in all the sectors. Although sector three have the smallest level of deficits.

5.2 **PROPOSALS**

Proposals are type of solutions to the statement of problems which resulted in the undertaking of any aspect. With regards to this study, the following proposal wee identified.

1. Proposal 'A' Decentralized parking space within the CBD and relocation of singer warehouses.
2. Proposal 'B' Decentralized parking space outside the CBD coupled with physical restraint measure.

5.2.1 **Evaluation of proposals Through Cost-Benefit Analysis**

As the proposals are listed above, one can not just select that this particular proposal is the best or all of them are good therefore to know which should be selected, the cost and benefit of each will be taken into consideration.

Therefore, cost-benefit analysis implies the enumeration and evaluation of all relevant cost and benefit in money term, which has been frequently used in assessment of a project.

5.2.2 **Proposal "A"**

Decentralized parking space in proposal "A" involve the provision of parking space

in all the sectors within the CBD of Kano, in order to serve each sector effectively and to relocate the present singer warehouse, were whole sale purchase of good is done, along the direction at which the traders or flow of goods come from.

5.2.3 **Benefit**

- Easy connectivity between the sector, i.e high degree of accessibility to all the sectors.
- There will be relieve on transportation network, therefore there will be efficiency and improve travel time.
- On street parking will reduce, hence congestion will be eliminated.
- Accidents will be reduce to barest minimum
- Adaptability of functional element.
- It will promote convenience and safety.
- Projected parking deficits will be accommodate.

5.2.4 **Cost**

- Since Land value is at highest in the CBD, a very large sum of money will be involved, it will cost ₦166,923,000.00K.
- It will involve compensation and bulldozing of structure
- Relocation of use is eminent and it involves money.
- Extra cost in the distribution of goods to the CBD.

5.2.5 **Proposal 'B'**

Decentralized parking space in proposal 'B' involves the provision of parking space

in all the sectors outside the CBD of Kano, coupled with traffic management measure. In order to reduce the intrusion of low-occupancy vehicle to the CBD. Each parking space will be provided near to each sector at the periphery of the CBD.

5.2.6 **Benefit**

- There will be relieve on transportation network, therefore there will be efficiency and improve travel time.
- On-street parking within the main/core business sector will be eradicated.
- It will promote adaptability of functional elements
- Traffic problem in terms of congestion and accident will be reduced to the barest minimum.
- Ample parking space will be provided.

5.2.7 **Cost**

- The cost of providing the project will be small in comparison to proposal "A", it will cost ₦120,000,000.00k
- It will not involve relocation of use/structure.
- Compensation will be small because Land value are not at the highest outside the CBD.

5.2.8 **Selected Preferred Proposal (Short-term and Long-term Measures)**

Due to the cost as well as the benefit listed for each proposal. Proposal 'A' is recommended for immediate implementation as short-term measure (1997-2007) and proposal 'B' is also recommended for long-term measure (2007 and above).

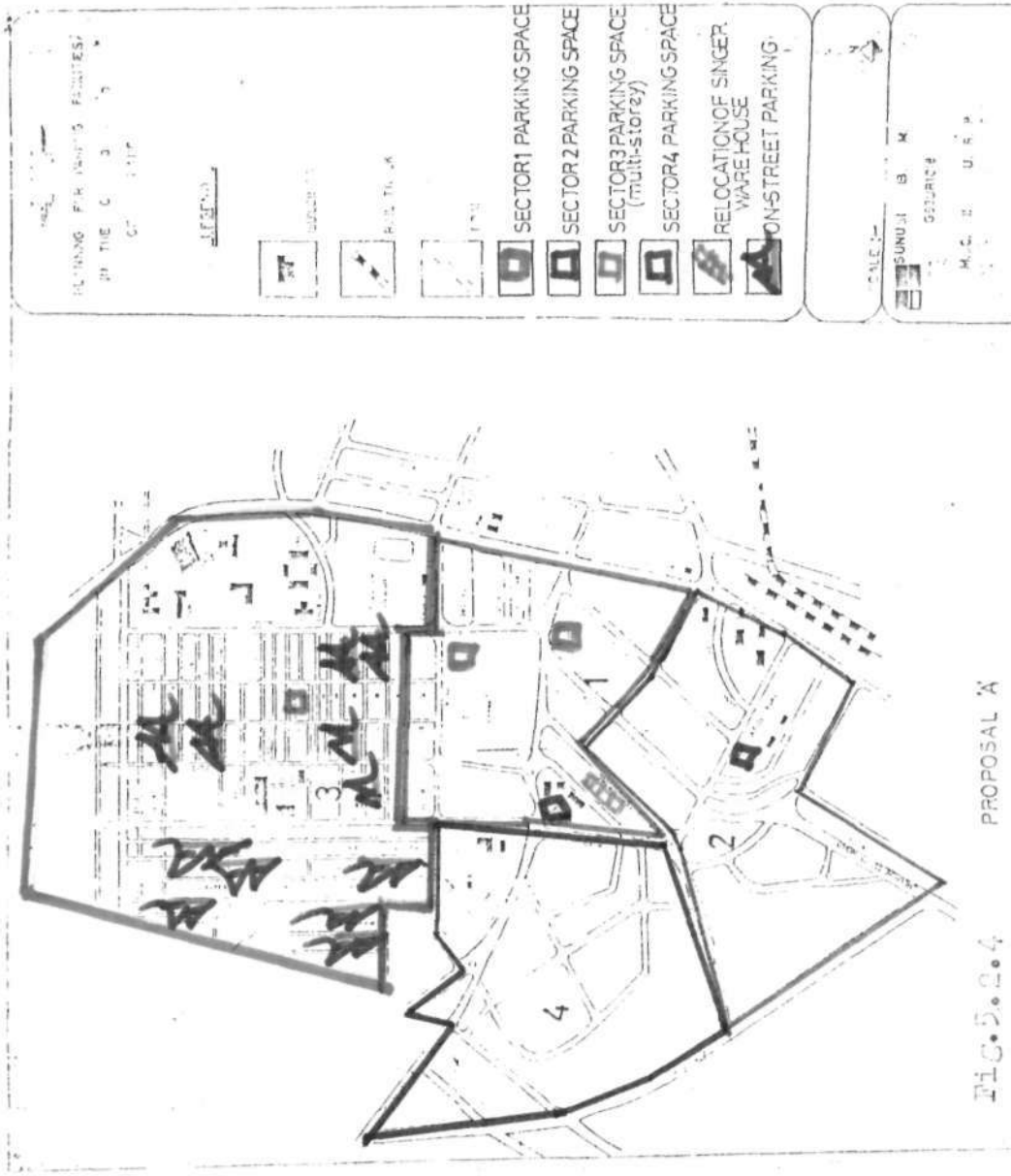


FIG. 5.2.4 PROPOSAL X

KANO MUNICIPALITY



FIG. 5.2.5

5.2.9 Planning Implications of the Selected Proposal

When proposal are put forward, there is a need to know the planning implication of such proposal, in order to safeguard the general Land use policy of the State (Kano).

The city Centre is and remains the Centre of gravity which determine the life of a city and the traffic pattern put throughout an even larger region. It is the intellectual and commercial meeting point. This heart of the city must be kept healthy. The city centre is the origin and destination of the biggest traffic steams. It is there that the traffic problem is greatest. The need for the relocation of singer warehouse to new commercial layout at Gyadi-Gyadi becomes eminent in order to decongest and reduce the traffic problem of Kano CBD.

Relocation of singer warehouse to new commercial layout at Gyadi-Gyadi is expected to go along way in relieving the CBD of Kano, of considerable amount of its traffic problem and congestion. This proposal is recommended as an effective measure towards relieving CBD of its heavy traffic and on-street parking, thereby increasing greater accessibility to the CBD. In addition, relocation of singer warehouse will provide individuals/Entrepreneur the ability or chances for expansion of their services in comparison to their former site.

Similarly, relocation of singer warehouse will increase the chances for effective provision of utilities and services in the new area and as a result it will promote the Land value of the area, also commercial activity of lower order will spring up. This in turn will create a better atmosphere for economic activity to strive.

However, experience shows that the concept of relocation of use has been successful

but not without some disadvantages. Relocation of singer warehouse will conflict with entrepreneur effect which will manifest in extra cost of distribution of goods, thereby promoting a low level inflation of goods to the consumers. Economic disadvantages of relocating singer warehouse are multi-farious in nature on the side of the Government, which include, the development of unplanned commercial activities (Hawking) which further pose problem to planning authorities. Although in the era of scare resources, the challenges facing the Government are many, the money required for infrastructural facilities and compensation in terms of incentives to entrepreneur and/individual (new site) are enormous, which Government alone can not financed.

5.3 POLICY RECOMMENDATIONS

Two basic criteria is taken into considerations in the policy recommendations for solving the problems of parking in Kano CBD. First, the CBD is known to be an area where Land values are at its highest, because of its multiple function it performs in the overall economy. Although parking is essentially one of the unprofitable Landuse, moreover, it is critical to the success of individual business premises and smooth functioning of the CBD and the whole town. Secondly, there are impediments in relation to limited vacant Land and the need to integrate the proposals within the general framework of the state (Kano) Land use policy.

Various type of convenience in parking is required by different categories of motorist. The owners and operators of public transport will want Lanes to enable them save time. Private car owners on shopping or business trips or working in the CBD require shady and secure parking space on long term basis. Shop owners want easy delivery of goods and convenient parking for their customers. For commercial vehicle drivers, if parking space is

not provided, they can park in any available space causing more problems (Wells, 1975), as is commonly the case in part of Kano CBD.

Central Business District is the nerve Centre of the town, a well planned provision of parking facilities to satisfy these diverse parking preferences and still maintain free flow of traffic in the CBD of Kano must be envisaged, to various conflicting demands for parking at the CBD. In order to maintain a free flow of traffic a balance should be struck in the provision for long term and short term parking. By so doing, there is a need to identify the streets along which short term and long term parking should be allowed.

Three major guiding principles are used in addressing the question of parking in Kano CBD, first is the provision of surface (ground) and high rise levels parking facilities at strategic locations to be effectively linked in order to meet the parking demand in the sectors. Second, provision of on-street parking which is to be allowed on some roads within sector three because of the presence of residential use. Third, some planning principle and traffic management techniques are required to reduce the levels of parking accumulation in the CBD.

5.3.1 **Short-term Proposal 'A'**

With regards to Kano municipality map, the Land identified in sector one, for the provision of parking space (see Fig. 5.2.2) include the following. The present mobil filling station opposite Bata Round about and its environment is to be acquired, the plot of Land is approximately 50m by 90m. It can accommodate about 213 vehicles based on 90° angled parking design. This meets 47% of the present level of parking deficit/demand in sector one. It is also recommended that the present Sabon Gari surface parking opposite A.C. Bank

meant for Intra State park should be relocated to K/mata park. The plot of Land is approximately 100m by 50m. It can accommodate about 236 vehicles, based on 90° angled parking design. This meets some 53% of the present level of parking demand/deficit in the same sector.

In sector two (see fig. 5.2.2) as a result of unavailability of vacant land. It is recommended that the present Ahmadu Dantata house (storey building) along post office road - should be acquired and be converted to high rise parking, the piece of land is approximately measured 40mx80m. It can accommodate about 325 vehicles. This meets 100% of parking demand/deficits in sector two.

The level of parking deficit in sector three is low in comparison with sector one and two: Although the sector is characterized by mixed use i.e Residential and business use. It is recommended that the present Bayero Square meant for volley ball field/sport should be acquired and relocated to K/mata indoor stadium, the plot of Land is approximately measured 60m by 90m. It can accommodate about 230 vehicles based on 90° angled parking design. This meets some 80% of the parking design in this sector. Some streets/roads is recommended for on-street parking as a result of residential use, it includes Niger street, Ladan road. Sanusi Street, Sani-Giwa and Church roads. This meets some 20% of the parking design in this sector.

Lastly, Sector four (see fig.5.2.2) the present total filling station along Galadima road should be acquired and converted to surface parking, the pieces of Land is approximately measured 60m by 100m. It can accommodate about 236 vehicles based on 90° angled parking design. This meets 100% of parking demand/deficits in this sector.

Consequently, parking duration is to be controlled by the official of parking planning Committee to be formed in conjunction with police and traffic warders, by discouraging long term parking. High fees should be charged for parking beyond a given time period as stipulated by the above Committee.

5.3.2 Proposal 'B' (Long-term Measure 2007 and above)

The land identified at the periphery of sector one, with regards to Kano municipality map, is the present portion of Yankaba motor park along Murtala Mohammed Way. Is to be acquired, the other portion of the motor park is vacant. The plot of land is approximately measured 80m by 160m. It can accommodate about 602 vehicles based on 90° angled parking design.

The present Kano line garage at the periphery of sector two, along Zaria road is to be acquired, already, a new site has been given to them. The plot of land is approximately measured 70m by 140m. It can accommodate about 461 vehicles based on 90° angled parking design.

Also, the present vacant land beside Federal Secretariat that belongs to Alhaji Aminu Dantata, at the periphery of sector four is to be acquired. The plot of land is approximately measured 60m by 120m. It can accommodate about 338 vehicles based on 90° angled parking design.

Lastly, physical restraint measures should be introduced. Whereby low-occupancy vehicle should be restricted from entering the CBD. Also the State Government through its transport agency, that is; Kano line should introduce high occupancy vehicles to pick and

drop passengers in the above designated parks at the periphery of the CBD. It is hoped that after Ten years period, the citizenry of the state would embrace the above proposal.

5.4 Design Proposals

Kerb or on-street parking provision involves relatively less expenditure in the design of kerb parking facilities, parallel rather than angled parking is generally acceptable on safe ground (see fig.5.4.4.). Angled parking is known to be more convenient for motorist because it requires less vehicles along a street compared with parallel design. Although it reduces road capacity, also a major cause of road accidents. The application of this design principle is demonstrated in figure 5 on a stretch of court road along Sabon-Gari area.

Other aspect of design proposal that relates to off-street parking facilities is demonstrated on figure 5.4.1. In design a surface parking space, organizing individual parking lots or bays on the 90° angle to the access lane makes for more economical of space use. A design standard of 90° parking with average vehicle space of 2.45 x 5.50 m and minimum aisle width of 5.50m for two-way operation and 3.65m for one-way operation is recommended for the surface parking to be provided in the CBD. This allows for effective use of the limited vacant space available in the CBD. Other lower angles as 45° and 60° parks make for ease of movement within the parking area but have the disadvantage of giving fewer parking lots. A mix of the various angle parks are indeed recommended depending on the characteristics of the particular spaces identified for parking in the CBD. For the purpose of demonstrating the application of the above design standard principles, one of the site is recommended for parking in the CBD of Kano (Mobil filling Station opposite Bata round about). Is taken for the detailed design, the requirement incorporated in the design include security post, shade trees, Land scape, individual parking lots

proportions, restaurant and office.

Also, parking garages are another aspect of design proposal that relates to off-street parking facilities. It is demonstrated on figure 5.4.2. In central business districts the demand for parking space is so great that it cannot be met on one level. High Land values make multi-level parking facilities essential. These require a cubic space of 65cu m. (1.430 cuft) for every car stall, there are many possible types of parking garage, some with lifts, some with tramps. Lifts are only to be recommended on cramped sites, because there is a danger in big facilities of queues forming at the entrances and exits where demand is heavy. The location and size of car parks and parking garages must be carefully chosen. They must be correctly located in relation to several networks.

Access to a parking garage should be by a right turn out of the road way. The exist should if possible lead out into a side street so that no additional disturbance and danger arises on the main street. At the first main road junctions the dense stream of vehicles leaving the garage will already branch out in different directions. Parking facilities are interchange points at which car occupants transform themselves into pedestrians. It is therefore, not enough to locate them favourably solely in relation to the main streets.

A parking garage is a magnet for many people and improves the business situation of its surroundings. Consideration must therefore be given, when locating a garage, to the town planning consequences. The application of the design principle is demonstrated in figure 5.4.2 on post office road (Ahmadu Dantata house).

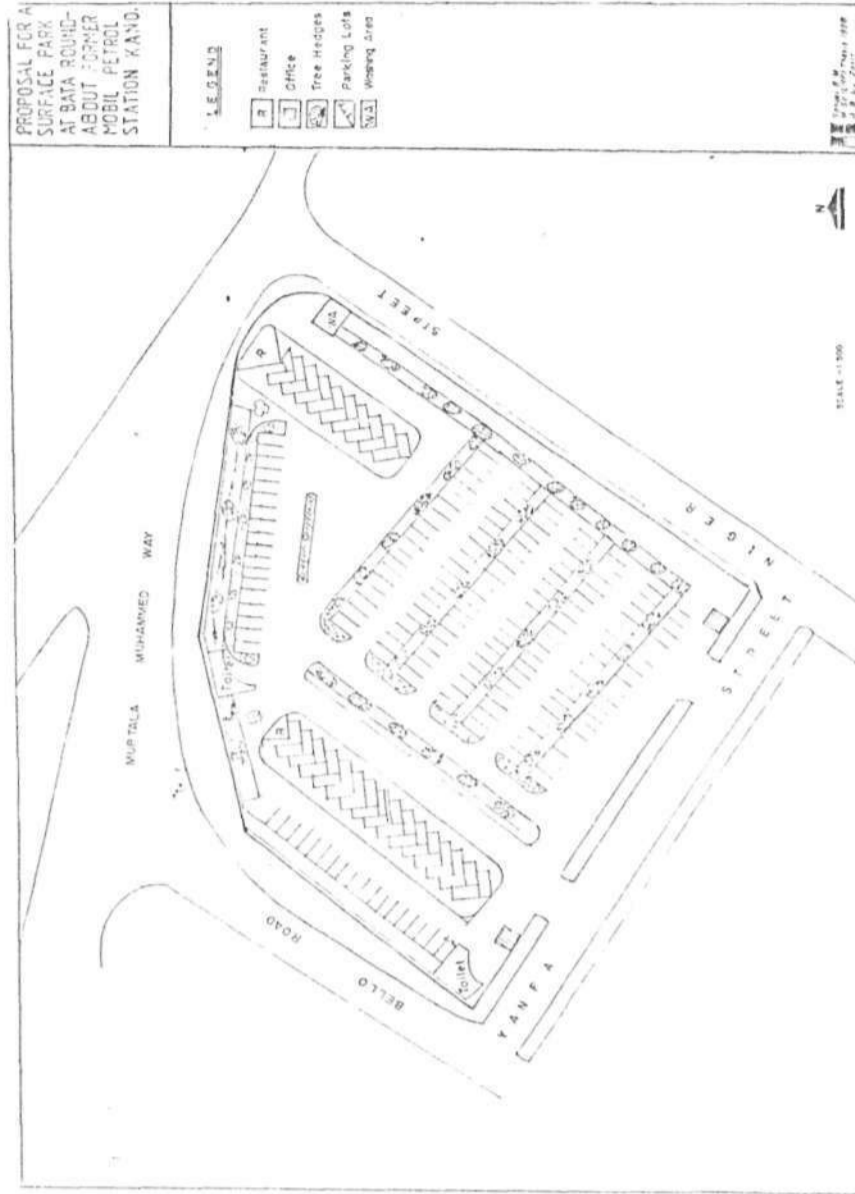


FIG. 5.34. SURFACE PARKING DESIGN FOR SECTOR 1

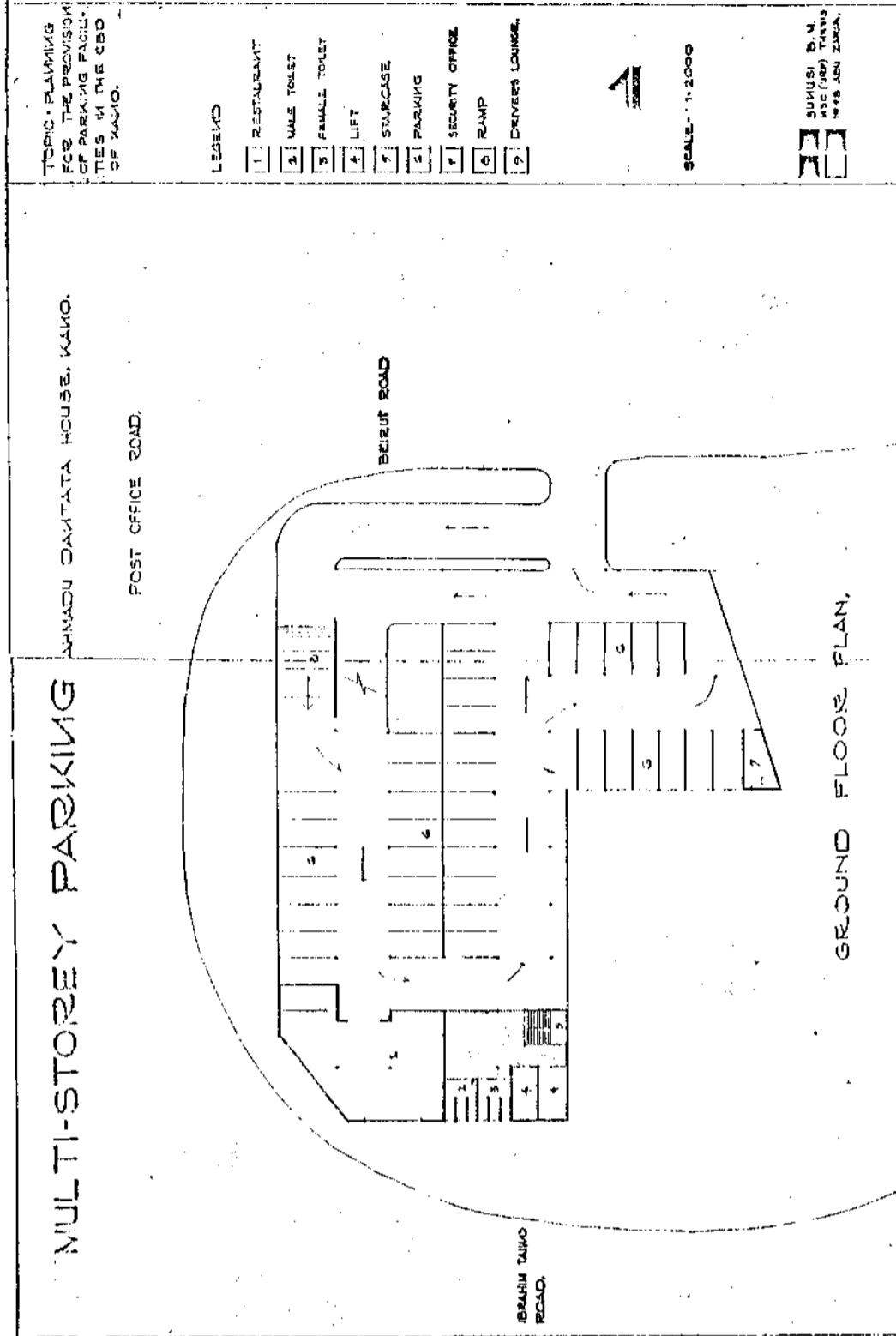


FIG.5.12. MULTI-STOREY PARKING DESIGN FOR SECTOR 2

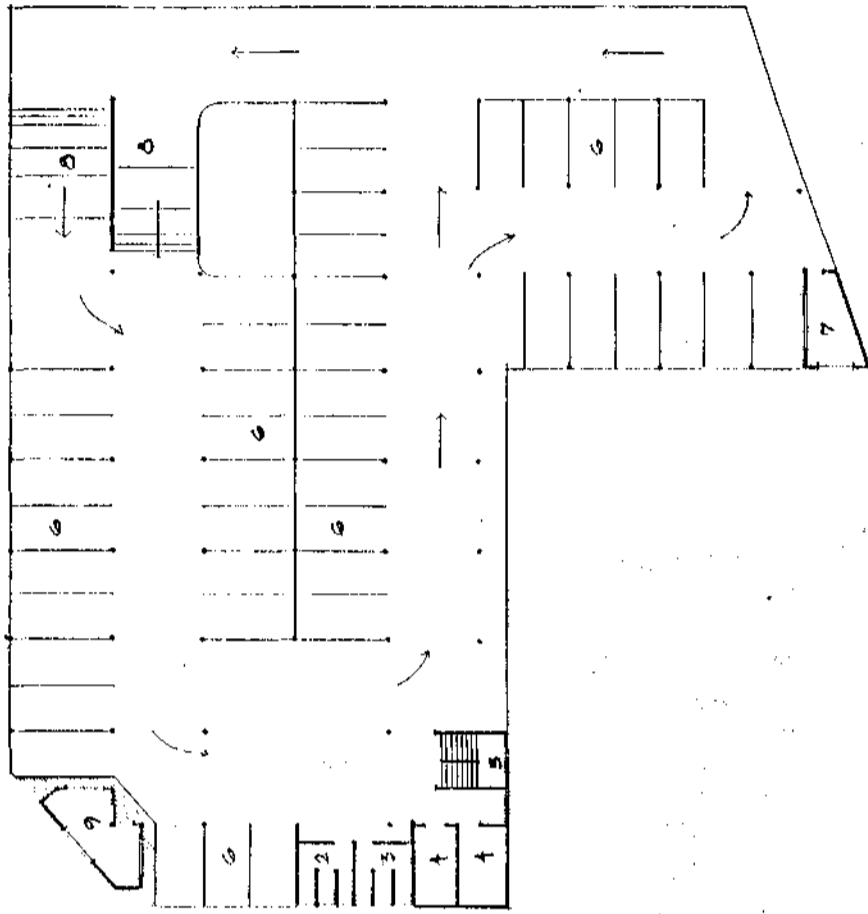


FIG. 5.42(a) MULTI STOREY-PARKING DESIGN FOR SECTOR 2

TYPICAL UPPER FLOOR PLAN,

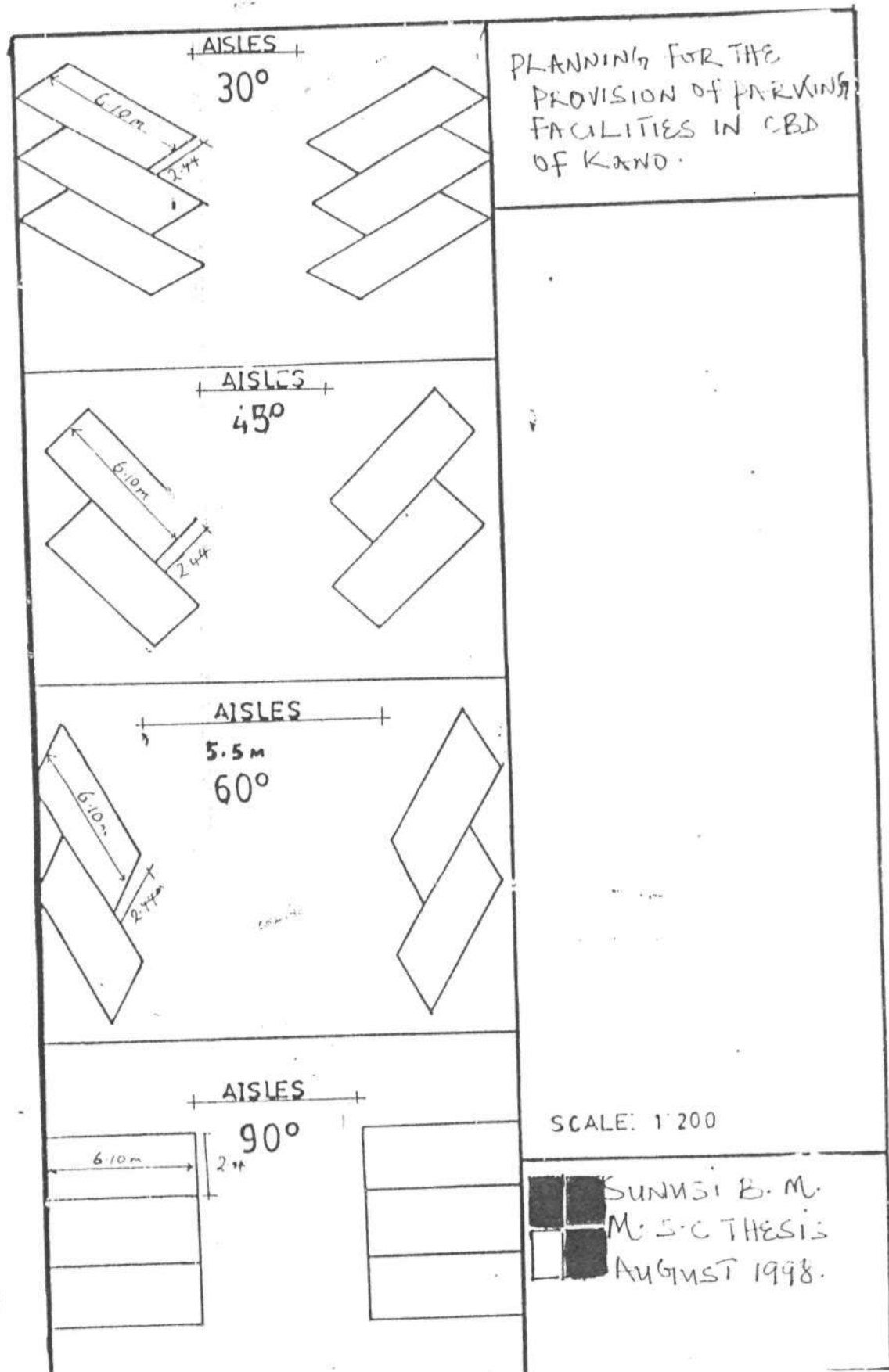


Fig. 5.4.3. Space and Aisle Requirements For Lot Parking At Various Angles.

Proposed For Keras Parking
Along Court Road, Katho.

LEGEND

- 1 Mountain Auto
- 2 Parking Lay Bye
- 3 Motorable Lane
- 4 Pedestrian Lane

Scale 1:500

SUNISI B.M
MSC. THESIS
AUGUST 1998

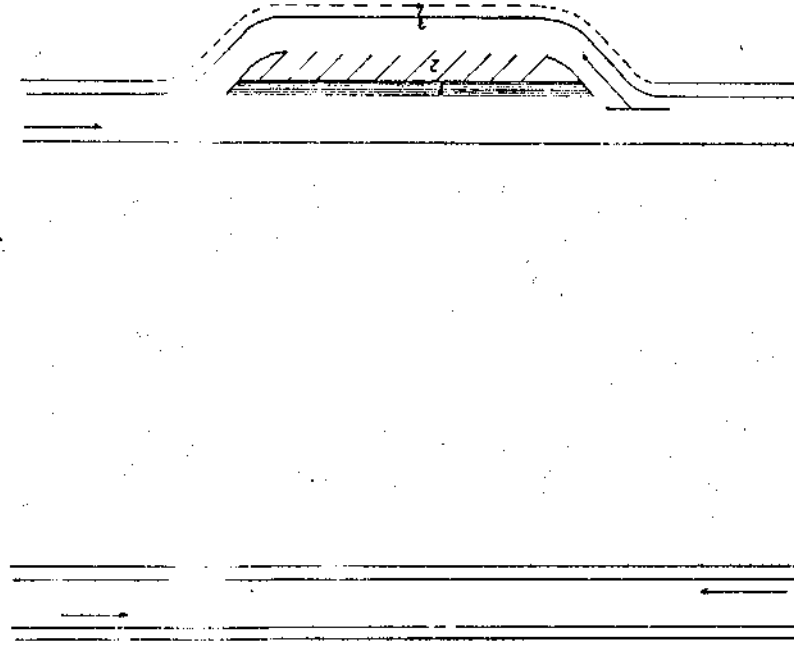


FIG. 5.4.7 ON-STREET PARKING DESIGN FOR SECTOR 3

TABLE 11: 5.5 COSTING

S/NO	PROJECT	SECTOR	NUMBER	UNIT COST	TOTAL COST
1	Compensation	1,2,4	3	SECTOR 1 - ₦10m 2 - ₦40m 4 - ₦12m	₦62 million
2	Clearing of site	1,2,3,4	4	1 - ₦100,000 2 - ₦200,000 3 - ₦100,000 4 - ₦100,000	₦.5m
3	Fencing	1,4	2	1 - ₦150,000 2 - ₦150,000	₦.3m
4	Provision of toilets	1,2,3,4	16	₦1 - 80,000.00	₦1.280m
5	Paints	1,2,3,4	30 gallons	₦1 - 400.00	₦12,000
6	Office/Security Post	1,2,3,4	16	₦70,000.00	₦1.12m
7	Restaurant	1,2,3,4	8	₦120,000	₦.960m
8	Provision of Literate	1,3,4	150 trips	₦500.00	₦.750m
9	Flowers/trees	1,2,3,4	100	₦10	₦1,000.00
10	Conversion of Ahmadu Dantata house to multi-storey parking	4	1	₦100 million	₦100m
	TOTAL				₦166,923,000.00

5.6 **IDENTIFICATION OF STAKE HOLDERS AND SUSTAINABILITY OF THE PROJECT**

All the recommendations made cannot be adequately implemented without a strong financial backing. By the very nature of surface and parking garages proposal, which is considered as unprofitable venture by individuals and the economic malaise that is being faced by Government. Government alone cannot finance this gigantic project, unless some

sort of partnership is formed. Based on the objectives of national and International agencies for promoting the provision of infrastructural facilities in developing countries of the world. The following agencies should serve as co-actors in the provision of these parking facilities at Kano CBD. that is World Bank through International Development fund and urban development Bank, and African International Bank. The above agencies prefer to deal with Government agencies rather than individual or cooperate bodies, because of the credibility of the Government concerned. The above agencies are identified as stake holders based on the programmes and projects they have been embarking upon in developing countries for the past decades. The total of project to be embarked upon at Kano CBD will cost ₦166,923,000 million.

5.6.1 **Source of Fund**

The International Development Fund (I.D.F) will contribute 45% of the total cost is ₦75,115,350.00 million followed by African Development Bank will also contribute 30% of the total cost of the project is ₦50,075,900 million. Also Urban Development Bank of Nigeria will contribute 10% of the total project to be embarked upon is ₦16,692,300.00 million and lastly, the State Government (Kano) will contribute 15% of the total cost of the project to be embarked upon is ₦25,038,450 million.

5.6.2 Method of Recovering Investment And Sustainability of the Project

Method of Recovering Investment should be through cost-recovery mechanism. It is a method whereby individual are expected to pay for the project provided by Government. The State Government should set up or constitute a committee to be known as a "Parking Planning Committee". And members to be drawn from Kaseppa, Police force, Military formation and State Civil Service. also they should be people with high integrity - reputable for their transparent honesty. The main implementation body to supervise the project should be KASEPPA. The Parking Planning Committee should ensure that the project is on sustained basis by ensuring that individuals pay for parking either for short term or long term basis, also ensure that the order is comply with and any defaulter should be prosecuted.

5.7 IMPLEMENTATION AND PHASING

Implementation is one of the stages in planning process. The importance of it therefore cannot be over-emphasized. If anarchy and chaos are to be avoided in the implementation of any development plan, it is necessary for it to be carried out within the frame work of a planned overall scheme.

In order to achieve the planned development of any urban area, it is necessary for that area to come under the jurisdiction of a well managed and organized administration, such an administration must be aware of every development proposal, thus enabling the development plan to be created. modified or amended to take account of the continuously shifting Landuse demands of the population.

Events have shown that the implementation of project in this country sometimes takes

a new dimension and it is always delayed due to political, economic and sometimes administrative bureaucracy. implementation procedure should therefore not be allowed to hamper the progress of this proposals.

The following authorities have been recommended to oversee the implementation of the proposals.

- (a) Kano State Environmental Planning and Protection Agency shall be charged with the responsibility of supervising the project.
- (b) Planning Parking Committee should ensure that the project is on.

TABLE 12: 5.7.1 PHASING

PHASE	PRIORITY PROJECTS	IMPLEMENTATION AGENCY	SOURCE OF FINANCE	AGENCY RESPONSIBLE FOR ITS SUSTAINABILITY
1 1997-2002	<ol style="list-style-type: none"> 1. Payment of compensation 2. Clearance of Parking site 3. Construction of Parking layout/lots and fencing 4. Construction of Public toilet 5. Flowers/tree planting 6. Construction of office/security posts 7. Construction of Restaurant 8. Modification of Ahmadu Dantata house into multi-level parking 9. Maintenance 	<p>KASEPPA</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>- I.D.F</p> <p>- A.D. Bank</p> <p>- U.D.B.N.</p> <p>- Kano State Government</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>- Parking Planning Committee</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>
2 2002-2007	<ol style="list-style-type: none"> 1. Extension of Parking Layout/lots 2. Extension of trees/flowers planting 3. Extension of multi-level parking 4. Maintenance. 	<p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>"</p> <p>"</p> <p>"</p> <p>"</p>

5.8 GENERAL RECOMMENDATIONS

The objective of a planned provision of parking could only be attained by removing the existing parking problem through the policy recommendations given in this chapter (5) and the needs to be supported by other actions. The following recommendations are made in order to achieve the objectives sets out in the research.

The existing policy requiring that new property development in the CBD of Kano is to include provision for parking adequacy assessment are generated and given importance while approving buildings for the CBD, in order to forestall parking problems.

Parking pricing measure should be applied to motorists that parked along roads, in order to forestall traffic problems that may arise as a result of on-street parking.

Charges related to the securing of the capital cost of providing the parking spaces known as economic charges should be levied for parking.

The State Government should henceforth constitute a Committee to be known as "Parking Planning Committee" and should ensure that the project is on sustained basis.

KASEPPA should ensure that the surface park at Sabon Gari market opposite A.C. Bank, is henceforth use for public park instead of intra State park.

The construction of new singer warehouse along Zaria road should be embarked upon and given priority. Government should create incentive to Individual/Entrepreneur in order

to enable them move to the new site.

Past attempt at traffic management in the city have failed because of inpart, a lack of proper traffic education. Deliberate attempt must therefore be made to educate road-users on a continuous basis. This should be done through the mass-media, in order to forestall people contravening traffic laws in terms of driving and parking habit.

5.9 CONCLUSION

The city centre remains the most important area, with its dominating position as the seat of public authorities, administrations, business and shops. It poses the most difficult town planning and technical problems, which must be tackled first if a plan for the sound development of the whole town is to be worked out. The city Centre is the origin and destination of the biggest traffic streams. It is there that the traffic problem is greatest.

It is obvious that appropriate policies measures to solve all these problems require imaginative and comprehensive approach as indicated in this research, involving Government, International and national agencies, private sector and Individuals which they all have a stake over different aspect of urban transportation.

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APPENDIX I

Model for Converting Parking Accumulation into Number of Parking lots Required

$$\frac{Ac - Lp}{Pd} + LP = Pn$$

Where Ac = Average Accumulation

Pd = Average Parking duration for Sector

Lp = Lots used for Long-term Parking

Pn = Parking lots needed for sector.

APPENDIX 2 NUMBER OF VEHICLE REGISTERED IN KANS BY TYPE OF OWNERSHIP

REGISTERED VEHICLE TYPE	1990	1991	1992	1993	1994	1995	1996	1997
(1) PRIVATE	1807	1757	5500	5137	4013	3222	3788	3970
(2) COMMERCIAL	878	928	1964	2116	1567	1824	2136	2980
(3) GOODS VANS	77	481	208	348	564	295	384	525
TOTAL	2762	3166	7672	7601	6144	5341	6308	7475

SOURCE: Kano Licensing Office 1997

THESIS TOPIC: PLANNING FOR THE PROVISION OF PARKING
FACILITIES IN THE C.B.D OF KANO.

M. Sc II U.R.P. 1994/95.

ROAD SIDE INTERVIEW ON INDIVIDUAL PARKERS (DRIVERS)

1. Registration No:.....
2. Type of vehicle (i) Car () (ii) Taxi () iii. Bus ()
(iv) Lorry () (v) Cycle ()
3. Nature of parking, (i) Legal () (ii) Illegal ()
(iii) Kerbside () (iv) Off-street ()
4. Time at which vehicle stopped (if seen)
5. Purpose for the stop (i) shopping () (ii) Work ()
(iii) Business () (iv) Off-loading ()
6. How long do you normally stay?
7. How frequent do you make trips to the C.B.D
8. Origin, where do you start your trips?.....
9. Destination, where do you work?/where are you going?
.....
10. How often do you use this location for parking?.....
11. Do you pay for parking here? Yes / No
12. If yes, how much do you pay?
13. Is the amount fixed? Yes / No
14. If No, how is the amount determined?

1. Where in the City Centre are you going?

2. Where do you intend to look for parking space?
.....
3. How often do you come here?
4. How far away is your car from your destination?
.....
5. How convenient is the distance?
6. What suggestions will you give in order to solve this parking problem

MANAGEMENT

1. Is there any parking provision made by the local planning authority for the designated CBD?
2. In approving building plans for developments at the CBD is there any clause on parking provision on individual purposes?
3. What plans does LPA have with regards to parking and off - Loading of Heavy Duty vehicles bringing in goods for other parts of the country whose major destination is the CBD?

Appendix v

SHEET FOR PARKING DURATION SURVEY IN
KANO C B D

ENUMERATOR'S NAME: _____ DATE _____
DAY: _____

VEHICLE TYPE	REG. NUMBER	TIME (CLOSEST MINUTE)		
		TIME IN	TIME OUT	TIME DIFFER

Appendix vi

DATA SHEET FOR CORDON COUNT, KANO CBD PARKING
SURVEY 1997

TRAFFIC FLOW DIRECTION: PLEASE SKETCH LOCATION
ON BACK OF NUMBER 1

MARK/IN COLUMN FOR EACH VEHICLE OBSERVED. USE FRESH
FORMS FOR EACH HOUR (TIME PERIOD)

OBSERVATION STATION: _____ DATE _____ DAY _____

TIME PERIOD	BYCLE/M-CYCLES	CARS/TAXIS	PICKUP DELIVERY	TRUCKS VANS	TRUCKS LARGE
7 - 8a.m					
8 - 9					
9 - 10					
10 - 11					
11 - 12					
1 - 2p.m					
2 - 3					
3 - 4					
4 - 5					
5 - 6					
6 - 7					
7 - 8					
8 - 9					