

# Road Hierarchy and Nomenclature Development for Gwarzo, Karaye and Dawakin Kudu Local Government Areas of Kano State

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**Abstract:** A functional road hierarchy has been used as a means of defining each roadway in terms of its function, such that appropriate objectives for that roadway can be set and appropriate design criteria can be implemented. Road nomenclature on the other hand simply relates to the naming of roadways, the names can be based on road type or its source. The road network in both the metropolitan area and the local areas of Kano State does not seem to be developed along functional lines, and the nomenclature of the roads does not seem to be properly developed either with a lot of hierarchy breach in the roads network. This project presents the initial research phase towards functional hierarchical classification of roads in Kano north particularly Gwarzo, Karaye and Dawakin Kudu Local government areas together with the development of associated nomenclature. Its purpose is to investigate the feasibility of developing a new road classification, hierarchy and nomenclature; its objective is to provide recommendations to improve the existing road classification to better meet the requirements of Kano State traffic. An investigation was undertaken into current road hierarchies, an inventory data of the study areas (Gwarzo, Karaye and Dawakin Kudu) was collected. The inventory data basically consists of road length, width of carriageway and shoulder, road surfacing type, direction of the road, number of lanes in each approach, junction type and control. Road ownership information was collected from various governmental agencies. The inventory Data shows that for just Gwarzo Local Government, about 19 roads are access roads, 9 are collectors, and 6 are arterials. Surfacing of the roads was made with up to 48.5% asphaltic concrete, 13% were unpaved roads, while 12.1% were surface dressed. The 19 access roads and 9 collectors cover a distance of 82km and 89.4km respectively, while the 6 arterials were 61.26km. 18% of the roads are owned by the State Government, while classification was developed based on the observed functions and characteristics of the road. A new nomenclature was derived from local government name, functional classification and serial numbers. Similar procedure was used for Karaye and Dawakin Kudu local governments.

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## Introduction

### 1.0 Preamble

Transportation system is a key component of the built environment which serves the land users contained within that particular environment, whether they are residential, commercial, and educational or others. The road hierarchy has been used as a tool to assist in planning the interface between land use and the road system, and the appropriate linkage of roadways in the road system.

Road hierarchy and Nomenclature has been a topic of interest to engineers and planners since early 1960's, when the Buchanan Report titled "Traffic in towns" was published (Wikipedia, 2007).

(Eppell et al., 1997) in their book titled "Four Level Road Hierarchy for Network Planning and Management" revealed that the hierarchy of roads categorizes them according to their functions and capacities. While sources differ on the exact nomenclature, the basic hierarchy comprises freeways, arterials, collectors and local roads.

A functional road hierarchy is a system of classifying roads for different functions and for managing roads and traffic according to this classification system (Macbeth, 2007). The road carrying (or intended to carry) most traffic are at the top of the hierarchy, while those with least traffic (and which serve primarily to provide property access) are at the bottom".

However there can be problems with terminology and definitions. For example, when most people talk about road hierarchy what they really mean is "a system of roads designed to benefit motorized traffic, with more important roads being those that either carry most traffic (and/or) roads that carry longer-distance Journeys". There is also the implication that the higher level roads are the most important, and that therefore they should have more money spent on them. Anyone who is a pedestrian or a cyclist would be unlikely to accept this particular idea of

road hierarchy-although perhaps both would argue for most of their journey they would like to travel on comfortable, high-quality footways/cycles lanes.

Furthermore, an environmentally conscious society would surely argue for reducing the number of longer-distance journeys. Certainly every journey made by a person starts on a local road (the lower level of a road hierarchy) whilst fewer and fewer use the roads in the upper levels of a hierarchy. In this sense it is the lower levels which should have more money spent on them.

Road hierarchy is a means of defining each roadway in terms of its function such that appropriate objectives for that roadway can be set and appropriate design can be implemented. These objectives and design criteria are aimed at achieving an efficient road system whereby conflicts between the road the roadway and the adjacent land use are minimized and the appropriate level of intersection between the roadway and land use is permitted.

Road nomenclature on the other hand simply relates to the naming of roadways, the names can be based on road type whether it is a cul-de-sac, open-ended or either of the two; and it can be based on source, preferred sources for road names generally includes original names, local history, early explorers, pioneers, settlers and other eminent personalities. For example, “Tal’udu Road” in Kano is named after Taylor and Ode. A street or road nomenclature is an identifying name given to a street. The street name usually forms part of the address (though address in some parts of the world, notably most of Japan, makes no reference to street names). Buildings are often given numbers along the street to further help in identifying them. Names are often given in a two-part form: an individual name known as the *Specific*, and an indicator of the type of street, known as the *generic*. Examples are “Main Road”, “Fleet Street” and “Park Avenue”. The type of street stated, however, can sometimes be misleading: a street named “Park Avenue” need not have the characteristics of an avenue in the generic sense. A street name can also include a direction (The cardinal points; East, West, North and South, or the quadrants; NW, NE, SW, SE) especially in cities with a grid-numbering system. “These directions are often (though not always) used to differentiate two sections of a street. Other qualifiers may be used for that purpose as well. Examples: upper/lower, old/new, or adding extension”, (Wikipedia, 2007).

A road authority is the body responsible for the care, control or management of roads within a given jurisdiction. These authorities are typically owned by the Local, State or Federal Government. For example here in Nigeria, FERMA is the Authority saddled with the responsibility for maintenance of Federal roads while KNUPDA and KARMA are the agencies responsible for the planning and maintenance of roads in Kano State.

In Kano State, absence of efficiently developed road hierarchy and nomenclature database for the road networks has rendered maintenance and improvement programs on the roads to be rather hectic as well as land use, planning and asset management. This project will provide a comprehensive hierarchy and nomenclature of roads in Gwarzo, Karaye and Dawakin Kudu Local Government areas by utilizing the data collected through the inventory of the roads. The developed nomenclature will be used primarily in addressing the road system, while the hierarchy part could be used by planning and maintenance agencies like KARMA and KNUPDA in planning of road maintenance and improvement programs, orderly planning of heavy vehicle and dangerous goods routes, planning and provision of public transport routes, identifying the effects of development decisions in and on surrounding areas and roadways within the hierarchy, development design that facilitates rural design principles such as accessibility, connectivity, efficiency, amenity and safety; assigning control over access onto traffic carrying heavy/dangerous goods to ensure safe and sufficient operation for traffic, and lastly in identifying treatment such as barriers, buffers, buffers and landscaping to preserve amenity for adjacent land uses.

## 1.1 Statement of Research Problem

The road network in Gwarzo, Karaye and Dawakin Kudu Local Government areas does not seem to be developed along functional lines. Roads in the rural areas are mostly access roads that link the inhabitants to their farms, markets, residential buildings etc. This indicates that access roads are more required than Arterials and collectors. Functional classification of roadways is important for developing appropriate maintenance and planning schemes in the road network. This aids development of nomenclature and hierarchy for the road network.

## 1.2 Aims and Objectives

### 1.2.1 Aims

The project aims to carry out functional classification of road ways for Kano Northern senatorial zone particularly Gwarzo, Karaye and Dawakin Kudu Local Government Areas as well as their hierarchy and nomenclature.

### **1.2.2 Objectives**

1. To identify the number of roads in the project areas and classify them accordingly.
2. To identify the pavement type, number of bridges and other road furniture along the roads.
3. To measure the length and width of the roads identified.
4. To repeat the above procedures for Federal and State roads passing through the LGAs.
5. To develop a nomenclature for streets addressing system.
6. To group roadways in a framework around which state and local governments can plan and implement various construction, maintenance, and management schemes and projects.

### **1.3 Scope and Limitations of the Study**

#### **1.3.1scope**

The study is based on the physical parameters of roads within the study areas (Gwarzo, Karaye and Dawakin Kudu Local Governments Areas) and having an integrate database of their existence. This include measurement of approximate length in kilometres of all the asphaltic surface roads, gravel surface roads with surface dressing and even an unpaved roads. The information will be documented in a database for future referencing and for the purpose of statistical analysis, while maintaining the initial aim of the project.

#### **1.3.2 Limitation**

The project is limited to reconnaissance survey of road features and measurement of road parameters (length and width only) as well as the functional classification and nomenclature of the roads within the study area

### **1.4 Significance of the Research**

Road hierarchy and nomenclature development is a tool that can be used in a number of areas of transport planning and road network management including helping local and state governments with the adoption of appropriate standards for roadway construction.

Other significances include:

- Planning- In designating for a region of a strategic transport network consisting of roadways, as well as other facilities for movement of goods and people;
- Environmental Management and Sustainability-Road hierarchy and nomenclature are used in management of road network to facilitate efficient operation, which will assist in achieving environmental sustainability and improve amenity to the region's inhabitants;
- Access Management- In designing and programming improvements to achieve desirable improvement performance criteria over time for each element of the road network;
- Congestion Management-In planning and management of the road network to ensure traffic volumes carried are appropriate to roadway functional and management attributes;
- Safety Management-In management of road network by controlling access onto traffic carrying roads, providing appropriate design standards, and proper use of the network by the vehicle fleet to facilitate safe movement of all road users.

## **Literature Review**

### **2.1 Historical Background**

The history of road hierarchy could be dated back to around 2600 BC since the inception of roads network. The world oldest known paved road was laid in Egypt sometimes between 2600and 2200 BC, and with the creation of roads the need of hierarchical classification of such roadarose for the purpose of access control. Road nomenclature comes at the same time with hierarchy, because for any newly constructed road there is a need of naming it for easy identification, map creation and route designation.

The post-World War II era saw very rapid development in respect of the growth and usage of private cars, associated with this growth was the worldwide production of transport plans in the 1950s and 1960s which emphasized the urgent need to provide more and bigger roads and this gave birth to the concept of modern road hierarchy and its associated nomenclature policy which largely depends on the governmental policies of a particular nation. It might be noted that cities that have adopted approaches which favour the private car, place

considerable emphasis on the importance of road hierarchy and on the implementation of traffic operations which provides motorists with real-time information regarding congested locations and times, and improve traffic flow with the aid of traffic control technologies

## 2.2 The Concept of Road Hierarchy

The road hierarchy philosophy begins with consideration of the local needs in what is termed a “specific area” or “environment cell”. A specific area is a part of the urban fabric that is contained within a “block” bordered by traffic carrying roads or other physical boundaries (refer to figure 1). Arterial roads carry through traffic external to the specific area, and sub arterial roads carry through traffic between multiple specific areas and the arterial roads.

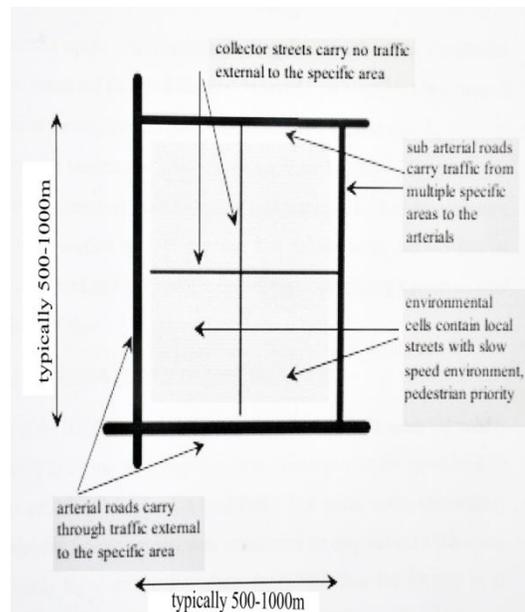


Figure 2.00: Specific Area Concept (In Road) Hierarchy

Source: Wikipedia.com

Collector streets are located within the specific area, providing indirect and direct access for land uses to the road network. These streets should carry no traffic external to the specific area. The environmental cells within the specific area are bounded by the collector streets, and contain local streets with low speed environments and pedestrian priority. Their function is to provide direct property access. Within environmental cells, considerations of amenity and environment dominate. One key aims of the hierarchy is to optimize accessibility, connectivity, amenity and safety for all road users including motor vehicles, bicycles pedestrians, and public transport portions. That is why in doing so the relationship between hierarchy and the land uses serves the need to be considered. A number of research projects had been conducted in the area of road hierarchy and nomenclature development. Some of such researches were summarized here.

(Eppell et al, 1997) in their work revealed that the notion of hierarchy is deeply embedded within the planning of transport network.

In a similar work, (T. Eppel et al, 2001) presented the overall framework for a new four level road hierarchy. They also presented a sample of the desirable criteria suggested for each roadway classification. These criteria and the overall four level frameworks can be used in a broad range of transport planning and road system management areas. (Dong et al, 2013), worked on quantitative assessment of urban road network hierarchy planning, they provided an assessment framework which consisted of eight mathematically formulated indicators; the inputs required are GPS data, data from taxi-fare meters and GIS data (or digitalized road network maps). The research was conducted using a dataset collected in Beijing, China.

One of the principal factors that relates to road hierarchy is the access and mobility provided by the roadway. Those roadways that provide a high level of mobility are called “Locals” and those that provide a more balanced blend of mobility and access are called “Collectors”.

The distinction between mobility and accessibility is important in assigning functional classifications to roadways. Other factors considered include but not limited to:

- Collectors
- Access points
- Efficiency of travel
- Speed limit
- Number of travel lanes
- Route spacing
- Annual Average Daily Traffic(AADT)
- Vehicle Miles of Travel(VMT)
- Regional and statewide significance

Highly significant roadways connect large activity centres and carry longer-distance travel between and through regions and states. Arterials carry the vast majority of trips that travel through a given state while local roads do not easily facilitate state-wide travel. A collector maintains a balance between arterials and locals. Table1.Summarizes the relationship between the factors previously described and the three broad categories of functional hierarchical classification of roads.

Table 2.1: Functional Classification and Travel Characteristics

Functional Classification	Distance Served (And length of routes)	Access Points	Speed Limit	Distance Between routes	Usage AADT & VMT	Significance	Number Of Travel Lanes
Arterial	Longest	Few	Highest	Longest	Highest	State-wide	More
Collector	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Local	Shortest	Many	Lowest	Shortest	Lowest	Local	Fewer

### 2.2.1 Functional Classification Identification

A primary objective of the functional system is to connect traffic generators (Population centres, schools, shopping areas, etc.) with a roadway network that channelizes trips logically and efficiently. As classification proceeds from identifying arterials, collectors and locals, the perspective (and size) of traffic generators also move from a larger to a smaller scale (or from a smaller to a larger scale, if starting from a local development). When developing a functional classification network in a given area, the same basic procedures should be followed, whether the functional classification is applied in a rural or urban area. However, due to the differences in population and land development intensity between rural and urban areas, the process and considerations used to classify roadways may be different. Because functional classification is partly Art and Partly Science, these procedures are blend of detailed, task-oriented steps and qualitative guidelines. These procedures do not eliminate judgment from the classification process, but when used as a guide they help to apply judgment in a sound and orderly fashion. The procedures are as follows:

1. **Identify traffic generators:** In rural areas, traffic generators may be population centres (cities and towns); recreational areas such as lakes, national and state parks; military facilities; consolidated schools; and shipping points. In urban areas, traffic generators may be business districts; air, rail, bus and truck terminals; regional shopping centres; colleges and universities; hospital complexes; military bases; industrial and commercial centres; stadiums; fairgrounds; and parks. Regional traffic generators adjacent, but outside of the area of interest, should also be identified.
2. **Rank traffic generators:** Traffic generators should be categorized based on their relative ability to generate trips and be first stratified into urban and rural groupings. Traffic generators thought to be

significant enough to be served by a Major Collector or higher should be categorized into five to eight groups (it is better to have too many groups than to have too few, especially toward the lower end of the scale). Traffic generators with similar significance should be placed in the same group. These groups will be used to identify the functional classification of connecting roadways. Population, sales tax receipt, retail trade, visitation and employment are some examples of factors to consider when ranking traffic generators according to their significance.

3. **Map traffic generators:** Traffic generators should be mapped using graduated symbols of varying sizes and/or colors according to the group to which the generator belongs. This will produce a visual representation of the ranking. For example, the group of generators ranked highest should all be symbolized with the highest symbol.
4. **Determine the appropriate functional classification to connect traffic generators:** To determine the functional classification of roadways, work from the highest mobility facilities first by identifying interstates, other freeways & expressways, other principal arterials, then minor arterials and Collectors (Major, then Minor). Then, by definition, Local Roads will be all of the roadways that were not classified as arterials or collectors. In other words, begin with wide, regional perspective to identify Principal Arterials then gradually move to smaller, more localized perspective as minor arterials, major collectors and minor collectors are identified. In this process, consider the size of the traffic generators connected and the predominant travel distances and “travel shed” served.

Based on the procedures outlined above, an arterial is considered as the one that serves a wide range of functions across the access mobility spectrum, some consideration and rules of thumb for designating roads as arterials are:

- Start with Interstates and other freeways & expressways. Control of access is perhaps the easiest criterion to apply, since roadways with full or partial control of access will most always be in arterial classification category. It is therefore advantageous to identify these roadways first, providing a convenient starting point in defining the arterial system.
- Preserve the continuity of principal arterials (Interstate, other freeways & expressways and other principal arterials). Continuity of principal arterials routes traveling from rural areas, then into and through urban areas, should be preserved.
- Arterials should avoid neighborhoods. They often serve as buffers between incompatible land uses and should avoid penetration of residential neighborhoods.
- Most high volume roadways in urban areas function as arterials. Notable exceptions to this rule in intensely developed area exist in cases where high volume roadways actually function as collectors that serve traffic movements between locals and arterials or provide a high degree of direct access service to abutting land uses. For example, roadways that border on high-activity, low-land area generators may carry proportionally high volumes of traffic while functioning as collectors.
- The network of minor arterial roadways will usually intersect roadways in all other classifications.
- In urban areas, guidance for distinguishing between principal and minor arterials include:

As regards collect to collectors, which may have an important land access function, it serves primarily to funnel traffic between locals to arterial roadways. In order to bridge this gap, collectors must and do provide access to residential neighborhoods. When deciding between major and minor collectors, the following guidelines should be considered:

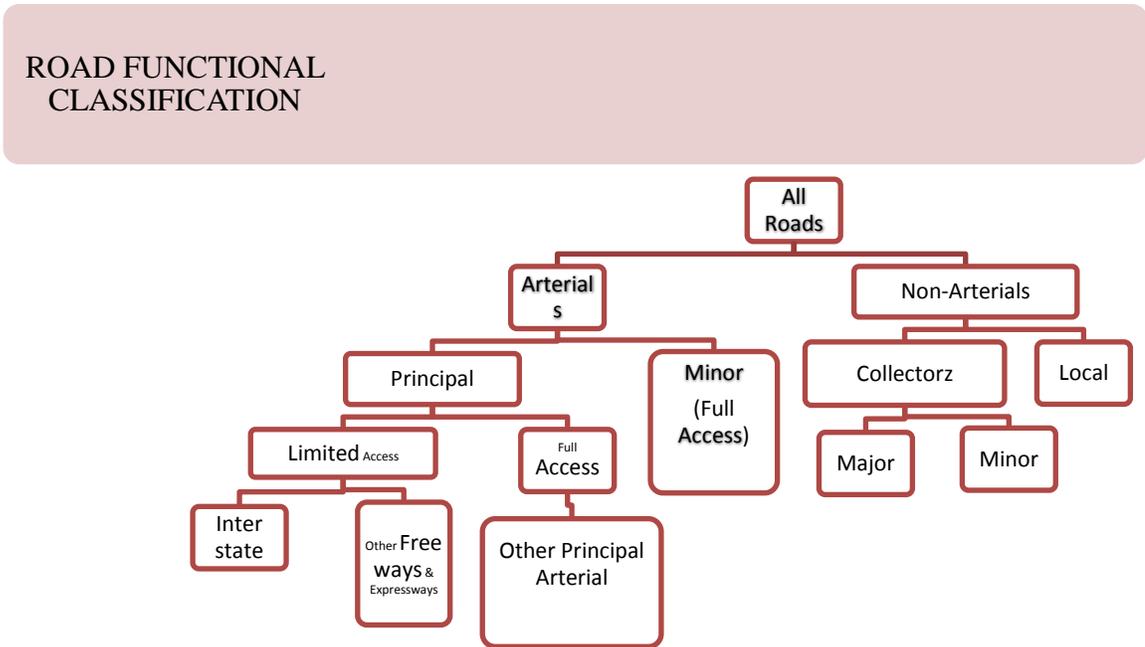
- A road that is not designated as an arterial but that connects larger generators to the arterial network can be classified as a major collector. Major collectors generally are busier, have more signal-controlled intersections and serve more commercial development.
- Identify minor collectors for under-served residential areas. After major collectors have been identified, minor collectors should be identified for clustered residential areas that have yet to be served by a roadway within higher classification categories.
- In rural areas, minor collectors should have approximately equal distance between arterial or major collector routes for equal population densities, such that equitable service is provided to all rural areas of the state. The population density within each area bounded by an arterial and/or major collector route can be determined, and the existing spacing of routes already selected can be measured. Areas with poor service can then be identified by comparing the data with a table of desirable collector spacing (mileage between routes) versus population density. Additional routes can be added to the system as necessary.

Any roadway that doesn't satisfy the consideration as depicted above is termed as local streets, and it simply provides access function to the adjacent land uses.

Typical functional hierarchical classification of roads decision tree is shown in the figure 2 below. This serves as a clarification to what was stated earlier.

The hierarchy classification of roads differs from one country to another and basically with respect to name adopted for different road functions. In The United States and Canada for instance, the road hierarchy was categorized as Freeways, Arterials, Collectors, and Local Roads with Freeways being at the top level of the hierarchy. In United Kingdom, names like Motorway, Primary A-road, Non-primary A-road, B-road, C-road and unclassified were adopted. With regards to France, the roads are categorized as Auto route, Route Nationale, Route De'partementales, and Routes Communales.

**2.2.2: Road Hierarchy and Functional Classification**



**Figure 2.1:**Roads Functional Hierarchical Classification

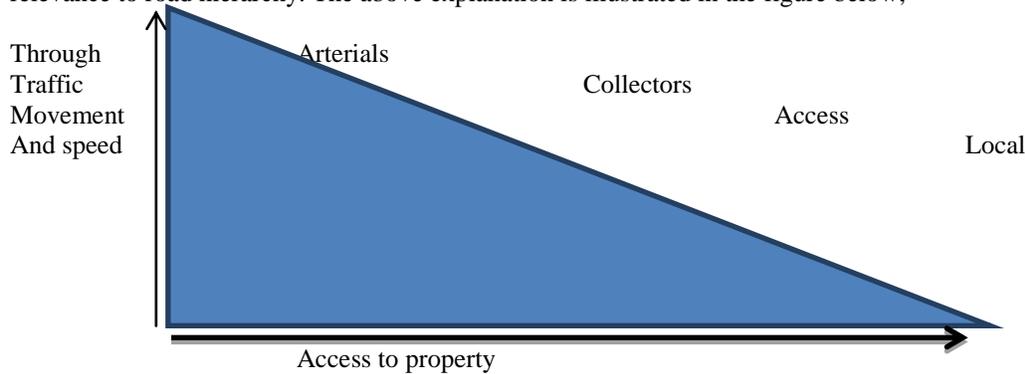
The terms Road hierarchy (RH) and functional classification (FC) mean the same thing. The apparent difference is that RH by definition says that some roads are more important than others; whilst in FC people assume that some roads are more important than others. Meanwhile, both RH and FC group (or class) roads in a network in terms of their function (RGDM,2011). The question that the above statement rise is OK, but how many different groups or classes or levels of road are there?

**2.3: Levels of Road Hierarchy**

**2.3.0: A4-Level Road Hierarchy;**

According to this, there are only four levels in a road hierarchy (freeway, arterial, collector/distributor and local. (Wikipedia, 2010) suggests that “Road hierarchy can be defined in terms of two topics. One topic is “access to property”, the other is “through traffic, movement and speed”. So far as RH is concerned only these four topics are

involved (traffic movement, speed and access) “Through traffic, “movement” and “speed” each has the same relevance to road hierarchy. The above explanation is illustrated in the figure below;



**Fig.2.2:** A four level Road Hierarchy  
Source: Wikipedia,2019

The figure is most likely illustrative, and not based on measured values. Having said this however;

1. The graph is a continuous curve- it does not show four discrete steps. The continuous curve implies that there can be any number of levels in a road hierarchy, not just four.

Indeed, The accompanying text bring in additional road types which do not appear in the graphic ( e.g motorways, limited access roads, streets) and also introduces sub-classes (major and minor arterials, rural and urban arterials.)

2. There is no qualification of term “through traffic on a motor definition of through traffic on a motorway would be “any vehicle trip which is longer than (say) 100km”- which would mean that any vehicle trip which partly uses a motorway and which is only 99km long should be define as “access traffic”.

### 2.3.1: A3-Level Road Hierarchy;

Based on this classification, There are only three levels in a functional road classification (arterials, collector and local) (Lankashire, 2002).

Functional road classification can be defined in terms of two topics one is “land access”, the other is “mobility”.

There is also an indication that “mobility” refers to journey distance (the traffic local or long distance....”) and to “the characteristics of traffic service”.

Mobility can also be equated with speed once the functional classification of a particular roadway has been established, so has the allowable range of design speed. (FWHA, 2010) says “mobility can incorporate a wide range of elements but the most basic is operating speed or trip travel time”.

### 2.3.2: 5-Level Road Hierarchy;

This is based on the fact that there are 5 levels in a road hierarchy. According to (ODA, 1991) “Developed countries define road network as a hierarchy in terms of road types, according to the major functions the road will serve. The main basis for classification is whether the road is to be used primarily for movement or for access. Roads can be categorized according to their function or according to their operational characteristics”.

The document suggests the following 5 levels in a road hierarchy:

- Primary distributors
- District distributors
- Local distributors
- Access roads
- Pedestrian streets.

Also according to (TRGDM, 2011), The 5 levels in a functional road classification are:

- Trunk roads
- Regional roads
- Collector roads
- Feeder roads

- Community roads

### 2.3.3: 6-Level Road Hierarchy;

This uses 6 levels of functional classification. “Geometric design standards depend on the functional requirements of the road. However, the functional classification of the road system does not automatically lead to the selection of a design speed and cross section for a specific link in the network (EAC, 2010). And roads may also be classified based on some other criteria but the classification based on speed and accessibility is the most generic one (OWNITALICS, 2011). The figure below describes six levels of functional classification.

### 2.3.4: 2-Level Road Hierarchy

(Buchanan, 1963) says “Basically, however, there are only two kinds of roads; distributors designed for movement and access roads to serve the buildings”.

Also, (Brindle, 1989) said that; “Because the movement and access functions are seen as being continuous, the road classes are not clearly defined but merge from one to the other”. He refers to four grounds for questioning the classical model of road hierarchy, including” It creates a broad range of roads intermediate between major traffic routes and minor streets on which there is conflict of access and movement functions, leading to lower than desirable levels of safety and amenity”. Brindle argues in favour of a “separate functions or two categories road hierarchy, where a road has either an access function or a traffic function.

### 2.4.0 Some Functional Classification of Roads

The hierarchical classification of roads differs from one country to another basically with respect to name adopted for different road functions. In United States and Canada the road hierarchy was categorized as Freeways, Arterials, Collectors and Local roads with freeways being at the top level of the hierarchy. In United Kingdom they adopted names as Motorway, Primary A-road, and Non-Primary-A road, B-road, C-road and Unclassified. With regards to France, the roads are categorized as AutoRoute, Route, Route Nationale, Routes Départementales, and Route Communales. Here are the classifications in detail;

**2.4.1 United States and Canada:** as already explained, the roads are classified as freeways, arterials, collectors and local roads.

**2.4.2 United kingdom:** in the UK, hierarchies include;

- Motorway: similar to freeways, these high-speed roads are designated with an M prefix (M) suffix e.g M1, A1 (M). The speed limit is generally 70 miles per hour (110kn/hr.) and there is a hard shoulder, an often slightly narrower lane next to lane 1. Emergency phones are normally located every mile to serve motorist in case of vehicle break down. Cyclists, pedestrians, mopeds, very slow vehicles and certain other traffic is banned.
- Primary-A road: These can be either a single carriageway or dual carriageway. The primary road network is fully connected, meaning you can reach any part from any other without leaving the network. Emergency telephones, if present at all, are usually infrequent.
- Non-primary-A road: Often exist where the route is important but there is a nearby primary route (A or motorway) which duplicates this road’s function. Some non-primary A-class routes.
- C road: These roads are used as local authority designations for routes within their area for administrative purposes. These routes are not shown on road maps.
- Unclassified: Unclassified roads are local roads with no defined destination. Local destinations may, be signed along them.

**2.4.3 France:** France categorize their roads as

- *Auto-routes:* Along with the rest of Europe, France has Motorways or Auto routes similar to the British network. Unlike in the UK, the network is mostly accessible on payment of toll, which is usually distance-dependent.
- *Route Nationale:* Before the construction of auto routes, the Routes Nationale were the highest classification of road. They are denoted by a route number N, or occasionally RN. They are maintained directly by the state and are usually the shortest route between major centres. The hard shoulder is often narrower than on full motorways and there are fewer emergency telephones.

- *Routes Department ales*: The roads in this class are numbered with a letter c prefix. Local level of government is responsible for maintenance of all the local roads.

#### **2.4.4 Romania:** In Romania the roads are classified as:

- *Austostrazi (A)*- Motorways
- *Dumuri Nationale Si Europe (DN, E)*- National and Europe Roads.
- *Dumuri Nationale (DN)*- National Roads
- *Dumuricomunale (DC)* -Communal Roads.

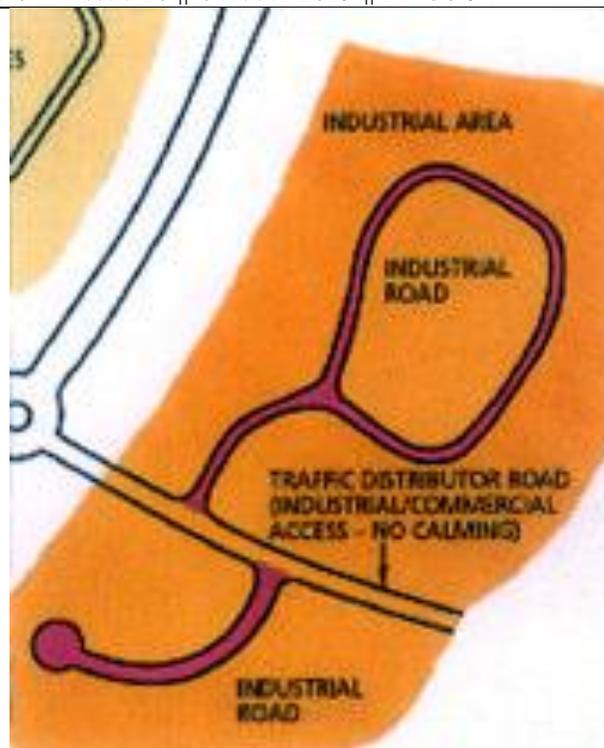
**Most of other European countries** have adopted motorways (*Autoroutes/Autobahns/Autopistas/Autostrada*), usually similar to those in France and the UK.

In developing countries such as India, the hierarchy is becoming increasingly popular as suburban development takes on forms strongly resembling those of America exurbs. However the suburban-like cities in China are the aftermath hierarchical street-layout and rapid urban development, they are distinctively different from American suburbs. China adopted road hierarchy in their planning system in (1960's).

#### **2.4.5 The NAASRA Road Classification System**

It is one of the best known Road Hierarchy. A road hierarchy is a scheme for categorizing roads into groups based on a number of factors including; usage, location, surface type, capacity, etc. The road classes are:

- Access Place
- Access Road
- Access Street
- Arterial Road
- Collector Road
- Collector Street
- Collector-Distributor Road
- Distributor Road
- District Distributor
- Fire Access Track
- Industrial Access Street
- Industrial Collector



**Fig2.4:** Industrial Access Road

Source: Wikipedia.com

#### 2.4.6 City of Ballarat Road Hierarchy

The road hierarchy is a division of the Network into identifiable road classifications which reflect the functionality of the roads making up the network. The hierarchy attempts to reflect the preferred movement of vehicles throughout the network and gives guidance to road managers, road users and land developers as to council's intended road network objectives.

The City of Ballarat has a network of roads which is designed to allow the safe and convenient movement of people and goods across and throughout the municipality.

#### 2.5 ROAD NOMENCLATURE

Road nomenclature is necessary for easy identification of roads and streets. A road name is an identifying name given to a street. The street name usually forms part of the address (though addresses in some parts of the world, notably most of Japan, make no reference to street name). Buildings are often given numbers along the street to further help identify them. Different countries have different method of naming streets and roads according to some standards and policies. Names are often given in a two parts form: an individual name known as the *specific* and an indicator of street type known as the *generic*. Examples are "Main Road", "Fleet Street" and "Park Avenue" need not have the characteristics of an avenue in the generic sense. Some street names have only one element, for example "Broadway", "The Mall". Road name can also include a direction (the cardinal points east, west, north and south, or the quadrants NW, NE, SW, and SE) especially in cities with a grid-numbering system. Examples include "E Roosevelt" and "14<sup>th</sup> Street NW". In US, most streets are named after numbers, landscapes, trees, etc. or a combination of trees and landscapes. Here are some examples;

- Type of commerce or industry: Roads are named according to the type of commerce or industry found on the road.
- Landmarks: Some streets are also named for landmarks that were in the street, or nearby area, when it was constructed. Such names are often retained after the landmark disappears. In Barcelona, *The Rambla de Canaletes* named after an fountain that still stands.

- Self-descriptive names: While names such as Long Road or Nile Mile Ride have an obvious meaning, some road names' etymologies are less clear. The various Stone Street, For example, were named after a city that is many miles away and has no obvious link to the street.
- Distinguish or famous Individuals: Moreover roads are named after famous or distinguished individuals.
- Themes: Group of streets in some areas is sometimes named using a particular theme. One example is *Philadelphia*, where the major east-west streets in William Penn's original plan for the city carry the names of trees: from north to south, these were Vine, Chestnut, Sassafras, Mulberry, etc. Other examples of themed road: In Washington D.C, each of the 50 U.S. states has a road named after it. Most of the state avenues cross diagonally through the alphabetic and numbered streets. In area of northwest Portland, streets are in alphabetical order and are named after businessmen pioneers.
- Grid –based naming systems: In many cities laid out on a grid plan, the streets are named to indicate their location on a Cartesian coordinate plane. Example, in Denver, Colorado, all roads running east/west are given "Avenue" while those running north/south are given "Street" designations.
- Streets without names: Road between cities, and especially highways, are rarely named; they are often numbered instead. Interstate roads are rarely named; they are often numbered instead.
- Numbering: Some major roads, particularly motorways and freeways are given road numbers in addition to names rather than, or in addition to, names. Examples include the M1 and Interstates. Many roads in Britain road numbering scheme, and the same apply in many other countries.
- Local history: Aboriginal names taken from the local Aboriginal language.
- Commemorative names: Names given to road in memory of an important personality.

#### 2.5.0 Definition of Terms or Suffixes Used For Roads Nomenclature Development

- **Street:** a public way or road, paved or unpaved, in a town, or city, and having houses, shops, or the like, on one side or both sides for any through fare.
- **Road:** a way, usually open to the public for the passage of vehicles, persons, animals; a road generally connect localities some distance apart. Meant for thoroughfare.
- **Lane:** a narrow way or passage between hedges, fences, walls or houses for residential roads.
- **Crescent:** a curved street, shaped like the moon in its first quarter used for a crescent shaped road.
- **Avenue:** a roadway with trees or other objects at regular intervals; a broad street used for residential roads.
- **Boulevard:** a broad street, especially with rows of trees along it.
- **Place:** a short street, a court, etc. and area, especially one regarded as an entity and identifiable by name, used for habitation, as a city, town or village. Subject to being no confusion with any local open space.
- **Close:** An enclosure about or beside a building, cathedral. Etc. a narrow entry or alley, or a courtyard to which it leads: a cul-de-sac only.
- **Way:** a path or course leading from one part to another- a road, route, passage, or channel (usually used in combination, e.g. a roadway). For major roads.
- **Drive:** a road used for driving, especially a private access road to a private house. For residential roads.
- **Terrace:** a raised level space, natural or artificial, especially for walking or standing. Row of housing along the top or face of a slope.
- **Esplanade:** an area suitable for leisurely walking, especially one along the seafront at a resort, esplanade.
- **Grove:** a small wood or plantation of trees- i.e. not a term for identifying/naming a road or street. For residential roads.
- **Gardens:** For residential roads. Subject to there being no confusion with any local open space.
- **Square:** for a square only.
- **Hill:** For a hillside road only.
- **Circus:** For a large roundabout.
- **Vale:** For residential areas. Only for exceptional circumstances.
- **Rise/Flow**
- **Mead/Wharf**
- **Ring Road:** Road or series of connected roads encircling a town or city.
- **Bypass:** Any highway that avoids a built-up area, town, or village, to let through traffic without interference from local traffic, to reduce congestion in the built-up area, and to improve road safety, is named "bypass".

Basically each and every country had their specific mode of naming roads based on some certain standards and accepted public standards and accepted public policies. The Geographical Names Board of New South Wales for example, developed some guidelines for naming of roads basically based on road types. They provided guidelines based on uniqueness, sources, and property when naming and renaming of roads and streets.

### **2.5.1 Uniqueness**

Name duplication within a local government area should be avoided. If possible duplication of names in proximity to adjacent local government areas should also be avoided. Similarity in road names within these areas is also discouraged (e.g White Street and Whyte Street). However, roads crossing council boundaries should have single and unique name.

### **2.5.2 Sources**

Preferred sources for road names include: Aboriginal names, local history, early explorers, pioneers, settlers and other eminent persons, war/casualty list, thematic names such as flora, fauna or ships. Names should be appropriate to the physical, historical or cultural character of the area concerned. The origin of each name should be clearly stated and subsequently recorded. The Local Aboriginal Land Council should be consulted when choosing Aboriginal names unless the road naming authority already has an agreed list of appropriate names.

### **2.5.3 Property**

Names of living person should not be used; also names which are characterized as offensive or likely to give offensive, incongruous (out of place), and commercial or company are to be avoided. The remaining guidelines relates with the communication, spelling, form, and road type. More also, there are so many guidelines provided by department

## **Methodology**

### **3.1 Reconnaissance Survey**

Before the commencement of data collection, a preliminary study of the study area was conducted. Before visiting the areas, maps showing the prominent extents of the study areas were obtained and the prominent and most prominent routes were noted so as to ease the work.

In addition, the existing hierarchical classification of the roads within the study areas as well as the existing nomenclature was noted. Also, the ownership of the roads information was obtained from the local governments department of works, and Kano Roads Maintenance agency KARMA for the state roads, all the exclusions were the federal roads.

A preliminary visit was paid to all the local governments, so as to have a fair idea of their reality as depicted from the map, and to help us in the data collection arrangement.

It was observed that access roads which mostly enable the rural dwellers to access their farms, houses and other places of works are more needed in the rural areas in comparison with collectors and arterials.

### **3.2 Data Collection Arrangement**

#### **3.2.1 Site Description**

The case studies of this project are Gwarzo, Karaye and Dawakin Kudu Local Governments of Kano State. In this regard, description of the site of this project would not be regarded as complete without describing Kano State itself, since all the three local governments belongs to Kano State.

Kano is a city in Nigeria and the capital of Kano State in Northern Nigeria, in the Sahelian region south of the Sahara. It lies within geographical coordinates of Lat. 12°00'N & Long.8°31'E. Kano is the commercial nerve centre of Northern Nigeria and is the second largest city in Nigeria after Lagos. According to the 2006 census, Kano is the most populous state in Nigeria, with about 9,383,682 million people. It has 44 local governments including the three local governments where this project was carried out.

Kano is 481 metres (or about 1580 feet) above sea level. The city lies to the north of Jos Plateau, in the Sudan Savannah that stretches across the south of the Sahel. The city lies near where the Kano Challawa Rivers flowing from the southwest converge to form the Hadejia River, which eventually flows into Lake Chad to the east. The region features Savannah vegetation and a hot, semi-arid climate. Kano sees on average about 690mm (27.2in) of precipitation per year, the bulk of which falls from June through December. Kano is typically very hot throughout the year, though from December through February, the city is noticeably cooler. Night time temperatures are cool during the months of December, January and February, with average low temperatures of 11°-14°C.

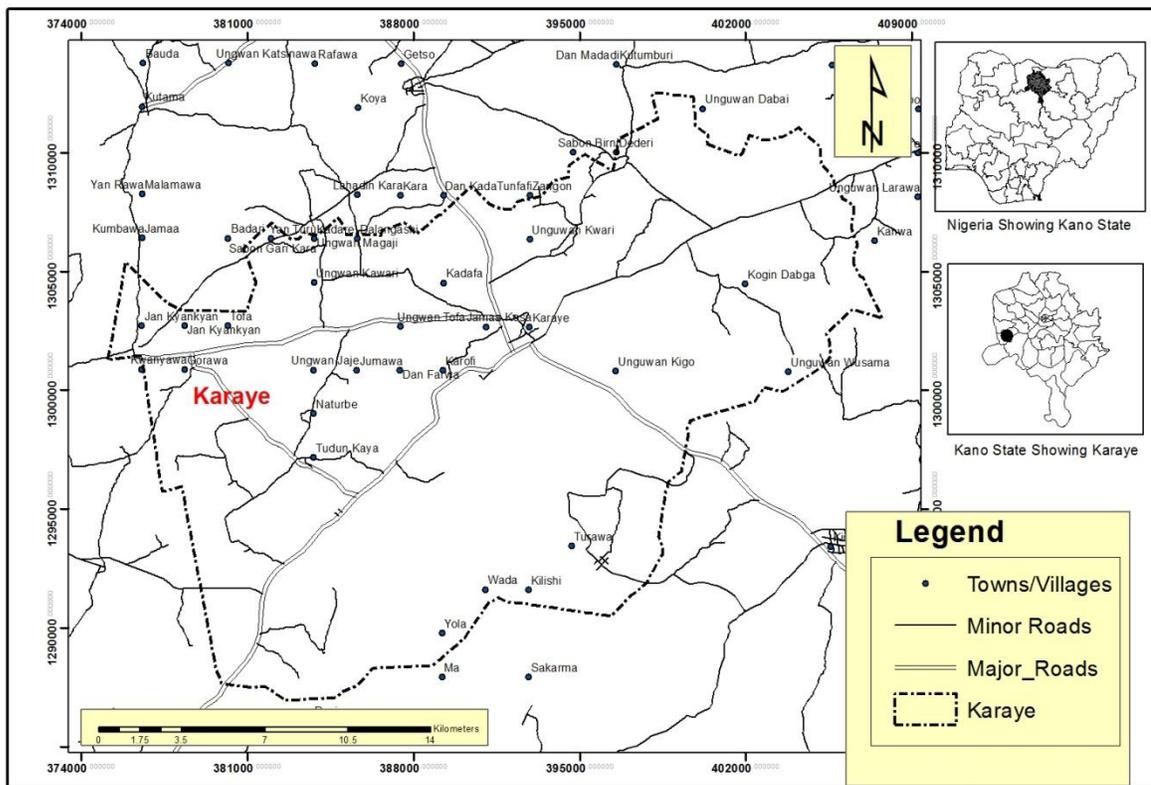
Kano is strategically located and owns its leading position as commercial hub in the sub-Sahara African cities by road. Fleet of trucks, buses and other means of transportation link it with cities in Niger, Chad, Cameroon and Republic of Benin, and this explained the chaotic nature of Kano roads network. A brief description of the local governments of our concern is given below.

### 3.2.2: Karaye (Case1)

Karaye is a local government area within the Rural Areas of Kano State. It lies within the geographical coordinates of Lat. 11°47'N & Long. 8°1'E with ISO 3166 code (NG.KN.KY). Its headquarter is at Karaye Town, It has an area of 479 km<sup>2</sup> and a population of 141,407 at the 2006 census. It also accommodates the National Youth Service Corps (NYSC) orientation camp in Kano State and Challawa Gorge Dam. Table 3.1 shows the summary of roads in Karaye local government area while Fig3.1 is the map of Karaye Local Government Area showing roads.

Table 3.1: Summary of Roads in Case 1

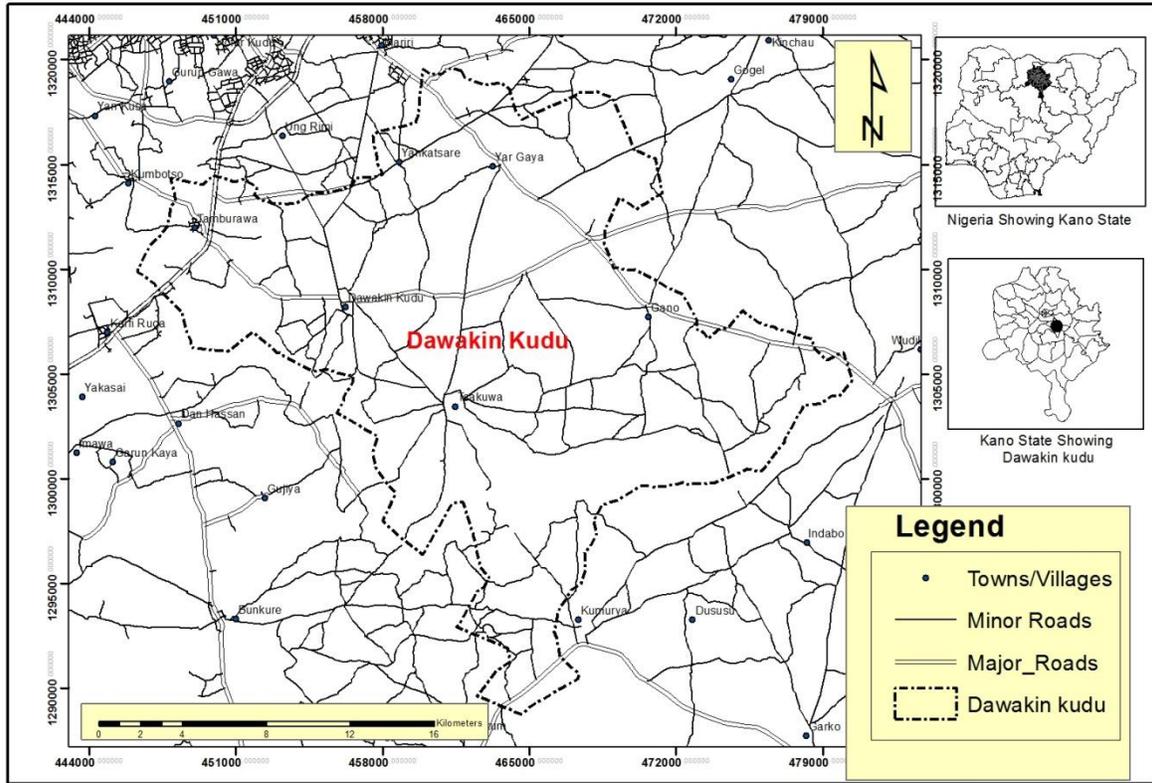
Road Classification	Number of Roads
Access	8
Collector	3
Arterials	4 (originated from other LGAs)



Source: Dept. of Geog BUK (2016)

Figure 3.1: Map of Karaye Local Government Area showing Roads





Source: Dept. of Geog BUK (2016)

**Figure 3.3:** Map of Dawakin Kudu Local Government Area Showing Roads

**3.3.0: Data Collection Procedure**

The data collection arrangement was carefully followed. The road inventory survey of the roads in the local governments of study was carried out. Information collected is basically related to the road itself. These include the width of carriage way, length of the roadway from start to where it branches to other links, and the type of roadway surfacing whether it's hot-mixed asphalt, surface dressing or even unpaved. Table 3.4 shows the sample of the inventory data collection form that was used in the data collection.

**Table 3.4:** Road inventory Survey Form  
 Kano University of Science and Technology, Wudil  
 Department of Civil Engineering  
 Road Inventory Survey Form

FORM NUMBER					Sketch	
Name of Observer:						
Local Government area:						
Date:						
Time:						
Weather						
Road Type	Federal	State	LG	Others	Current Road name:	
						N-S    W-E

Number of Lanes in each direction	1	2	3	Direction		S-N	E-W
Road length							
Road width							
Road shoulder width							
Surfacing	Gravels		Surface Dressing	Asphalt		Others	
Junction	T-junction		Y-junction	Skewed		Cross-junction	
Junction			Cautionary	Roundabout		Signal	
Bridge			Steel	Timber Composite			

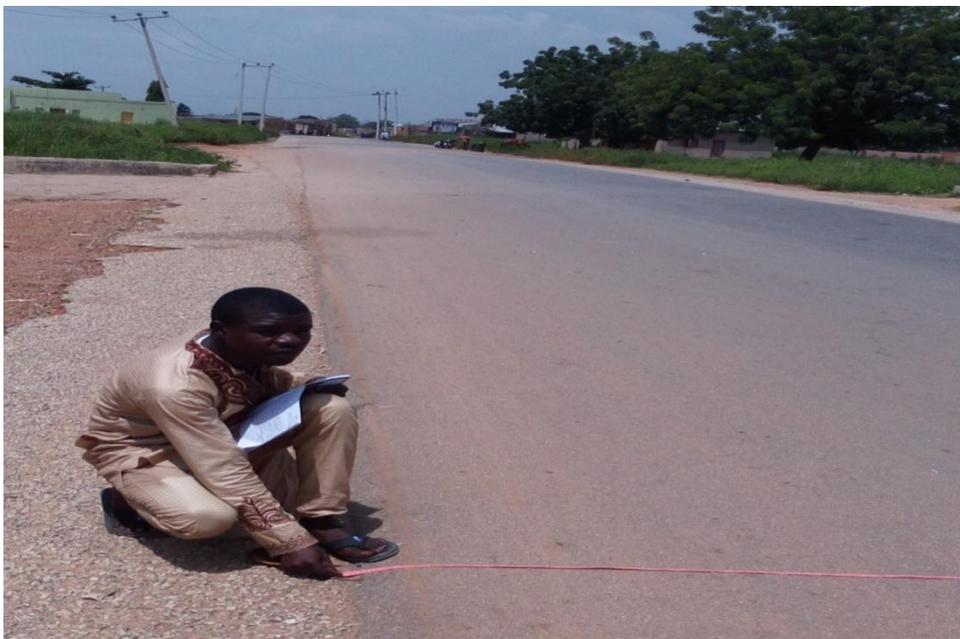
During the inventory survey, the length of the road was measured using the odometer of our vehicle, and average widths of road shoulder ( if available) was measured using a tape, Direction of the road was observed from map of the area. Information needed that relates to number of lanes in each direction of the roadway, surfacing type, junction type and its control type, and type of bridges if there is any. Any other information that might be helpful that relates to the features adjacent to the road was also noted. Figures 4(a)-4(c) shows the data collection in progress.



**Figure 4.(a):** Data collection in progress (Zaria Road)



**Figure 4(b):** Data collection in progress (Tamburawa Road)



**Figure 4(C):** Data Collection in Progress (Dayi Road)

### **3.4: Existing Road Nomenclature**

The existing nomenclature system in Kano State and its environs are those applies to trunk-A roads( Federal Roads) only, trunk-B roads( State Roads) and trunk-C roads( Local Government Roads). There is no fully developed nomenclature.

In trunk-A roads, the nomenclature system used was in the form of A1, A2, and so on. For example, Zaria Road has nomenclature code A2. But with regards to collectors and access which are common in rural areas, they were only named according to their origin and destination, names of important personalities in the area (e.g. T. Gwarzo Road in Gwarzo) and so on. In this regard, a fully developed nomenclature system is required to cater for the challenges and difficulties encountered in identifying roads and street, based on their types and functions such as arterial, collectors and access roads especially when it comes to maintenance, rehabilitation and construction of new roads within these localities by the road agencies such as KARMA, FERMA and KNUPDA. Using the appropriate nomenclature will also help the government at all levels in choosing the right type of road required at a particular location. For example, the use of highest quality asphaltic road in access roads within the rural areas may be considered as uneconomical.

## **Result and Discussion**

### **4.1 Summary of Inventory Data**

All the data collected during the inventory was summarised and presented in the format as shown in tables 4.1-4.3 for all the three local governments.

On this note, it should be noted that in the data summary, all the classifications given to the roads based on the type; access, collectors and arterials. This will only serve as a preliminary classification; a more developed classification will follow later in this chapter after all the data collected have been analyzed.

Also, all the directions were based on cardinal points; N-S, S-N, W-E, E-W. This was only an approximate because at times direction is along NE, NW, SE and SW or even narrower cardinality, but the later was adopted for simplicity.

All lengths of roads as well as their widths were average. Average values were taken because in most cases, the widths of the roads are not constant throughout their lengths. This is because at the beginning of the road, it widths is large but along the road it used to start getting narrower and vice-versa, and at times some parts of the road was dual carriage but along the road it becomes single carriage. This scenario can be found in almost all the 44 local government areas of Kano State due to the newly constructed 5Km roads Constructed by Former Governor of Kano State (Gov. Rabiukwankwaso). The same thing applies to shoulder, in some parts of the road there is shoulder while it is missing along the way.

Format used for number of lanes is in form of 1(one) which means 1 directional lane, single carriage. 2(two) means two directional lanes, dual carriage and so on.

Junction type, junction control, and ownership of the road whether it is Federal, State or Local Government is self-explanatory.

As regards to the bridge column, 1c means one concrete bridge, 1s means one steel bridge, 1ic means one interchange and so on.

Table 4.1: Inventory Data Summary (Gwarzo)  
**Kano University of Science and Technology, Wudil**  
**Department of Civil Engineering**  
**Road Inventory Survey**  
**(Summary Sheet)**  
**Local Government Area: Gwarzo** Sheet No.GRZ001

Name of Observer: Umar I.M

Date: 18/09/2016

S/N	Current Road Name	Length (Km)	Average Width(m)	Shoulder Width(m)	No. of Lanes	Direction	Surfacing	Junction Type	Junction Control	Bridge	Ownership	Classification
1	Kutama-Gude	16	10.5	1.6	1(one)	W-E	Asphalt	R/about	Cautionary	-	State	Arterial
2	Dakwara-Kutama	14.9	10.5	1.5	1(one)	N-S	Asphalt	T	Cautionary	-	State	Arterial
3	GwarzoKafi-D/Tunfafi	12.5	7.4	1.7	1(one)	N-S	Asphalt	R/about	Cautionary	1c	State	Arterial
4	Lakwaya-K/Jama,a	15.8	-	-	-	N-S	Unpaved	Y	Cautionary	-	L.G	Collector
5	Fadailiyasawa-U/magaji	22.8	-	-	-	E-W	Unpaved	Crossed	Cautionary	-	L.G	Collector
6	Jaga	7	6.4	0.0	1(one)	W-E	S/ dressed	Y	Cautionary	1c	L.G	Access
7	S/birniDederi-Gude	10.7	-	-	-	S-N	Unpaved	T	Cautionary	-	L.G	Access
8	Bauda- U/katsinawa	2.6	-	-	-	W-E	Unpaved	Skewed	Cautionary	-	L.G	Access
9	Kutama-Katata	10	6.4	0.0	1(one)	S-N	Asphalt	T	Cautionary	-	L.G	Collector
10	Getso Town	1.5	7.4	1.5	1(one)	E-W	Asphalt	Crossed	Cautionary	2c	L.G	Access
11	Koya-Kutama	5.7	-	-	-	E-W	Unpaved	Y	Cautionary	-	L.G	Access
12	Godiya Rd	8.8	-	-	-	W-E	Unpaved	Cross	Cautionary	-	L.G	Access
13	Gwarzokafi-Zango	8.8	-	-	-	E-W	Unpaved	Cross	Cautionary	-	L.G	Collector
14	Lakwaya Rd	7.3	6.5	1.0	-	N-S	Asphalt	Y	Cautionary	-	L.G	Access
15	Koya	2.5	6.4	1.2	-	N-S	Asphalt	Y	Cautionary	-	L.G	Access
16	Danmaliki-Gammo	8.8	-	-	-	W-E	Unpaved	T	Cautionary	-	L.G	Collector

Table 4.1: Continued Inventory Data Summary (Gwarzo)

**Kano University of Science and Technology, Wudil**  
**Department of Civil Engineering**  
**Road Inventory Survey**  
**(Summary Sheet)**

Local Government Area: Gwarzo  
 Name of Observer: Umar I.M

Sheet No.GRZ002  
 Date: 18/09/2016

S/N	Current Road Name	Length (Km)	Average Width(m)	Shoulder Width(m)	No. of Lanes	Direction	Surfacing	Junction Type	Junction Control	Bridge	Ownership	Classification
17	Badari	4.0	-	-	-	E-W	Unpaved	skewed	Cautionary	-	L.G	Access
18	Getso-S/BirmiDederi	8.3	-	-	-	W-E	Unpaved	Y	Cautionary	-	L.G	Collector
19	K/Kudu-K/Arewa	0.8	4.6	0.0	1(one)	W-N	Surface dressed	T	Cautionary	-	L.G	Access
20	T-Gwarzo	1.4	6	1.5	1(one)	S-N	Asphalt	Y	Cautionary	-	L.G	Access
21	Gude-GwarzoKafi	16	7.4	1.3	2(two)	W-E	Asphalt	Y	R/about	-	State	Arterial
22	S/Gari Kara	3.5	-	-	-	E-W	Unpaved	T	Cautionary	-	L.G	Access
23	Hospital	0.8	6.9	0.0	1(one)	N-S	S/ dressed	T	Cautionary	-	L.G	Access
24	Katambawa	1.0	4.6	0.0	1(one)	N-S	Asphalt	Y	Cautionary	-	L.G	Access
25	KofarGabas	1.2	5.8	0.0	1(one)	E-W	S/dressed	T	Cautionary	-	L.G	Access
26	KwanarTsaure	14	6.7	1.4	1(one)	S-N	Asphalt	Y	Cautionary	1c	L.G	Collector
27	Gwarzo-Dayi Road	1.86	6.9	2.0	1(one)	W-E	Asphalt	T	Cautionary	-	State	Arterial
28	Jamaa-Kutama	4.5	-	-	-	S-N	Unpaved	cross	Cautionary	-	L.G	Access
29	Zango	6.5	6	1.0	1(one)	W-E	Asphalt	T	Cautionary	-	L.G	Access
30	Bichi Rd	14.9	6.5	1.5	1(one)	N-S	Asphalt	T	R/about	-	State	Collector
31	Gude- Danmadadi	8.8	-	-	-	N-S	Unpaved	Y	Cautionary	-	L.G	Collector
32	Yanguruza	2.2	6.7	1.4	1(one)	S-N	Asphalt	skewed	Cautionary	-	L.G	Access
33	Getso-Kaura	10	6.5	1.2	1(one)	N-S	Asphalt	T	Cautionary	-	L.G	Access

Table 4.2: Inventory Data Summary (Karaya)  
**Kano University of Science and Technology, Wudil**  
**Department of Civil Engineering**  
**Road Inventory Survey**  
**(Summary Sheet)**

Local Government Area: KarayeSheet No.KRY001

Name of Observer: Umar I.M

Date: 19/09/2016

S/N	Current Road Name	Length (Km)	Average Width(m)	Shoulder Width(m)	No. of Lanes	Direction	Surfacing	Junction Type	Junction Control	Bridge	Ownership	Classification
1	Jama,a-Kwanyawa	15.6	7.4	1.5	1(one)	E-W	Asphalt	T	Cautionary	-	State	Collector
2	Tudun Kaya	9.5	6.2	1.0	1(one)	N-S	s/dressed	Cross	Cautionary	-	L.G	Access
3	Gorawa-T/Kaya Rd	9.0	6.8	0.9	1(one)	N-S	Asphalt	T	Cautionary	-	L.G	Collector
4	Karaye-Gwarzo Rd	6.8	7.5	1.2	1(one)	S-N	Asphalt	T	R/About	-	State	Arterial

5	Rogo Rd	28	7.4	1.5	1(one)	E-W	Asphalt	T	Cautionary	-	State	Arterial
6	KoginDabga	9.2	-	-	-	N-S	Unpaved	Y	Cautionary	-	L.G	Access
7	S/BirniDederi-Kadafa	8.3	-	-	-	N-S	Unpaved	Skewed		-	L.G	Access
8	T/Kaya-U/Tofa	5.5	-	-	-	S-N	Unpaved	T	Cautionary	-	L.G	Access
9	U/Kwari-Jama,a	6.8	-	-	-	E-W	Unpaved	T	Cautionary	-	L.G	Access
10	U/Magaji-U/ Kwari	1.8	-	-	-	S-N	Unpaved	Y	Cautionary	-	L.G	Access
11	U/Larawa- Karaye	9.2	-	-	-	W-E	Unpaved	Y	Cautionary	-	L.G	Collector
12	Karaye Network	5.9	6	0.5	1(one)	-	S/dressed	T	Cautionary	-	L.G	Access
13	Dederi - Yammedi	7.3	6.4	1.2	1(one)	E-W	„ „	Y	Cautionary	1c	L.G	Access
14	Karaye-Kiru	25	8.9	1.0	1(one)	E-W	Asphalt	T	Cautionary	-	State	Arterial
15	Karaye-Yola-T/kaya	12	7.6	1.8	1(one)	N-S	Asphalt	T	Cautionary	-	State	Arterial

Table 4.3: Inventory Data Summary (Dawakin Kudu)  
**Kano University of Science and Technology, Wudil**  
**Department of Civil Engineering**  
**Road Inventory Survey**  
**(Summary Sheet)**

Local Government Area: Dawakin Kudu Sheet No.DKD001

Name of Observer: Umar I.M

Date: 20/09/2016

S/N	Current Road Name	Length (Km)	Average Width(m)	Shoulder Width(m)	No. of Lanes	Direction	Surfacing	Junction Type	Junction Control	Bridge	Ownership	Classification
1	Dawakinkudu-Tsakuwa	7.3	7.4	1.2	1(one)	N-S	Asphalt	T	Cautionary	-	State	Collector
2	Zaria-Dawakin Kudu Rd	7.5	7.2	2	1(one)	W-E	Asphalt	T	Cautionary	-	State	Collector
3	Zaria Road	7.5	10.9	2	2(Two)	N-S	Asphalt	T	Cautionary	1ic,1c	Federal	Arterial
4	Tamburawa-Kumbotso	2.5	7.8	2.3	1(one)	E-W	Asphalt	T	Cautionary	1c	State	Collector
5	Yankatsare-D/ Kudu	8	-	-	-	N-S	Unpaved	Cross	Cautionary	-	L.G	Collector
6	Mariri-Gano-Wudil Rd	24.3	10.9	2	2(Two)	N-S	Asphalt	Cross	Cautionary	-	Federal	Arterial
7	Yargaya-Tsakwa	10.2	7.6	1.3	1(one)	S-N	Surface dressed	Cross	Cautionary	-	L.G	Collector
8	LahadinMakole	8.2	5.8	1.6	1(one)	N-S	„ „	T	Cautionary	-	L.G	Collector
9	Tsaure-Kumurya	2	5.5	1.5	1(one)	N-S	„ „	T	Cautionary	-	L.G	Access
10	K/Arewa	0.8	5.6	0.0	1(one)	E-W	„ „	Y	Cautionary	-	L.G	Access
11	TitinAsibiti	1	5.6	0.5	1(one)	N-S	S/dressed	T	Cautionary	-	L.G	Access
12	KofarKore Rd.	1	5.4	0.0	1(one)	N-S	S/ dressed	T	Cautionary	-	L.G	Access
13	KofarGabas	0.5	5.6	0.0	1(one)	E-W	„ „	T	Cautionary	-	L.G	Access

14	Hakimi	4.7	7	1	1(one)	N-S	„ „	Y	Cautionary	-	L.G	Access
15	Dawakin kudu-mariri	10	7.6	1.5	1(one)	S-N	Asphalt	T	Cautionary	-	L.G	Collector

Table 4.3: Continued Inventory Data Summary (Dawakin Kudu)

**Kano University of Science and Technology, Wudil**

**Department of Civil Engineering**

**Road Inventory Survey**

**(Summary Sheet)**

**Local Government Area: Dawakin Kudu SheetNo.DKD002**

**Name of Observer: Umar I.M**

**Date: 20/09/2016**

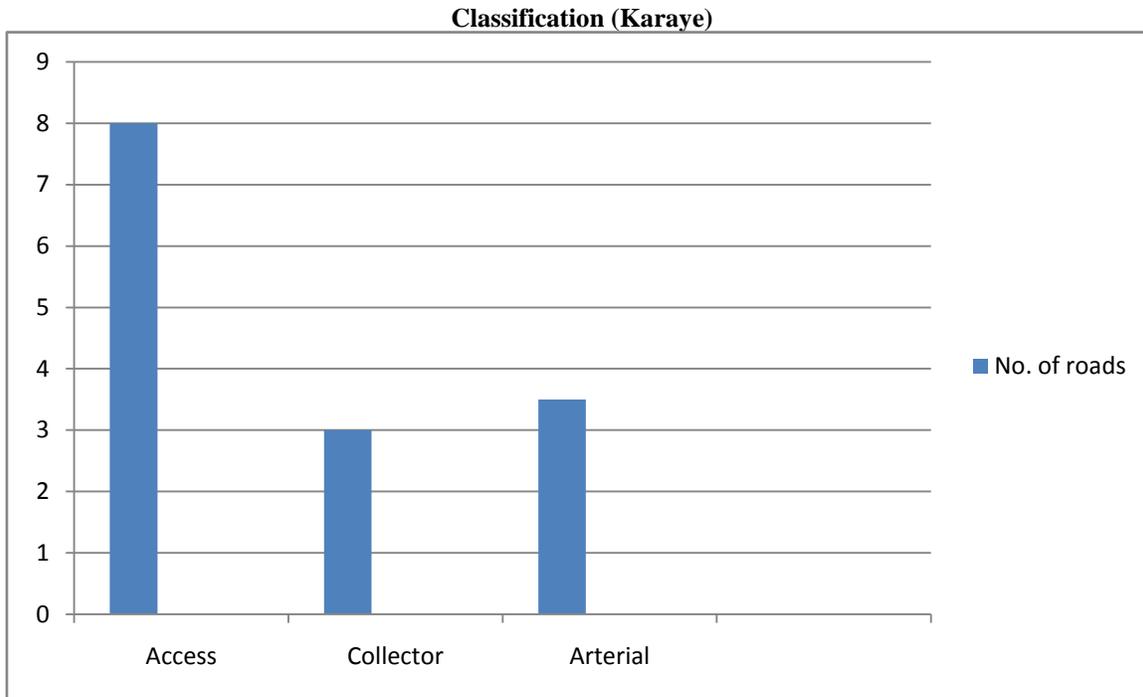
S/N	Current Road Name	Length (Km)	Average Width(m)	Shoulder Width(m)	No. of Lanes	Direction	Surfacing	Junction Type	Junction Control	Bridge	Ownership	Classification
16	Yargaya-Tsaure Rd	12.6	7.2	1.2	1(one)	S-N	Asphalt	Cross	Cautionary	-	L.G	Collector
17	Tsakuwa-Kumurya Rd	11.8	-	-	-	N-S	Unpaved	Y	Cautionary	-	L.G	Access
18	Yankatsare Rd	7.8	7.6	1.5	1(one)	S-N	Asphalt	T	Cautionary	-	L.G	Collector
19	Tsakwa-Dawakinkudu	3.5	7.4	1.2	1(one)	S-N	Surface dressed	Skewed	Cautionary	-	L.G	Access

**4.2: Data Analysis**

The inventory data for all the local governments as presented earlier was analysed based on its functional classification, road surfacing, road length, and ownership types of roads. The analysis was presented below for each local government using charts.

**4.2.1: Karaye**

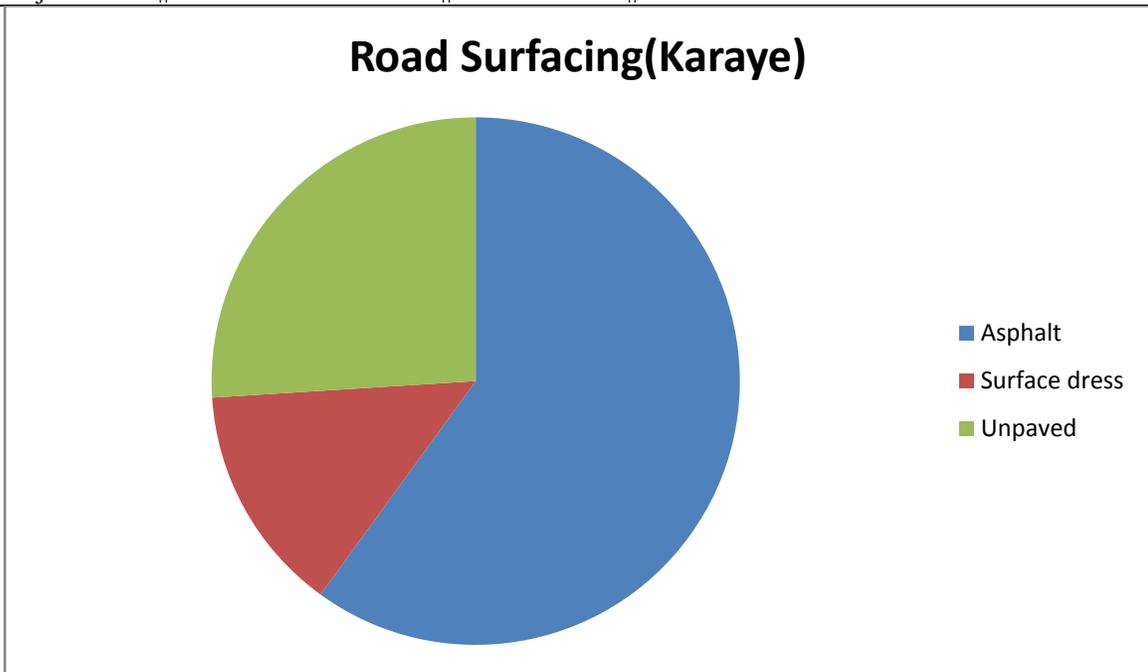
Figure 4.1(a), shows the number of roads in each functional classification. About 8 are access roads, while 3 collectors and 4 are arterials. All the 4 arterials originate from neighboring local governments, but rather it just pass through the local government. It was included only to simplify reference.



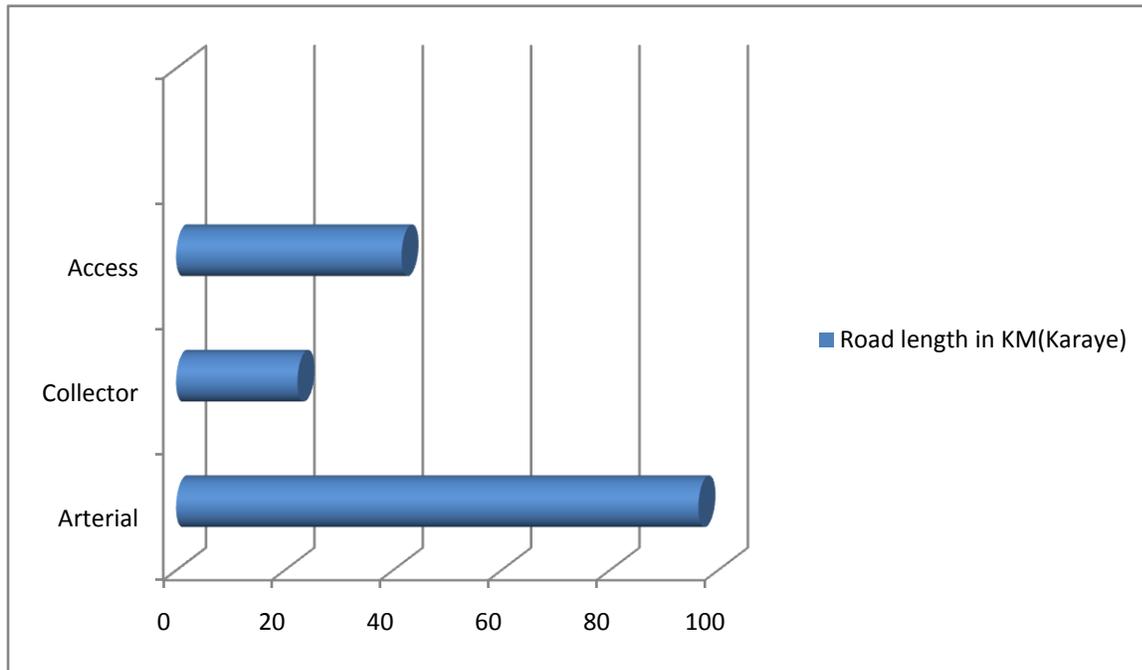
**Figure 4.1(a): Classification of Karaye Roads**

Figure 4.1(b), shows the types of surfacing for all the roads in Karaye , about 60% of the pavements was made up of asphalt, surface dressed roads amount to 14% while unpaved roads amount to about 26%.

Figure 4.1(c) , shows the length in kilometres of the different roadway functions, about 54.3km is for access roads, 33.8km for collector while 71.8km for arterial. Since all the arterials passing through Karaye local Government did not originate from the local government, their total lengths was considered as the distance from point of origin within the local Governments boundary to the end of the roads within the boundary.

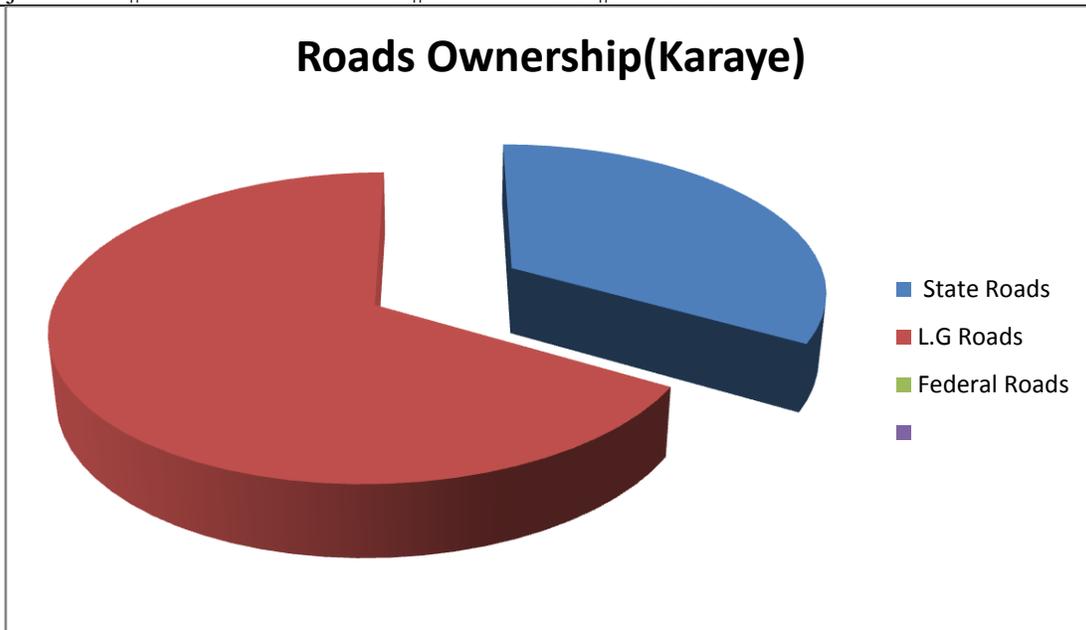


**Figure 4.1(b):** Road surfacing type for Karaye



**Fig 4.1(c):** Road Length in Km (Karaye)

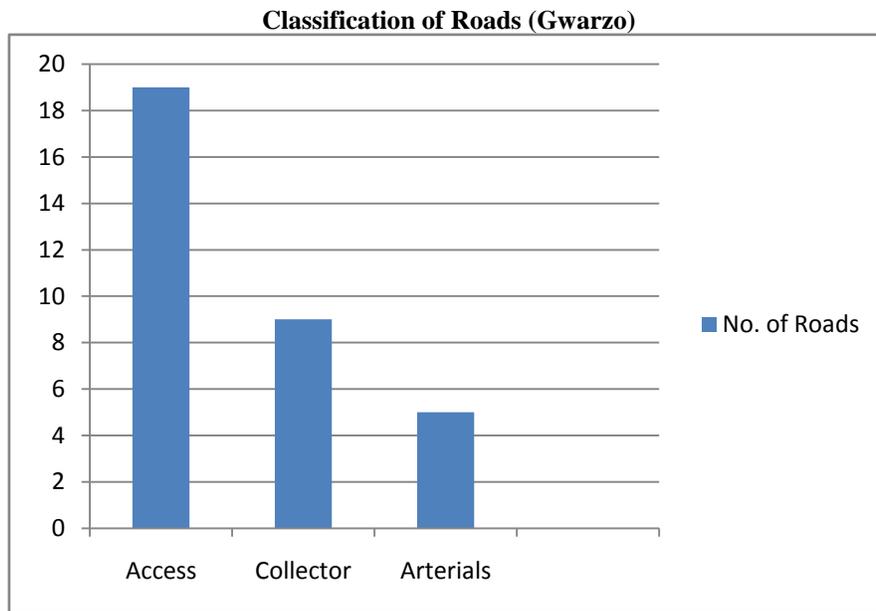
Figure 4.1 (d), shows the percentage of road ownership in Karaye Local Government. 33.3% of the roads are owned by the state government, 66.7 by the Local government while 0% is owned by the Federal government. Most of the roads owned by the local government were mainly access. While some few access and most of the collectors were owned by the state government.



**Figure4.1(d):** Roads Ownership (Karaye)

**4.2.2: GWARZO**

Figure 4.2 (a), shows the number of roads in each functional classification. About 19 roads are access roads, 9 are collectors, while the remaining 5 roads are arterials.



**Figure 4.2(a):**Classification of GwarzoRoads

Figure 4.2(b), shows the types of surfacing for all the roads in Gwarzo, about 48.5% of the pavements was made up of asphalt, surface dressed roads amount to 12.1% while unpaved roads amount to about 39.4%.

Figure 4.2(c ), shows the length in kilometres of the different roadway functions, about 54.3km is for access roads, 33.8km for collectors while 71.8km for arterials. Since all the arterials passing through Gwarzo local

Government did not originate from the local government, their total lengthswas considered as the distance from point of origin within the local Governments boundary to the end of the roads within the boundary.

Figure 4.2(d), shows the percentage of road ownership in Gwarzo Local Government. 18% of the roads are owned by the state government, 81% by the Local government while 0% are owned by the Federal government. Most of the roads owned by the local government were mainly access. While some few access and most of the collectors were owned by the state government.

Figure 4.2(b) shows the types of surfacing for all the roads in Gwarzolocal government. About 48.5% of the pavements was made up of asphalt, surface dressed roads amount to about 12.1% , while the remaining 39.4% of the potential roadways were unpaved.

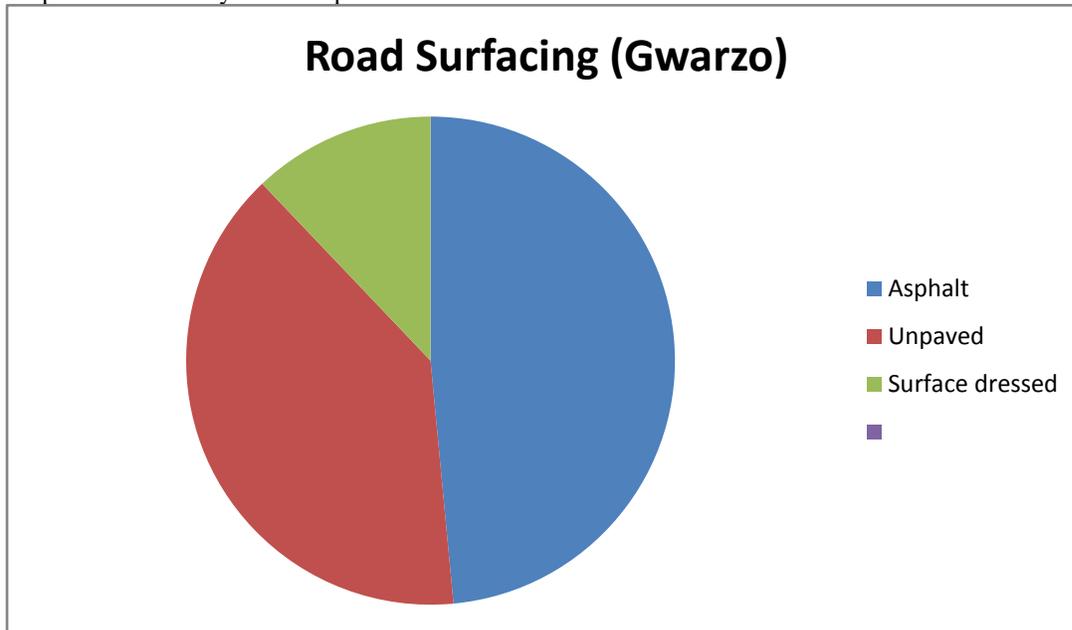


Figure 4.2 (b): Road Surfacing Type for Gwarzo

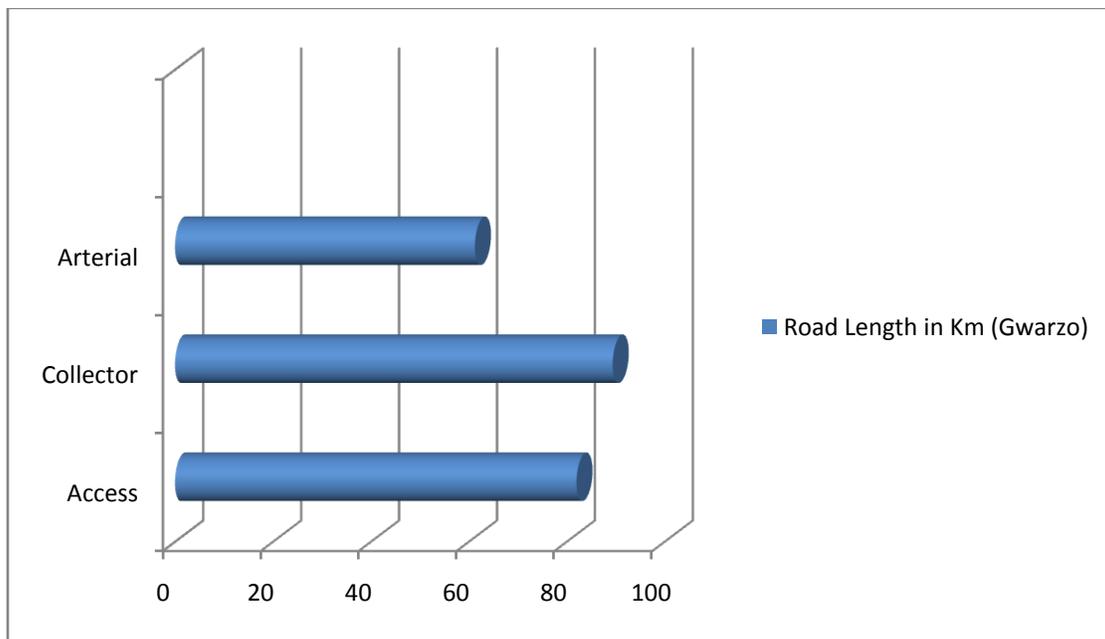
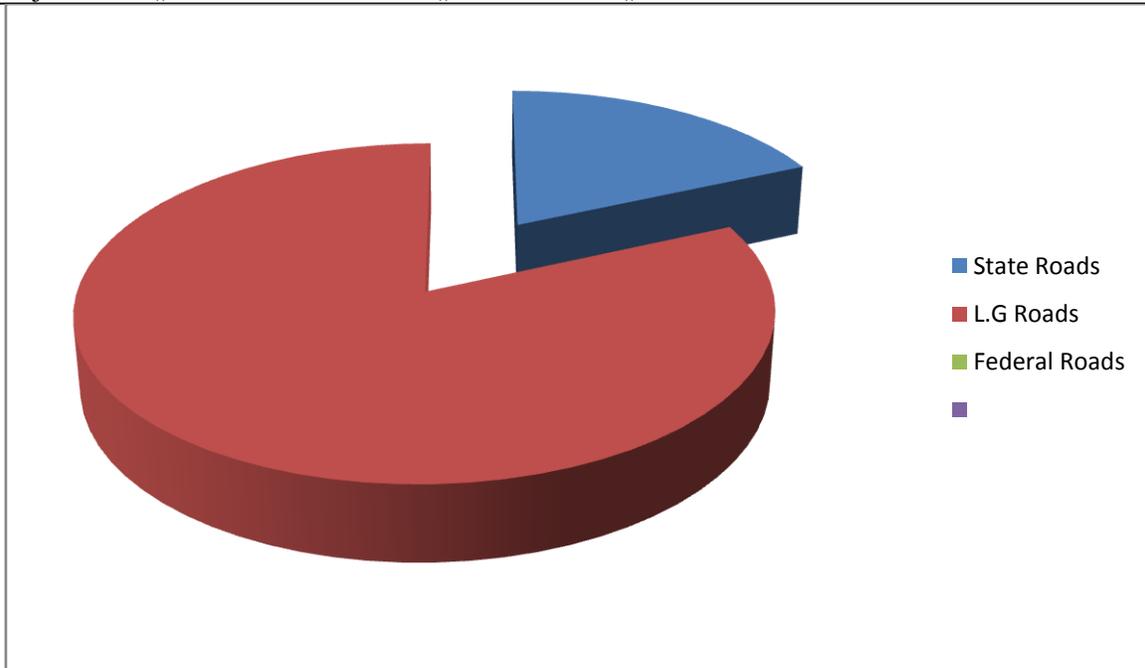


Figure 4.2(C): Road Length in Km for Gwarzo

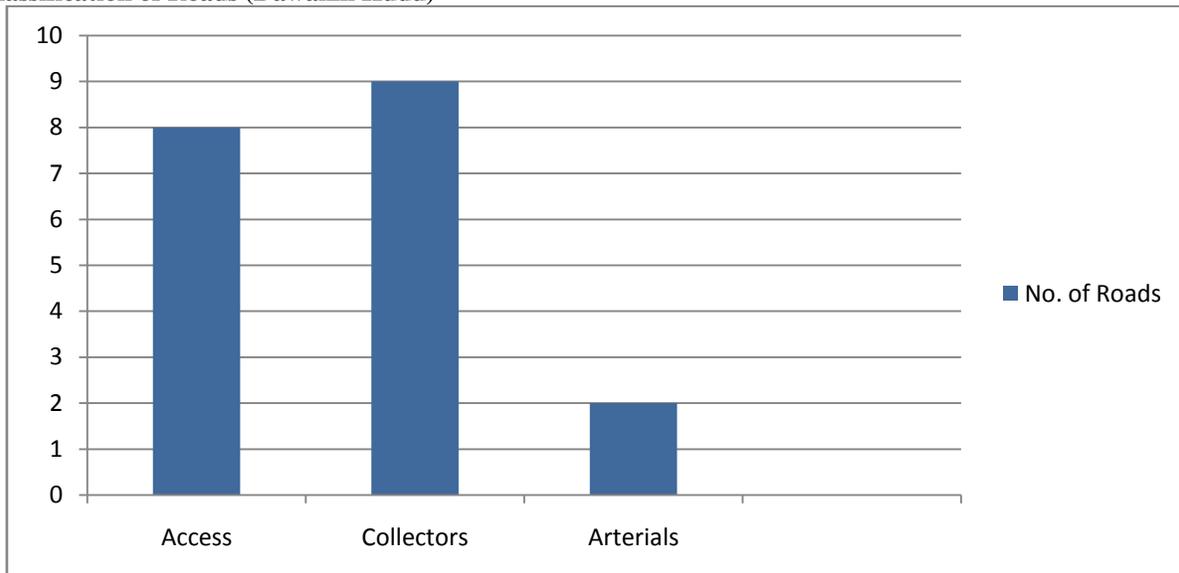


**Figure 4.2(d): Road Ownership (Gwarzo Local Government)**

#### 4.2.3: Dawakin Kudu

Figure 4.3(a), shows the number of roads in each functional classification. About 8 are access roads, 9 are collectors while 2 are arterials. All the 2 arterials originate from neighboring local governments, but rather it just pass through the local government. It was included only to simplify reference.

#### Classification of Roads (Dawakin Kudu)



**Figure 4.3(a): Classification of Dawakin Kudu Roads**

Figure 4.3(b), shows the types of surfacing for all the roads in Dawakin Kudu , about 47% of the pavements was made up of asphalt, surface dressed roads amount to 41.2% while unpaved roads amount to about 11.8%.

Figure 4.3(c), shows the length in kilometres of the different roadway functions, about 25.3km is for access roads, 81.6km for collector while 31.8km for arterial. Since all the arterials passing through Dawakin Kudu local Government did not originate from the local government, their total length was considered as the distance from point of origin within the local Governments boundary to the end of the roads within the boundary.

Figure 4.3 (d), shows the percentage of road ownership in Dawakin Kudu Local Government. 15.8% of the roads are owned by the state government, 73.7 % by the Local government while 10.5 % are owned by the Federal government. Most of the roads owned by the local government were mainly access. While some few access and most of the collectors were owned by the state government.

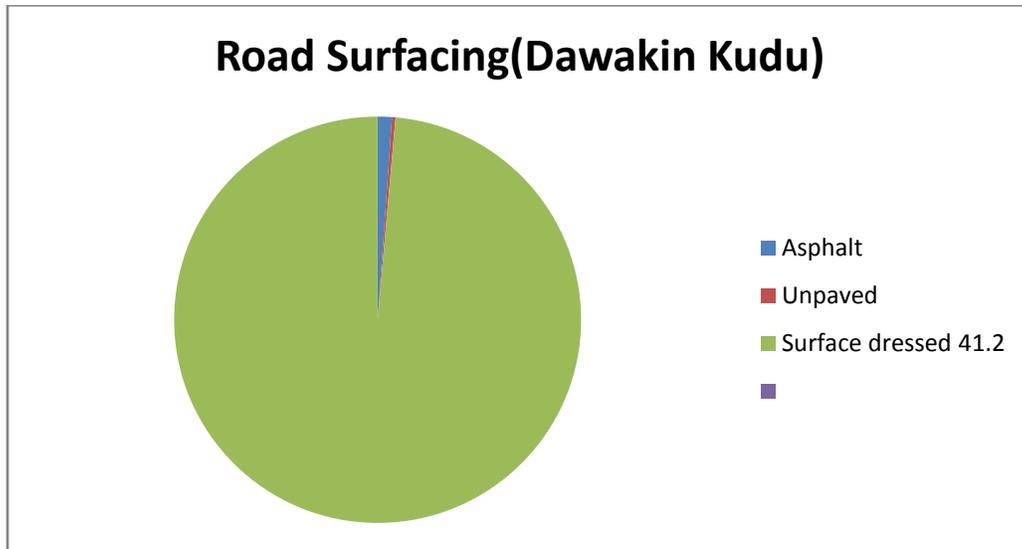


Figure 4.3(b): Road Surfacing types for Dawakin Kudu Local Government

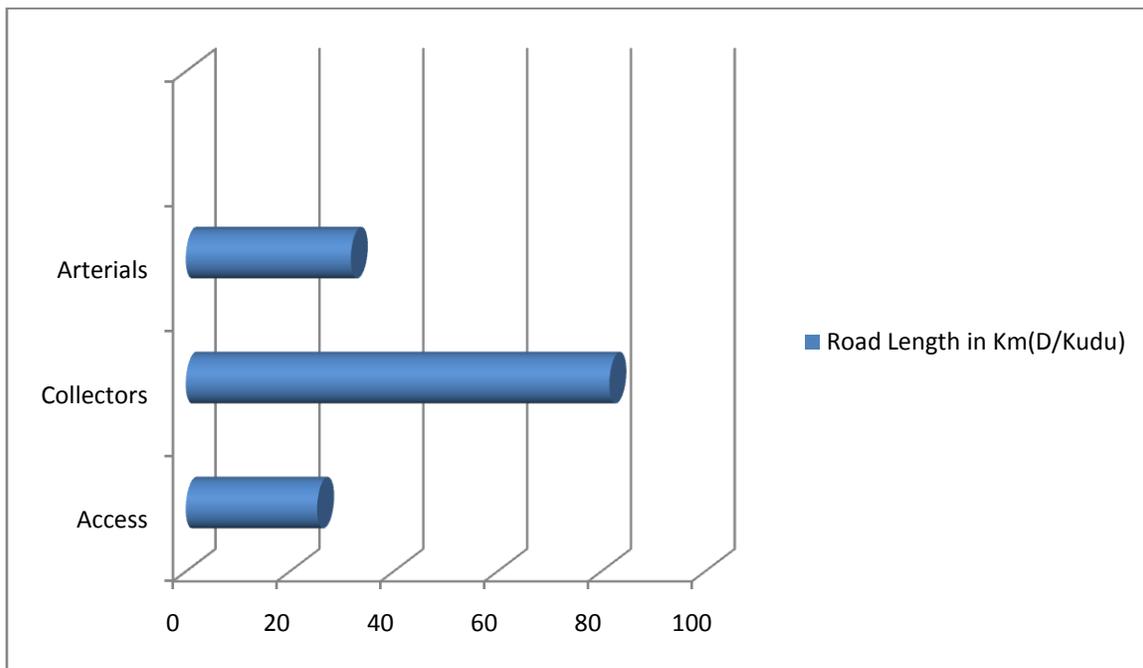
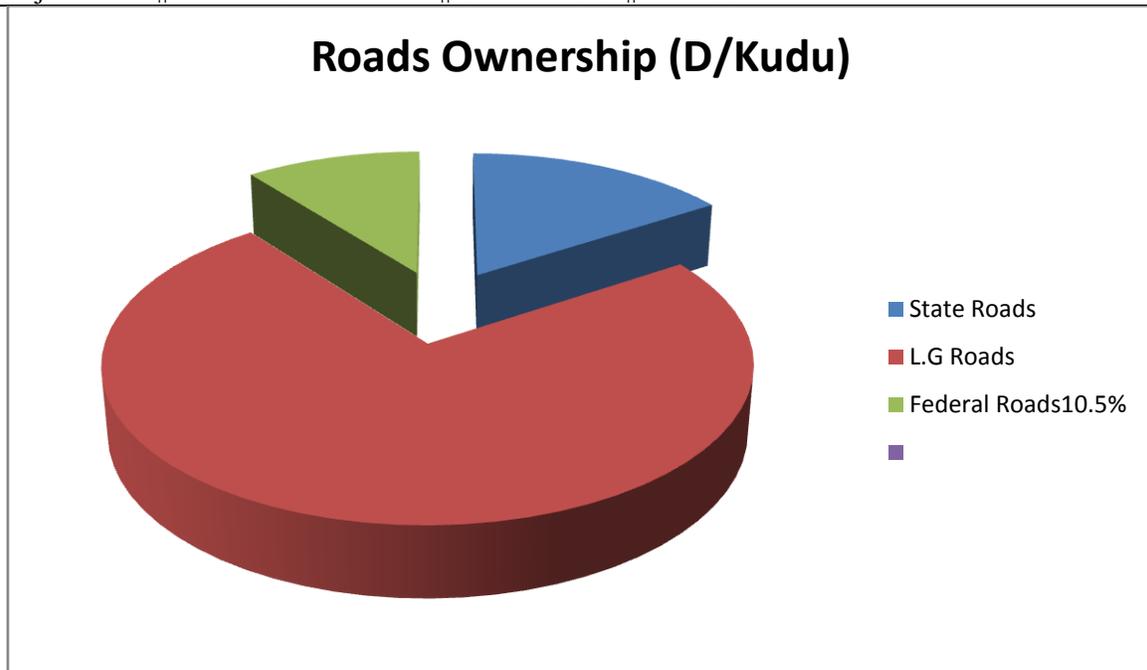


Figure 4.3(C): Road Length in Km for Dawakin Kudu



**Figure 4.3(d): Roads Ownership(Dawakin Kudu Local Government)**

#### **4.3: NEWLY DEVELOPED ROAD HIERARCHY**

From Figure 2.1, the classification shown was used in the following classification and from it based on the characteristics of the roads, arterials were sub-categorised into Arterial Interstate, Arterial Freeway, Arterial Expressway. The collectors were also sub-divided into Major collectors and Minor collectors. The Access Roads were maintained as it is.

Using the above hierarchy, all the roads were given a new classification; some of the Access Roads were upgraded to serve as minor collectors.

#### **4.4: NEWLY DEVELOPED NOMENCLATURE**

The nomenclature was developed from the Local Government Name, functional classification and serial number of a road. A system of 5-character codes was used for the development of nomenclature which consists of 3-letters and 2-numbers, the following codes were developed.

##### **First and Second Letters** (from name of LG)

KY-Karaye  
GW-Gwarzo  
DK-Dawakin kudu

##### **Third Letter** (functional classification)

A-Arterial  
C-Collector  
S-Access

Serial number: is a combination of two numbers ranging from 01 to 99

Example for using this system;

GWC01-Refers to Collector road in Gwarzo Local Government with serial number 01.

**Table 4.4:** Newly Developed Nomenclature for Gwarzo Roads

S/N	EXISTING NOMENCLATURE	NEW NOMENCLATURE
1	Kutama-Gude	GWA01
2	Dakwara-Kutama	GWA02
3	GwarzoKafi-D/Tunfafi	GWA03
4	Lakwaya-K/Jama,a	GWC 01
5	Fadailiyasawa-U/magaji	GWC02
6	Jaga	GWS01
7	S/birniDederi-Gude	GWS02
8	Bauda- U/katsinawa	GWS03
9	Kutama-Katata	GWC03
10	Getso Town	GWS04
11	Koya-Kutama	GWS05
12	Godiya Rd	GWS06
13	Gwarzokafi-Zango	GWC04
14	Lakwaya Rd	GWS07
15	Koya	GWS08
16	Danmaliki-Gammo	GWC05
17	Badari	GWS09
18	Getso-S/BirniDederi	GWC06
19	K/Kudu-K/Arewa	GWS10
20	T-Gwarzo	GWS11
21	Gude-GwarzoKafi	GWS21
22	S/Gari Kara	GWS12
23	Hospital	GWS13
24	Katambawa	GWS14
25	KofarGabas	GWS15
26	KwanarTsaure	GWS16
27	Gwarzo-Dayi Road	GWA04
28	Jamaa-Kutama	GWS17

**Table 4.4:** Cont'd

29	Zango	GWS18
30	Bichi Rd	GWC07
31	Gude- Danmadadi	GWC08
32	Yanguruza	GWS19
33	Getso-Kaura	GWS20

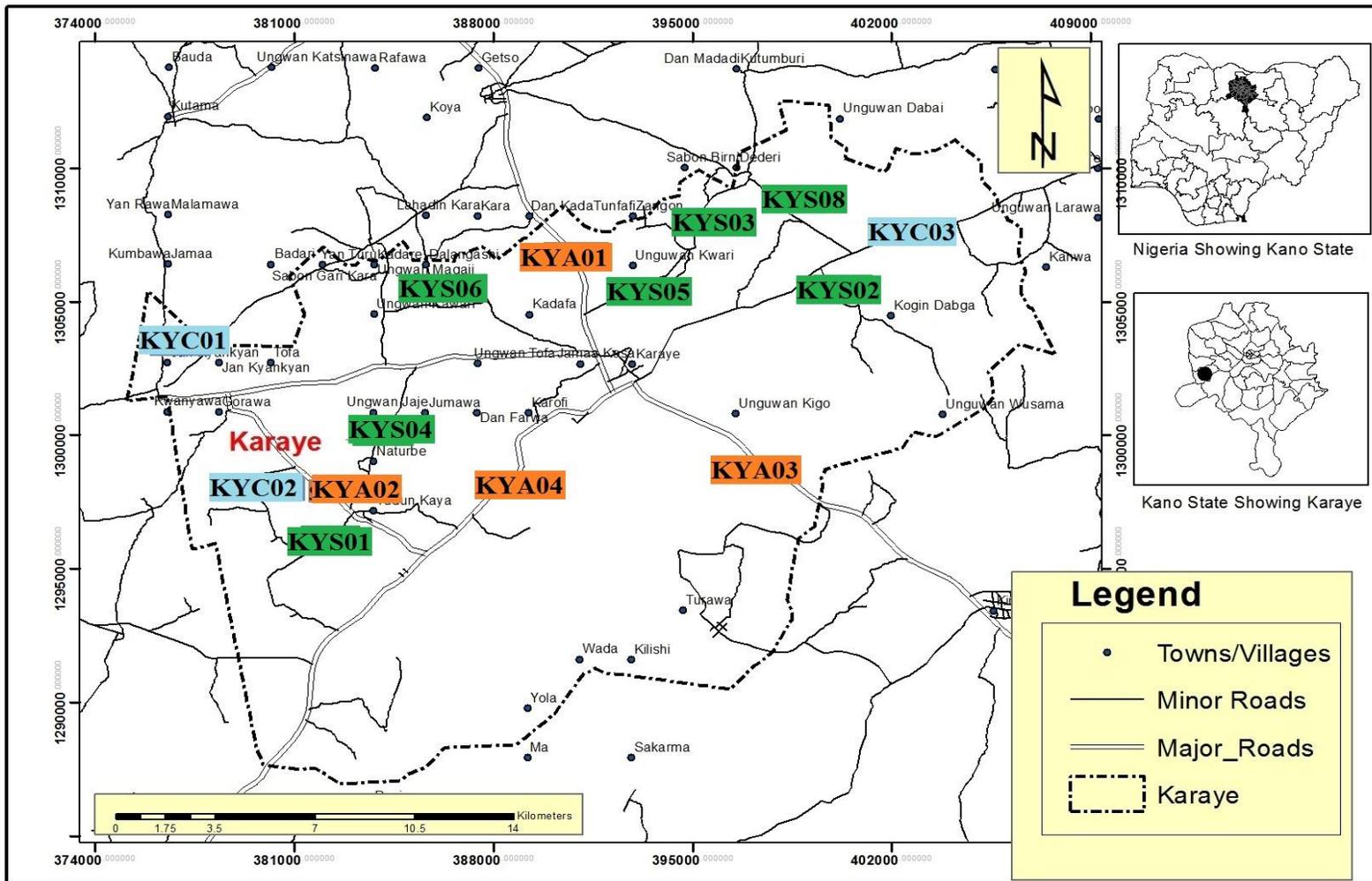
**Table 4.5:** Newly Developed Nomenclature for Karaye Roads

S/N	EXISTING NOMENCLATURE	NEW NOMENCLATURE
1	Jama,a-Kwanyawa	KYC01
2	Tudun Kaya	KYS01
3	Gorawa-T/Kaya Rd	KYC02
4	Karaye-Gwarzo Rd	KYA01
5	Rogo Rd	KYA02
6	KoginDabga	KYS02
7	S/BirniDederi-Kadafa	KYS03
8	T/Kaya-U/Tofa	KYS04
9	U/Kwari-Jama,a	KYS05
10	U/Magaji-U/ Kwari	KYS06
11	U/Larawa- Karaye	KYC03
12	Karaye Network	KYS07

13	Dederi – Yammedi	KYS08
14	Karaye-Kiru	KYA03
15	Karaye-Yola-T/kaya	KYA04

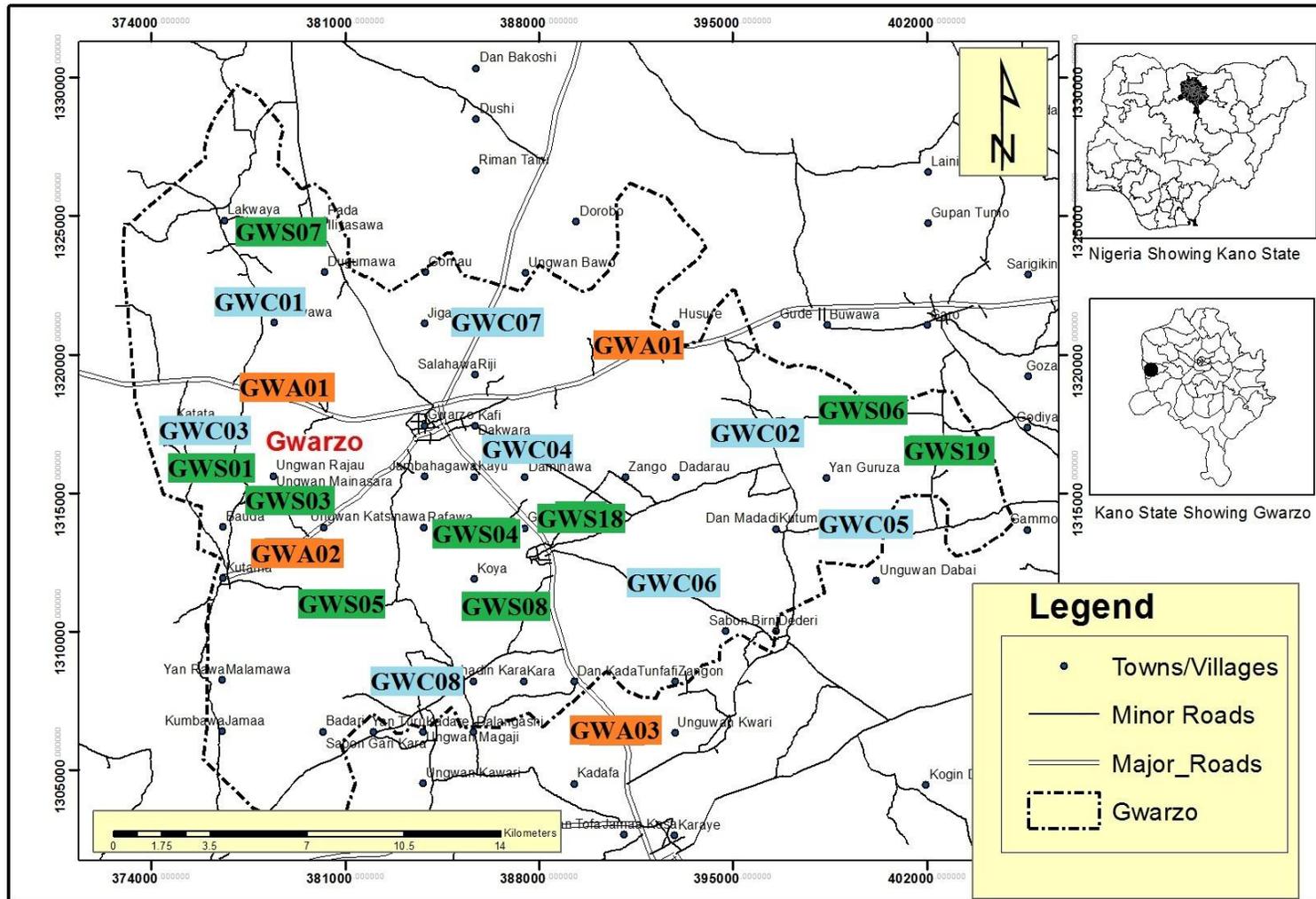
**Table 4.6:** Newly Developed Nomenclature for Dawakin Kudu Roads

S/N	EXISTING NOMENCLATURE	NEW NOMENCLATURE
1	Dawakinkudu-Tsakuwa	DKC01
2	Zaria-Dawakin Kudu Rd	DKC02
3	Zaria Road	DKA01
4	Tamburawa-Kumbotso	DKC03
5	Yankatsare-D/ Kudu	DKC04
6	Mariri-Gano-Wudil Rd	DKA02
7	Yargaya-Tsakwa	DKC05
8	LahadinMakole	DKC06
9	Tsaure-Kumurya	DKS01
10	K/Arewa	DKS02
11	TitinAsibiti	DKS03
12	KofarKore Rd.	DKS04
13	KofarGabas	DKS05
14	Hakimi	DKS06
15	Dawakin kudu-mariri	DKC07
16	Yargaya-Tsaure Rd	DKC08
17	Tsakuwa-Kumurya Rd	DKS07
18	Yankatsare Rd	DKC09
19	Tsakwa-Dawakinkudu	DKS08



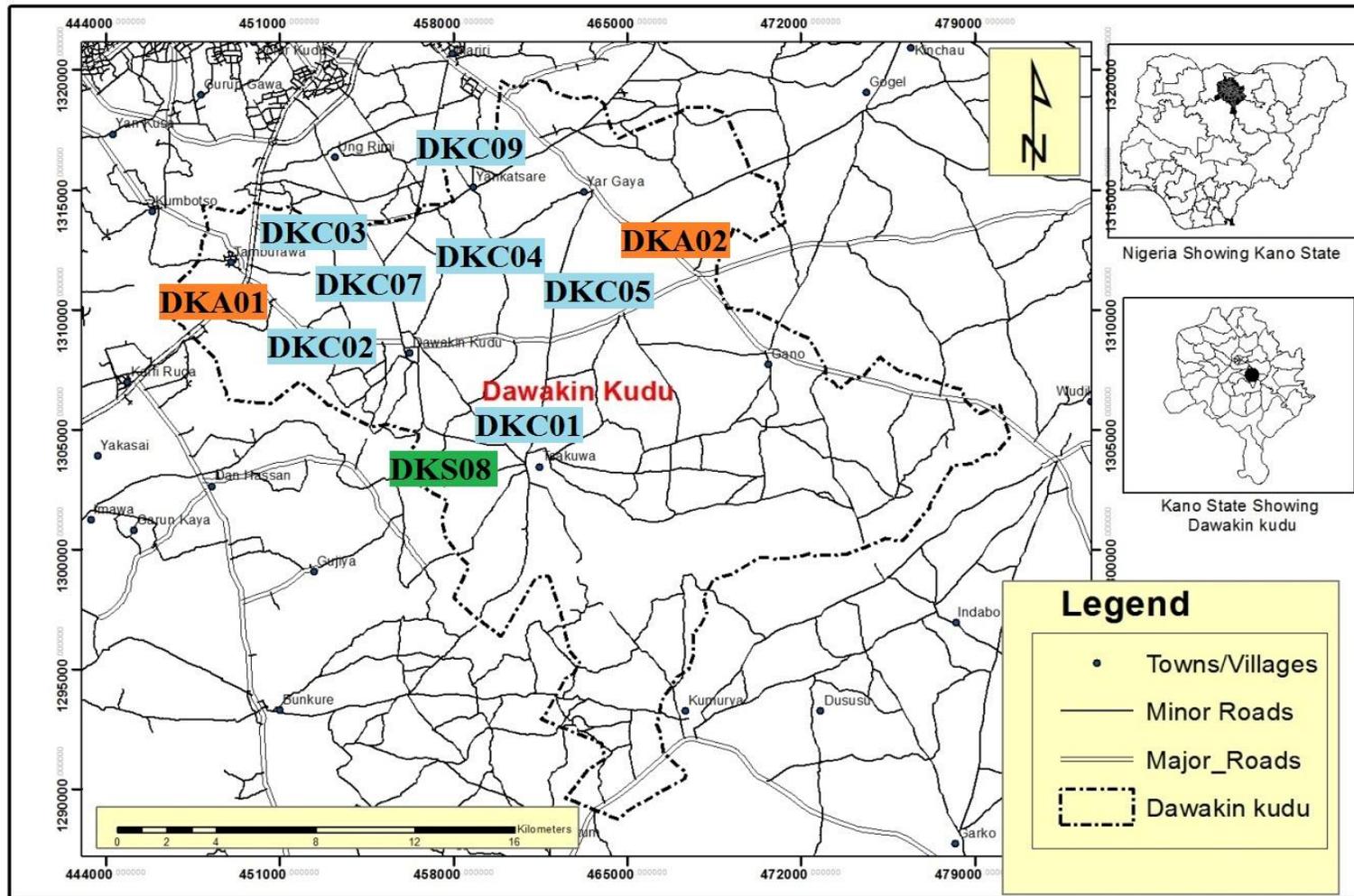
Source: Dept. of Geog BUK (2016)

Figure 4.4: Map of Karaye Local Government Showing the Newly Developed Nomenclature



Source: Dept. of Geog BUK (2016)

Figure 4.5: Map of Gwarzo Local Government Showing the Newly Developed Nomenclature.



.Figure 4.6: Map of Dawakin Kudu Local Government Showing the Newly Developed Nomenclature

## Conclusion and Recommendations

### 5.1 Conclusion

From this project, it can be concluded that the total length of the roads for Site 1, 2 & 3 are as follows;

- ❖ Site-1 (Gwarzo LG), about 19 roads was access roads, 9 are collectors, and only 5 is arterials. Surfacing of the roads was made with up to 48.5% asphaltic concrete, 12.1% for surface dressed roads, 0% for roads that are under construction, while the remaining 39.4% were unpaved roads. The 19 access roads covered a distance 54.3km 9 collectors covered 33.8km and 5 arterial covered a distance of 71.8 km within the site. About 0% of the roads were owned by the Federal Government, 18% were owned by State Government and the remaining 81% were owned by Local Government.
- ❖ Site-2 (Karaye LG) has a total number of 15 roads; in which 8 were access roads with total length of 54km, 3 collectors with total length of 33.8km and 4 number of arterial with total length of 71.8km. It was also discovered that 26% were unpaved, 14% were surface dressed, 60% were asphalt surfaced and 0% under construction. It also discovered that 66.7% of the roads were owned by the Local Government, 33.3% owned by State government and 0% owned by federal.
- ❖ Similarly Site-3 (Dawakin Kudu LG) has total number of 19 roads; in which 8 were access roads with total length of 25.3km, 7 collector with total length of 81.6km and 2 arterial has a total length of 31.8km. It was also found that 11.8% were unpaved, 41.2% were surface dressed, 47% were asphaltic and 0% under construction.
- ❖ The number of roads of all the three local government it was found that 11 arterials, 19 collectors and 35 access roads which measured to be 119.6 km for arterial, 187.2 km for collectors and 151.4 km for the access roads
- ❖ The nomenclature was developed from the Local Government Name, functional classification and serial number of a road. A system of 5-character codes was used for the development of nomenclature which consists of 3-letters and 2-numbers, the following codes were developed.
- ❖ **First and Second Letters** (from name of LG)
- ❖ GW-Gwarzo KY-Karaye DK-Dawakin Kudu
- ❖ **Third Letter** (functional classification)  
A-Arterial C-Collector S-Access
- ❖ Serial number: is a combination of two numbers ranging from 01 to 99  
Example for using this system;  
GWC01-Refers to Collector road in Gwarzo Local Government with serial number 01.

### 5.2 Recommendation

Sequel to the achievement of the project aim and objectives of the project the following recommendations were made;

- ❖ A road has to be classified base on the function they were intended to serve, not base on ownerships type.
- ❖ Roads has to be constructed and used based on their functionality; merging arterial and access roads together is inappropriate, there has to be collector between them which serve as intermediate. To reduce traffic congestion and accidents on the roads.
- ❖ Our authorities does not have unique system of naming roads base on their functions, therefore we recommend the authorities to adopt the nomenclature system provided in this project.

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