Sudan University of Science and Technology
College of Graduate Studies
School of Civil Engineering

Development and Improvement of Traffic Flow and Artistic Elements in Omdurman City Centre

تطوير وتحسين التدفق المروري و العناصر الجمالية لوسط مدينة امدرمان

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Civil Engineering (Road Engineering)

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بسم الله الرحمن الرحيم

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Civil Engineering (Road Engineering)

BY

Mohammed Ismael Mohammed Ibrahim

(يرفع الله الذين آمنوا منكم والذين اوتوا العلم درجات والله بما تعملون خبير)

سورة المجادلة-آية 11

Dedication

To my mother

To my father

To my family and teachers

Acknowledgement

First, my thanks must be to Allah, who helped me to complete this dissertation.

I am also greatly indebted to all people who have contributed to this study in term of academic input, moral support and encouragement.

Special thanks to my research supervisor, Dr. Tarig Obeid Medani for his appreciable and valuable supervision, advices, guidance and assistance throughout the study. Considerable thanks are due to staff of civil Engineering Department, Sudan University of Science and Technology for their assistance and support.

Last, but not least, gratitude to Engineer, Abu Baker for his excellent co-operation, support and interest.

Abstract

This research aims to study the problem of traffic congestion in the heart of Omdurman city, specifically in the area between the house of the intersection of leader Al Azhari and local building and cemeteries Ahmed Sharafi and Hilal Stadium, activities varied in the study area, we find the government buildings, hospitals, universities and schools, in addition to the activities of commercial and business and the presence of the private sector the largest gathering point for transportation in the city.

And also the analysis of the aesthetic and traffic elements of the center of Omdurman city through the current reality evaluation of these elements and to identify the positive and negative effects, and to develop proposals that will help to develop the area aesthetically and traffic and functionally.

The study is based on methodology mainly on the descriptive and analytical approach based on available from the city of Omdurman and status information (questionnaire, personal interview, field survey, counting the traffic)

The results indicated that the Omdurman city center suffering from traffic jams and declining lay in the level of service in roads that the basic measure of the state of the road, optical distortion represented in the facades of buildings and billboards and umbrellas shops and sidewalks, as well as the lack of the area components aesthetic, the lack of public services and utilities.

The study concluded that a set of recommendations, the most important of the need to solve the traffic congestion problem and the local Omdurman reorganization of the city center and through the organization of spaces and squares, providing the area with furniture streets, study traffic and pedestrian traffic in the area and the organization of the billboards, and the restoration of the old and historic buildings and rehabilitation.

المستخلص

يهدف هذا البحث إلي دراسة مشكلة اختناق حركة المرور بقلب مدينة امدرمان ، تحديداً في المنطقة المحصورة بين تقاطع بيت الزعيم الازهري و مبنى المحلية و مقابر احمد شرفي و استاد الهلال, تتنوع الأنشطة في منطقة الدراسة فنجد فيها المباني الحكومية والمستشفيات والجامعات والمدارس، بالإضافة لنشاطات تجارية وأعمال القطاع الخاص ووجود أكبر نقطة تجمع للمواصلات بالمدينة.

وايضا تحليل العناصر الجمالية والمرورية لوسط مدينة امدرمان من خلال تقييم الواقع الحالي لهذه العناصر وتحديد المؤثرات الإيجابية والسلبية ،ووضع مقترحات تساعد على تطوير المنطقة جماليا ومروريا ووظيفيا.

وارتكزت الدراسة في منهجيتها بشكل أساسي على المنهج الوصفي والمنهج التحليلي بالاعتماد على المعلومات المتوفرة عن مدينة امدرمان ومركزها (الاستبيان,المقابلة الشخصية،المسح الميداني،الحصر المروري) .

وأشارت نتائج الدراسة إلى أن مركز مدينة امدرمان يعاني من واختناقات مرورية وتدني واضع في مستوى الخدمة في الطرق الذي المقياس الاساسي لحاله الطريق, وتشويه بصري متمثل في واجهات المباني ولوحات الإعلان ومظلات المحلات التجارية وأرصفة الشوارع ،وكذلك افتقار المنطقة للعناصر الجمالية إلي جانب نقص الخدمات والمرافق العامة .

وخلصت الدراسة إلي مجموعة من التوصيات ،أهمها ضرورة حل مشكلة الزحام المروري وقيام محلية امدرمان بإعادة تنظيم وسط المدينة ومن خلال تنظيم الفراغات والساحات ،تزويد المنطقة بأثاث الشوارع ،دراسة حركة المرور والمشاة في المنطقة و تنظيم اللوحات الإعلانية ،وترميم المباني القديمة والتاريخية وإعادة تأهيلها.

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CHAPTER 1

Introduction and methodology

1.1 Introduction:-

As a result of the continues development of communities and increase in the size of the population, the size of cities and pollution has increased causing suffocation in some areas, and as a result it becomes a necessity to develop solutions to this problem. This requires human intervention to guide, develop and organize a comprehensive work plan to preserve and protect the environment.

The planning is a flexible process that really between science and art to put an end to the chaos caused by the abuse of individual freedom. However, developing countries failed to build public facilities and services in existing cities. The population sprawl spreads in all directions without any sort of planning wasting the financial and human energy. We need to realize that we are planning for the future, and hence we have to establish a viable and solid ground for present and future generations within flexible frameworks open to modifications and adjustment to accommodate new developments.

It is disturbing to see a number of wrong practices applied and enforced without prior planning causing overpopulation, chaotic urban growth and consequently crisis and problems of unhealthy housing, traffic congestion and lack of basic facilities such as electricity, water and infrastructures.

1.2 Problem of the study and its relevance and rationale:-

The current aesthetic situation of city centers in Sudan in general and Underman, in particular, lacks the aesthetic of the magnificent elements like (car parks, green

areas, open spaces, street furniture, advertising panels, the particular traffic Islands, seating areas the ancient historical area, Etc.). All these elements are needed in cities and main streets to facilitate the movement of citizens and business, and provide entertainment and amusement to the people.

For the city of Omdurman and its city center, most of these items are unavailable. This may be caused by the absence of proper planning of these areas or the fact that local authorities focus much of their efforts towards things like water and electricity supply, street's maintenance, etc., or could be caused by the lack of cooperation between the different authorities responsible for the urban planning and design.

Hence the importance of this study is to try to identify the current status of aesthetic elements in downtown, the problems and obstacles and then put some proposals to improve these items by using the urban design to identifying the needs of the region.

1.3 The importance of this study is highlighted by the following aspects:-

1 – Omdurman City needs the evaluation and study of the current situation in terms of planning, traffic and aesthetic.

2 - The problem faced by the Omdurman city center is due to the lack the graphic elements and visual aesthetic.

3 – Need to develop planning strategies for the city center to be used by the local authorities involved.

4 - Lack of previous studies dealing with the issue of visual elements and aesthetic.

5- Study flow and traffic jams.

1.4 Objectives of the study:-

This study sought to achieve the following goals:

1. Studying and evaluating of the current state of the downtown area of Omdurman city.
2. Identifying the resources and capabilities that characterize this region and their characteristics.
3. Identifying the problems and obstacles that limit the impact of traffic, visual and aesthetic factors and solving these problems.
4. Conducting Research in the possibility of achieving the development and improvement in all aspects.
5. Solve the problem of traffic jams.
6. Developing strategies to contribute to the preservation and sustainability of integrated traffic and aesthetic of the city center of Omdurman.
7. Highlighting the problem of traffic congestion in the heart of Omdurman and the study of the etiology him

1.5 Research hypothesis:-

In the absence of a holistic and effective local planning and lack of coordination between the national planning bodies and institutions, and the poor awareness, poor service, and with the absence of the real role of central cities to control and manage the natural resources, the Visual and aesthetic balance can contribute to balance the aesthetic aspects and reduce visual pollution in cities that facing these challenges and drawbacks.

1.6 Study area:-

This study focuses on the central area and the commercial center in the city of Omdurman and can be selected (Cemeteries Ahmad Sharafi – Al Morada - Stadium Al Helal –Al Hejra).

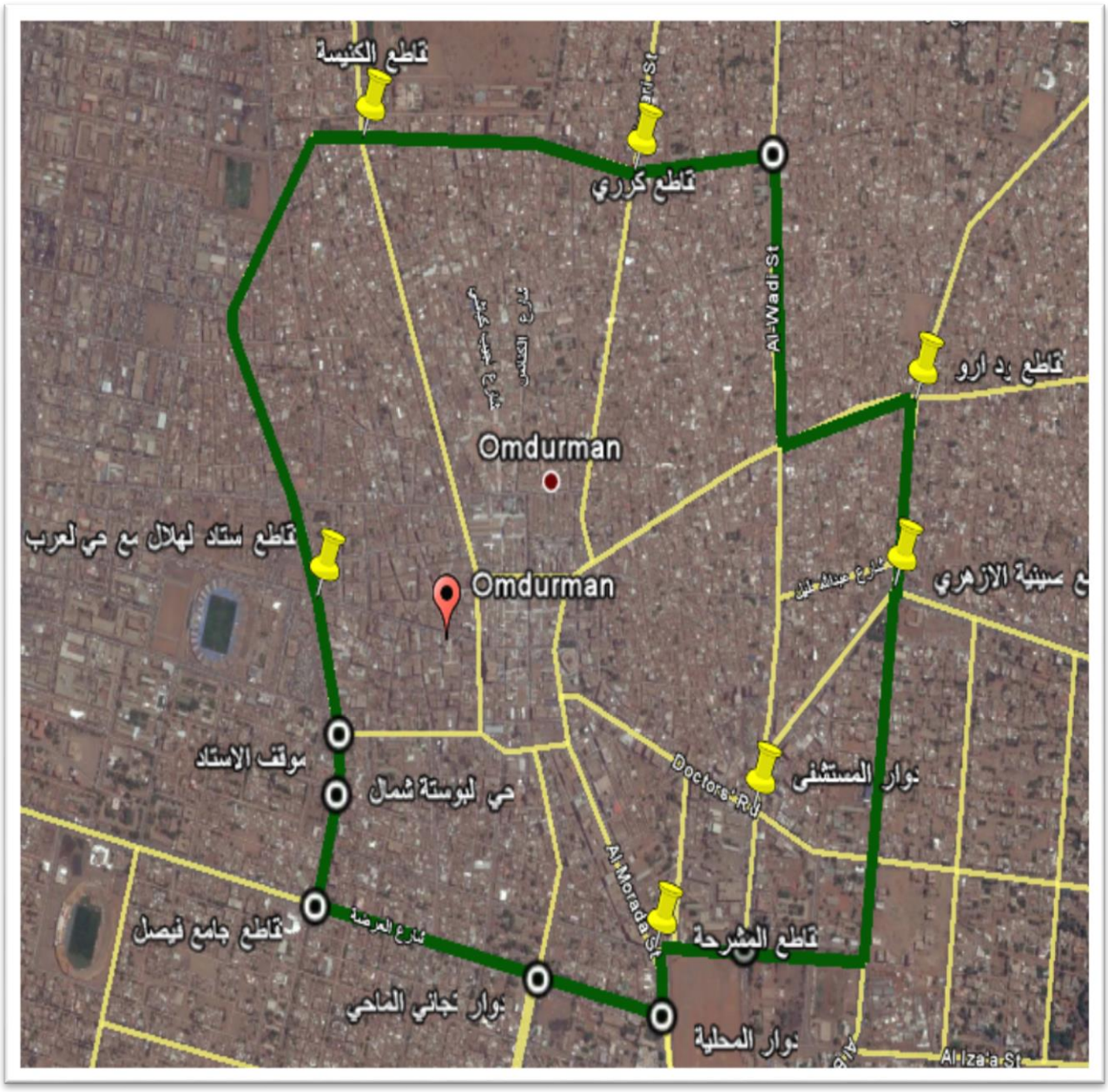


Figure 1-1 Study area (source Google map)

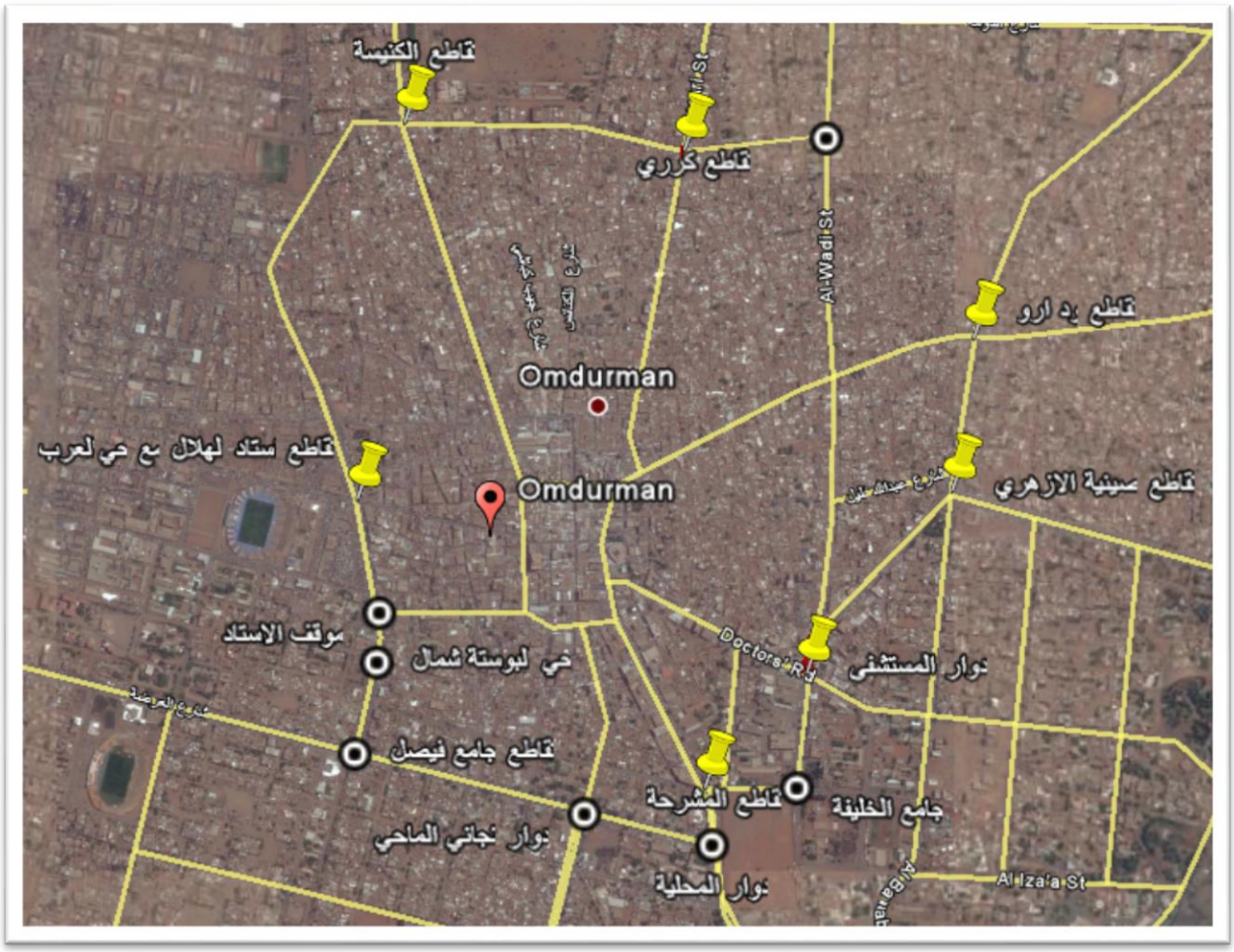


Figure 1-2 Main roads (Google map)

1.7 Plan and methodology of the study;-

The methodology based on the following frames:

(1) **Theoretical framework**: the framework includes access to sources, references, studies and research related to urban planning, planning of the commercial center, the planning, design and visual aesthetic elements in cities.

(2) **Information collection**: included field study and the study of the current reality of the study area in terms of the different uses of the elements of the existing buildings, streets and sidewalks, as well as to identify the problems of this region.

(3) **Analysis and evaluation**: analyze and evaluate the current situation and to highlight the problems and difficulties of the study area, and try to develop proposals for the improvement and development of the region. Mainly been the adoption of the historical method and descriptive analytical method, in addition to the inductive approach, It was also the use of tools such as the resolution of scientific research, observation and interview.

1.8 Sources of information:

Study is based on the following sources of information:

- Office sources: include books, references, thesis and journals on the subject of the study.
- Official sources: includes data and information from official institutions such as the Central Bureau of Statistics of Sudan, the Ministry of Planning, Public Administration to traffic, local Omdurman.
- Non-official sources: publications and reports published by the Community institutions and research centers.
- Personal sources: include information that will be collected by the researcher through field survey and personal interviews, the researcher's experience through specialization in engineering and jobs.
- Interviews: interviews with twenty one (21) different individuals from different related areas (architects, planners, engineers, experts, impact, environment, community, shop, local architects, students from the Faculty of engineering).

- Traffic account: It has been traffic account in the main streets in the area and then determine the control points in the study area
- Survey questionnaire: questionnaire has been designed in a way that it consists of two main parts and several questions that can cover the subject.

Part one: respondent's general information's, which included (age, sex, marital status, educational level, occupation, place of residence).

Part two: information of the properties of aesthetic and traffic for the study area.

• Two hundred (200), questionnaires were distributed to a one hundred forty seven (147), shopkeepers and fifty three (53) questionnaires were distributed to local community and visitors to the region.

• The questionnaires were distributed in between (14\8\2014.-11\10\2014.)

• Analysis of the results from the questionnaires using (SPSS) program.

1.9 Contents of the study

The research plan and methodology is divided into five main chapters, consists of:

- Chapter 1: introduction and methodology,
- Chapter 2: contains the general and basic concepts and theories of urban planning as well as design and aesthetic elements and traffic, in addition to the study of similar situations along with an overview of the city of Omdurman where the site and population status of urban planning.
- Chapter 3: the current reality of traffic and aesthetic elements of Omdurman city center were analyzed.
- Chapter 4: Calculations and data analysis in three stage, the visual elements of the area , survey and the elements of the traffic flow

- Chapter 5: handled solutions and proposals for the development and regulation of the properties, aesthetic elements and traffic to Omdurman center.
- Chapter 6: includes the research findings and recommendations for further studies.

CHAPTER 2

Literature Review

2.1 Introduction:

Urban Design is one of the important items in a contemporary urban planning. It mainly deals with the human senses, and includes both the systems and the form of the urban environment.

It represents the regulatory process for a group of buildings and urban spaces correlated with each other in a certain way that forms a visible entity that follows some basic principles, related to the unity, system, and proportionality between those urban entities. [2]

Urban design represents the bridge that links architectural design with urban planning; it serves as an environmental regulator of urban areas, and some people consider it as a tool to deal with determining the spatial identity, through configuration of the urban space. Urban design is used to find appropriate solutions to existing problems, at the urban level, which highlights the aesthetic and environmental problems in the content, and linking it directly with the problems of urban life and the nature of the city's functions. [3]

Urban environment represents the result of interaction between these aspects with each other, and the physical aspect is considered to be the main element of the process of urban design. It also determines the form in which the urban environment is shown. One of the important things to be considered by the urban designer is the impact of economic variables and the effect of these variables on the physical condition of the urban environment. [8]

2. 2 City planning:

The city is a relatively closed social pattern that includes the ecological, historical, geographical, legal, political, economic and architectural dimensions, and involves a greater degree of social organization. It also involves more internal and external communications that facilitate the social changes, cultural interaction and technical and scientific interaction. The main elements of the city are Streets, roads, bridges, metro, tunnels, canals, trains, airports, ports, water, electricity, sewage and storm water drainage systems, homes, buildings, and other facilities. [5]

The city planning is all about making it a convenient place to live and work in so that people can achieve social, economic and cultural progress through the following:

1. Improving the relationship between houses and streets, industrial areas and public services, in such a manner that will not overshadow other areas and find some kind of harmony between them.
2. Maintaining public parks and squares in residential areas by planting more trees and green areas, to be a convenient place for people to spend their free time.
3. Separation of residential and industrial areas as far as possible to reduce noise levels and provide a healthy environment free from pollution which is suffered by most of the world today.
4. Enhancing the beauty of the city by following a specific standard for the design of the building that creates harmonious city with urban and architectural characteristic.
5. Allocating certain areas shopping, car parking, bus stops and create integration between different parts of the city, for example, a health clinic serving the neighborhoods close to each other.
6. Providing all the necessary services such as water and power supply and sanitary system to all parts of the city in a fair manner.

7. Developing of the economic structure of the city, and encouraging investment to increase production and create jobs for the city residents, and develop the city capabilities.
8. To support and encourage the good social values, behavior and actions of people.
9. In general, city planning is inseparable from the general scheme of the State or the society, each of which supports and complements the other, and city planning primarily means the development and improvement of the city to serve as a human settlement and contribute to and serve the community. [3]

2. 3 Conceptual planning of urban design

Urban design is an integral part of the process of town planning. In general, it is a three dimensional visualization design that also deals with non-Visual, environmental factors such as pollution and the sense of danger or safety which effectively contribute to configure the properties of the study area.

The researchers considered urban design, as part of city planning, which deals with the aesthetic values and decides shape (Form) and management (Order) in the city. Others define it as the plan to provide urban environment with the characteristic to handle the urban physical, social, economic and aesthetical requirements through a gradual and prolonged coherent physical system that can be implemented as a continuous and flexible design process so that the kinetic dynamic urban configuration remains in the modern level corresponds to the circumstances of life changing. This is called detailed planning which is one of the planning stages where the preparation of the projects planning that makes up the General layout of the town or village And basic urban design qualities: Organizing the physical elements and human activities that make the environment to build. Urban design includes a Visual relationship between the areas of modern development, and the current form of the city as well as social, economic and political requirements and

available resources, and also the relations between the different patterns of movement in urban areas. [7]

2.4 Elements of urban design:-

It is often synonymous with the concept of the urban fabric, and (Kevin lynch) give a definition for the concept of urban as it represent the nature of the spatial distribution committed to human activities, and physical components of the urban environment. He has identified five main parts as the basic elements of the urban structure (Lynch, 5691st):-

1. **Motion paths (Paths):** where individuals are aware of their city through their movement and transportation in these channels, with different levels of mobility (pedestrian corridors, walkways, streets, railway lines.....Etc.).
2. **Sections of the city (Districts):** These are medium or large sized divisions, aware that it's two dimensions with certain privacy that distinguish it from others, and clearly reflected in the urban shape of those sectors, while sometimes overlapping with each other (as in the central area) in such a way that it would be difficult to distinguish them clearly.
3. **Boundaries (Edges):** The end of sections is defined as edges, but sometimes there are sectors fade gradually (from no borders aware) and disappear with another.
4. **Landmarks** :the most prominent visual features of the city, some are very large, and can be seen from a great distance, while others are small and can only be seen close(as statues and Fountains and monuments....Etc.) But the big ones are as high buildings with a specific job.
5. **Centers events or functional nodes (Nodes)**: which is about centers and axes and certain functional, which is similar to the hallmarks as a matter of principle,

but differ in terms of the fact that it represents a pillar optical element to attract prominent. [6]

2. 4. 1 Visual treatments to form the city: -

There are many treatments that can be performed to confirm the clear configuration, and easily comprehended and integrated image and rich. Visual area, for example, is the part of the city which is clearly identified with simple formation and sustainability of buildings (functionally And morphologically) and which varies from all parts of the city, with a clear and strong borders that make it distinctive in keeping it connected to the adjacent neighborhoods and (Visually Concaved) which produces the sensation of entry and exit of or sense of internal and external (inside-outside sense).

The following highlights the optical treatment to be considered in shaping cities:-

1. Exclusivity or (Singularity)
2. Simply set-up (Form Simplicity).
3. Continuity of elements composition: (Continuity.)
4. Clearly contact (Clarity of Joints).
5. Differentiation in directing traffic. (Directional differentiation)
6. Confirmation of the optical range: (Visual Scope).
7. Confirm the perception of motion .(Motion awareness)
8. Sequence of elements of the composition (Time series)
9 .Names and Meanings. [8]

2. 4. 2 Aesthetic and functional values in Urban Spaces: -

The city does not only consist of blocks of ground-based buildings but also a set of empty spaces between buildings, each one has its importance and function of its own. Urban Spaces consist of a range of different elements that give it its character and personality, so it must be carefully and accurately developed when determining the forms and their relationship. There must be homogeneity and balance between architectural elements (buildings) and natural elements within the urban Spaces.

City life is of two types: general and private life. The general life is the streets, squares, public parks and open spaces, and a private social life that needs to be away from the crowds looking for tranquility, privacy and indoor closed space.

When planning these streets we must separate the different function of each of the streets, open spaces, pedestrian-, car-parking and shopping places and at the same time aesthetics. [5]

Streets and public squares, parks and squares are the places where people exercise their activities, and need to be equipped with furniture in the context of a holistic design and include, seats, fountains, posters, optical signals, infantry barriers, kiosks, bin, mail boxes, lighting and other devices.[7]

People needs places to sit, beautiful lighting that fit individual needs, whether walking or riding. Billboard can constitute an attractive view for buildings, which are placed or attached to them. Citizen needs places to drink, and barriers to prevent encroachment cars, places to keep flowers, and kiosks selling newspapers and magazines, cars shed for protection from the rain and the heat of the sun .[7]

2.5 Network Planning

The improvement and development of highway network and intersections in the cities is the most important aims that must be used by decision maker in order to be most suitable agents the highly progress of traffic and transportation, where the (Level of Service (LOS)) is the best pointer about traffic characteristics like design speed, flow, density, trip time, and safety crossing for pedestrians.

Network planning is the highest level of planning under taken for the road network.

It enables Roads and Traffic Authority to develop a broad understanding of the current performance of the network and future performance based on forecast demands. The Roads and Traffic Authority has established an integrated network planning approach such that safety, traffic and asset Performance are considered together to improve Roads and Traffic Authority total view of the network.

This helps to identify those Parts of the network that are performing well and other areas that warrant further more detailed investigation and potentially future works. The network planning process is a necessary precursor to corridor planning.

It assists to put the relative importance and performance of each corridor into a network context. It is a useful initial Process to priorities sections of the network for future works, and therefore, optimize the allocation of limited Funds to maximize benefits to the community. [9]

2.5.1 Network performance data

Network performance analysis relies heavily on Quantitative data collected by a number of different Roads and Traffic Authority business areas. Roads and Traffic Authority's Road Information and Asset Technology Branch specializes in providing access to this data, and is capable of processing and presenting the

information in various formats. The kinds of data that are current and readily available and can be drawn on to inform network analysis include:

- Vehicle crashes
- Traffic volumes
- Traffic flow
- Traffic composition
- Road capacity
- Traffic origins and destinations
- Population and employment
- Forecast land-use changes
- Pavement roughness
- Sealed shoulder width [9]

2.5.2 Level of service (LOS)

Is a qualitative measure used to relate the quality of traffic service? LOS is used to analyze highways by categorizing traffic flow and assigning quality levels of traffic based on performance measure like speed, density, etc. [9]

LOS		Definition	Typ. Illustration
Acceptable	A	Represents a free-flow operation. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	
	B	Represents reasonably free-flow operation. The ability to maneuver within the traffic stream is slightly restricted.	
	C	Represents a traffic flow with speeds near or at free-flow speed of the freeway. Ability to maneuver within the traffic stream is noticeably restricted.	
	D	Represents speeds that begin to decline with increased density. Ability to maneuver within the traffic stream is noticeably limited.	
Unacceptable	E	Represents operation at its capacity. Vehicles are closely spaced within the traffic stream and there are virtually no useable gaps to maneuver.	
	F	Represents a breakdown of vehicle flow. This condition exists within queues forming behind the breakdown points.	

Figure 2-1 Level of service

2.5.3 Road Network Hierarchy

The road classification system recognizes the needs of different road user s and the transport and non-transport functions of roads. It recognizes the wide range and balance between mobility and access on the road network.

This is largely driven by the relationship between the road network and the land use it serves. There is a basic necessity for cars, trucks, buses, cyclists and pedestrians to travel on the road network to access a wide variety of land uses.

However, not all roads can cater effectively for all road user needs nor perform all functions efficiently.

It is important that roads are managed according to a functional hierarchy which consider s each road's intended purpose. This approach ensures an appropriate balance between movement and access on the road network. [9]

2.5.4 Road purpose and users:

The purpose of the road network is to provide for the safe and efficient movement of people and goods.

It provides access to land uses and may provide on-street par king. The road network is an integral part the total transport system. It supports economic Development and the social functioning of the Community and provides a structure around which a built environment can be formed. [9]

Road user s include passenger, freight and commercial vehicles, buses, motorcycles, bicycles and pedestrians. While these user s are varied they share a common desire for safe, efficient and reliable movement through the road network. To manage the road network in response to the needs and impacts of particular user s, road authorities often use road classifications and devise sub-networks that share specific design and access attributes. Some examples are:

• Appropriate geometric inter section design and controlled routes for heavy vehicles;

• Designated routes, bays, layover s and interchanges for buses; and

• Integrated local and regional on- and off-road facilities for bicycles and pedestrians [9]

2.5.5 Road type and function:

Road travel involves movement on a network of roads – local, collector, sub-arterial, arterial and motorway. It is desirable to encourage the movement of user s of the road network in a logical and efficient manner.

A wide range of factor s influence how a road should be managed, including its functional capability, current and expected future travel demands that they must Satisfy and community expectations. While safety is always a prime consideration, from a road function view point essentially two needs must be balanced:

• Mobility – The movement of people and goods.

• Access – The ability to enter/exit land use adjacent to the road.

At the two extremes, motorways provide a high level of mobility and local roads provide a high level of access. However, in practice most roads have developed with a mixed function in between these two extremes, as shown in Figure [9]

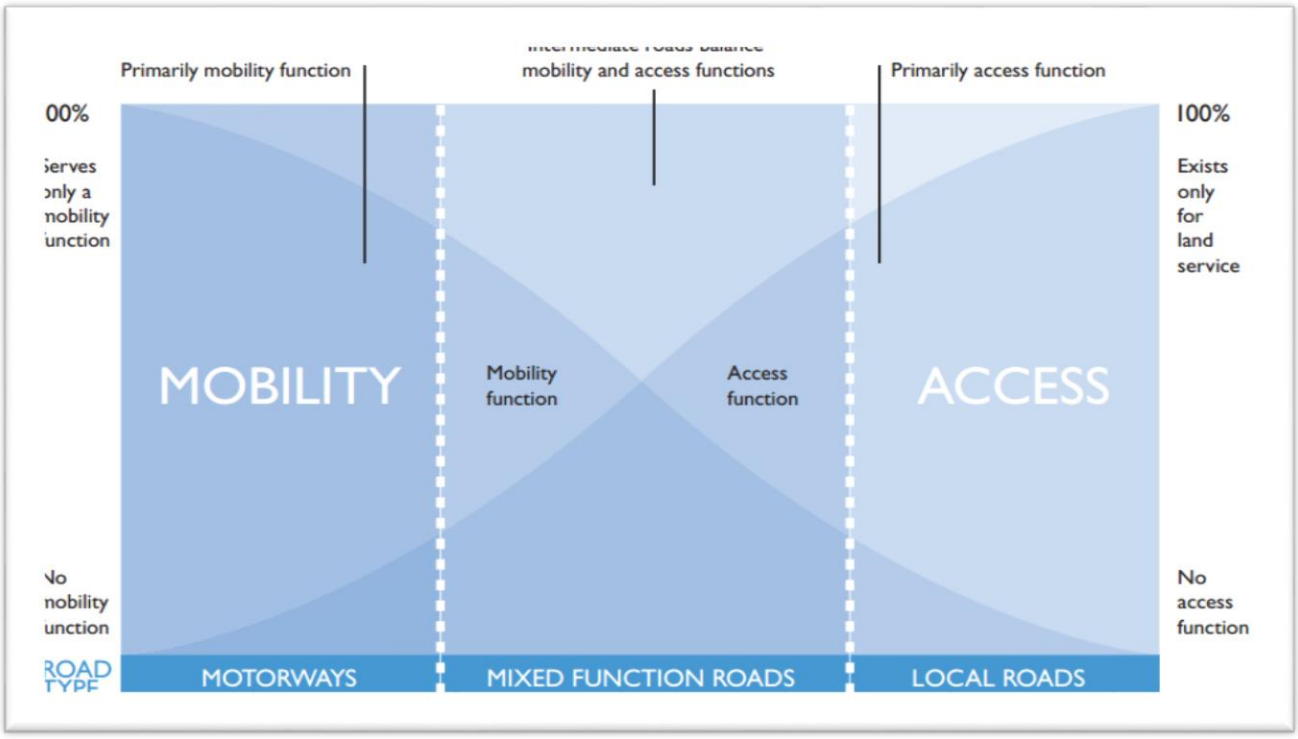


Figure 2-2 Mobility and access relationship

A summary of the available means of transport in the city of Omdurman, namely:

First: Taxi

Secondly - the civil bus (commercial): That the problem of these buses is the lack of space dedicated to stand often surprise the owners of private cars to park the bus when seeing the customer without being preceded by an alert or signal must be the need for reorganization of this service and for reasons including: the survival of this service is a given and the reality is difficult to change it, The bus owners offer popular dependable service by passengers addition, the owners of these buses are delivering economically efficient and high returns service for their owners as most of the bus owners covers the conduct of the service expenses in addition to the excess profit, as well as the fact that this pattern does not cost the state a government subsidy.

Third: private cars: It has to be taking into account that the car even if there was a transport network, it will continue to exist and the reasons for the acquisition of multiple and many people own cars most notably the comfort and ease of use as well as privacy for the family, In addition, for some governmental institutions or for some companies and institutions of civil buses

There must be a public transport service a sophisticated solution to the problems of congestion

Note that the absorptive capacity of the road design as measured by the most traffic that can be received by this road traffic while maintaining an acceptable level of service and therefore the size of increasing the volume of vehicle traffic for the absorptive capacity means low traffic service level to below an acceptable level

2. 6 Overview of Omdurman city:-

Introduction:

Omdurman is the largest city in Sudan, located in Khartoum along the West bank of the river Nile, with a population of around 726827 inhabitants (July 2001). It is the main commercial center of Sudan.

Omdurman, Khartoum and Khartoum North urban community has a total population of 7.830.479 inhabitants (2006). Omdurman is known as the Sudan national capital. National Sudan radio and television, Sudanese Parliament, Al-Nelain mosque, national theatre and the largest sports clubs in Sudan as well as the newly planned international airport all are located in Omdurman city.

2.7 Location and Placement:

Figure 2-3 Sudan map

2.7.1 Situation current schematic cities

Figure 2-4 Main town

2.7.2 Population size and growth rate

- Coordinates: 15°39′N 32°29
- Height of 178 m (584 feet)
- population total (2008) 2, 395, 159
- temporal time zone Eastern (UTC+3)

The size of the population and the rate of population growth

ولايه الخرطوم

تعداد السكان حسب المحليات والوحدات الادارية – تعداد السكان ٢٠٠٨م

اسم المحلية : أمدرمان

اسم المحلية/الوحدة الادارية	اســـم المنطقة	الجملة	ذكور	اناث
محلية أمدرمان		513,088	273,218	239,870
ودنوباوي		56,805	29,089	27,716
	١.القماير	7,384	4,045	3,339
	٢.الدباغه	1,186	643	543
	٣.الشرفيه	7,322	3,876	3,446
	٤.الكهجاب	518	255	263
	٥.ابوروف شمال	2,974	1,506	1,468
	٦.ابوروف والهجره	3,338	1,737	1,601
	٧.ابو روف جنوب	1,926	909	1,017
	٨.ابوروف وسط	2,004	1,013	991
	٩.ودالهنا	2,571	1,290	1,281
	١٠. بيت المال شمال	3,260	1,653	1,607
	١١. بيت المال شرق	2,200	1,140	1,060
	١٢. بيت المال غرب	3,688	1,800	1,888
	١٣. حي السيد المكى	2,323	1,211	1,112
	١٤. القلعه	2,115	1,065	1,050
	١٥. ود نوباوي جنوب	4,903	2,465	2,438
	١٦. ود نوباوي وسط	3,614	1,770	1,844
	١٧. ود نوباوي شمال	5,479	2,711	2,768

مورده	31,255	15,072	16,183
١.الملازمين شرق	3,827	1,569	2,258
٢.الملازمين غرب	3,740	1,670	2,070
٣.الهاشماب	1,409	690	719
٤.المورده جنوب	2,339	1,230	1,109
٥.المورده غرب	1,424	835	589
٦.المورده وسط	882	429	453
٧.المورده شرق	1,719	862	857
٨.بانت شرق	2,679	1,432	1,247
٩.بانت وسط	3,158	1,233	1,925
١٠. حي الضباط	2,726	1,335	1,391
١١. حي ابوعنجه	1,647	858	789
١٢. العباسيه شرق	2,800	1,418	1,382
١٣. العباسيه الام	1,082	554	528
١٤. الامراء شرق	1,823	957	866
و عنجة	53,209	27,960	25,249
١.العباسيه شمال	3,211	1,742	1,469
٢.العباسيه وسط	2,015	976	1,039
٣.العباسيه غرب	1,341	711	630
٤.العباسيه جنوب	2,562	1,455	1,107
٥.ابوكدوك	2,868	1,451	1,417
٦.بانت غرب	7,187	3,723	3,464
٧.الحي الاكاديمى	1,020	519	501
٨.العرضه جنوب	2,150	1,158	992
٩.العرضه وسط	1,473	774	699
١٠. حي الدوحه	4,750	2,491	2,259
١١. حى الدوحه	7,611	3,882	3,729

١.حي العمدة شمال	596	355	241
٢.حي العمدة شرق	2,851	1,411	1,440
٣.حي العمدة جنوب	1,499	768	731
٤.الركابية والكاشف	3,174	1,681	1,493
٥.حي الشهداء شمال	1,289	690	599
٦.حي الشهداء جنوب	1,102	699	403
٧.حي الإسبتالية	1,273	818	455
٨.حي البوسته جنوب	3,125	1,812	1,313
٩.حي البوسته شمال	634	401	233
١٠. حي العرب شرق	4,069	2,292	1,777
١١. المسالمه شرق	1,811	954	857
١٢. المسالمه غرب	2,950	1,602	1,348
١٣. حي العمدة غرب	4,193	2,211	1,982
١٤. حي المظاهر	1,991	1,330	661
١٥. حي العرب غرب	1,329	888	441
١٦. حي العرضه شمال	2,127	1,216	911
١٧. حي امتداد بيت المال شمال	2,181	1,031	1,150
١٨. سوق ام درمان	150	138	12
١٩. الصناعات	2,109	1,546	563
٢٠. السوق الشعبي	526	492	34

Table 2-1 Size of the population

Etymology:-

Name (Omdurman) Old in its history, which may be due to what is known as «the Era of Al Anj» former era Fung in the sixteenth century, Sudan century, and exceed novels in interpreting the meaning of the name and its origin and perhaps the most popular of those that talk about a woman belonging to the owner's family lived the place upon which the city near the Forum Niles white and blue, and had a son named «Durman» and lived in a house built of stone and surrounded by a fence solid been raised linger until recently in the neighborhood «Beet Al-Mal» current, and to the mother of this child ratios name of the place .

Another similar story says that women who were called Omdurman and that her home was a safe place because of what surrounds it from the wall and the woman dubbed it or Dar Al Eman, which skew became Omdurman.

There is a third novel go to Omdurman (open Hamza and maim) Arabic word Qahtani high origin and meaning of the land and named it the place to indicate the nature of topographic height from others Al brain, who located the two cities of Khartoum and Khartoum North present. And Omdurman last name is Old « Weshell» means the place a lot of water. It has been called the Mahdi after that as the capital of the state of a pure spot name. [13]

2.7.3 The history of the city:-

When Khartoum, capital of the Covenant in the Sudan by Imam Muhammad Ahmad Al-Mahdi in January 1885, and killed the Governor of the Sudan at the time Gordon Pasha, was in camp Abu Said in Omdurman, Al-Mahdi refused to take Khartoum, capital of his chosen on Omdurman as the capital of the new State, and was chosen for the site of Omdurman, he has come out with a group of his companions he pussy unleashed, followed by camel North of Abu Said Even set on the site of the now dome of Al-Mahdi (the Mahdi's Tomb), he built a mud cabin. Mahdi since he died buried his companions in his room. According to the historian Dr. Ibrahim Abu Salem, Sudanese the Omdurman saw further expansion of the Caliph Abdullah Al Taaishi, where houses were built with mud and brick and stone to replace those that were built with straw (grass and dry palm leaf) leather, and began to turn the city of Omdurman, the migrant camp followers of the Mahdi to flocked to it in 1885 and was the same year that the Mahdi died. And the Caliph Abdullah Al Taaishi House money, headquarters of the Treasury General of the nation, and named public prison (Al Sayer).

Two years after the construction of the ground floor of his building materials brought from Khartoum, and in the subsequent year, founded the House secretariat, a large store of weapons and war equipment, and construction of the ' dome ' to be Mehdi shrines honors Al-Mahdi And then started to build the city wall surrounding the city center where the dome of the Mahdi and Khalifa, the Caliphs guard houses and public facilities of the State. In 1889, was briefing the mosque in the great wall. Total length of the city between Bishop (Fortress) at Omdurman Al-sham bat (in Khartoum) north and South approximately six (6) miles, while the view East and West about two miles.

The city is stretched in length for further courses to favor people to establish their homes and shops on the banks of the River Nile. The number of the population before the arrival of migrants from the Western Sudanese Mahdi of 15 (fifteen) and 20 (twenty) million, while the number of 400 (four hundred) people in 1895. In the 1930s saw Omdurman national political movement in the alumni who demanded bilateral governance colonial grant of Sudanese self-determination and enable them to establish their own independent and sovereign State. [13]

Economy and trade:-

From a commercial viewpoint, Omdurman teeming with large markets rich in various kinds of goods, which is also a target market for goods exported to the states of western Sudan. The center for trade in private camels and sheep livestock, and trade in gold jewelry, handicrafts, spices and beans. And a group of commercial banks, including Bank of Omdurman National.

The fall of the city industrial zone, which includes a number of factories and workshops, light and food industries and maintenance mechanisms and crossover vehicles and metal lathes and mostly located in the industrial area in Omdurman.

Among the most prominent markets Omdurman: Market Omdurman great, and markets Om-Dafsso, Om-Sowega, and market boaters (for traditional turbans), and market Anagherib (for the manufacture of traditional family) and market Libya (for goods coming from Libya), and market individuals (Clothes and Textiles) and market gold (for gold jewelry and accessories weddings, henna, incense, incense burners and accessories traditional silver), and the market tanning (skins) - and market vegetables and fruits, spices, and market craftsmen where boots and leather belts and bags made industry of crocodile and large snakes, the industry is now facing Problems are threatened with extinction because they want the cheapest shoes expensive than countries such as China, India, Syria, Italy, because of strict laws that prohibit the hunting of crocodiles and large snakes and other protected wildlife. In addition to these traditional markets are no markets for modern goods, including the popular market for various goods, and the number of Last of closed markets (Al-bazar). These neighboring markets and in its form as well as its economic role in the city, no matter where the tourist landmark. [13]

Tourism:-

Omdurman tourist city of the first class, it is located a stone's throw from Khartoum, and is characterized by traditional their industries, but the most important is what distinguishes a tourist rings dervishes and offers singing and praise, which attract tourists from the West, especially from Scandinavia.

Also House Al khalefa Museum. It is the house where he was staying Abdullah ibn Muhammad al-Khalifa and other archaeological sites dating back to the era of Mahdia State since 1881, including Abdul Gayoom gate -the remains of the city wall, which was surrounded by in the period between 1885 and 1898.

There are also in Omdurman, the effects of "Al-Tabiya" It is a fortified site built of solid rock and the paper asked by the Mahdi Army snipers and artillery to repel any attack comes from the hand of the Nile.

On the other sights Niles mosque, which opened in the era of President Gaffer Muhammad Numeri and is considered one of the architectural features characteristic in Sudan, the mosque was built in the form of a giant shell at the confluence of the White and Blue Nile, and was constructed to implement the idea of designing a graduation project for students from the Faculty of Engineering and Architecture at the University of Khartoum in the mid-seventies of the last century.
It is the first building in Sudan is built from aluminum cutters and without columns assigned to the ceiling, as it relates to the ceiling to land directly completely.

Coupled Omdurman name the battle of Omdurman famous that took place on the outskirts of the city, fought between led by Caliph Abdallah ibn Muhammad Mahdist forces and British forces invasion under the leadership of Lord Herbert Kitchener and included in the ranks of former British Prime Minister Winston Churchill, who was at the time an officer in the army, and a thousand in After his famous "The River War" about his impressions of the period. [13]

Parks and public squares:-

There are in Omdurman, especially in the commercial center of the city and near the Horny Niles area gardens and public parks. It Omdurman Gardens:
Omdurman big garden (Magic Land for now), Park Al Mourada, Palm Garden
Park family Al Rivera on Nile Street, Golden get, Field of Prophet Mohammad's birth in the middle of Omdurman [13]

CHAPTER 3

RESEARCH METDOLOGY

3.1 Introductions:-

This study aims to analyze the traffic flow and land use issues in central city of Omdurman, which includes many streets, roundabouts and Omdurman local market. The research will carried out by different qualitative and quantitative methods which includes surveys, traffic account, questionnaire and interviews.

The research methodologies can be summarized into two parts as follows:

3.2 Data Collection methods:-

3.2.1 Questionnaire:

A questionnaire will be distributed among 200 of population as a community sample.

Questionnaire Attributes:-

The questionnaire will examine certain attributes in order to achieve the research objectives as below:

1. Identification of visual and aesthetic properties in the city center.
2. Identification of traffic elements and condition.
3. Importance and impact of historical and heritage buildings.
4. Impact of new buildings and development.
5. A framework design fit chime in with the general framework for the area

In order to achieve the optimal choice of the questionnaire follow the following:

1- Determine the general framework of the study, and of the visual and aesthetic characteristics in the city of Omdurman, in particular the study area, where the sample includes various segments of society in terms of the scientific level and the city's residents and visitors.

2- Use comprehensive survey of the study area by distributing the questionnaire to a sample size of 200 individuals representing all workers in the study area (comprehensive survey) and visitors in different periods.

The sample will represent a different components from local market workers, offices owners, students and pedestrians.

The questionnaire was divided into two parts:

(1) general information about the respondents, which included (age groups, gender, marital status, level of education, profession, place of residence, and place of work)

(2) Information about the visual and aesthetic characteristics of the study area and the elements.

3.2.2 Personal interviews:

Personal interviews will be conducted through 23 of specialist in traffic and planning fields.

3.2.3 Self-observation and survey:

Self-observation and survey in order to evaluate and define the current situation and existing problems.

Areas include three different architectural patterns, service, residential and commercial. The survey will examine the following:

- The positions of Transportation
- Landmarks and service installations
- Roundabouts streets
- Lanes/paths
- nodes
- landmarks
- Uses of buildings

- Use the squares
- Distinctive buildings
- State buildings
- historical periods of the buildings
- shaped vacuum (spaces and urban)
- taking into account the humanitarian Size
- surfaces and blocks and construction materials and texture and color
- Sky line
- Flooring
- Visual activities
- Visual perception

3.2.4 Traffic count:

Selected six intersections represent control points and traffic in the study area, count traffic to those points to see the traffic volume by traffic counting operation at peak hours in the history On Monday, 13 \ 10 \ 2014 exactly seven o'clock and half in six sites inventory by a working group composed of 16 individual then extract the design traffic volume through rates and conversion factors to convert all vehicles to the equivalent vehicle to enter data in the design of programs represented in the Synchro and SimTraffic Software.

3.2.5 Control point:

- Roundabout Al Arrda
- Shenqeeti intersection with the market
- Karri intersection
- Intersection of the morgue
- Hospital roundabout

- Intersection of Al Azhari

Figure 3-1 Boundaries of the study area

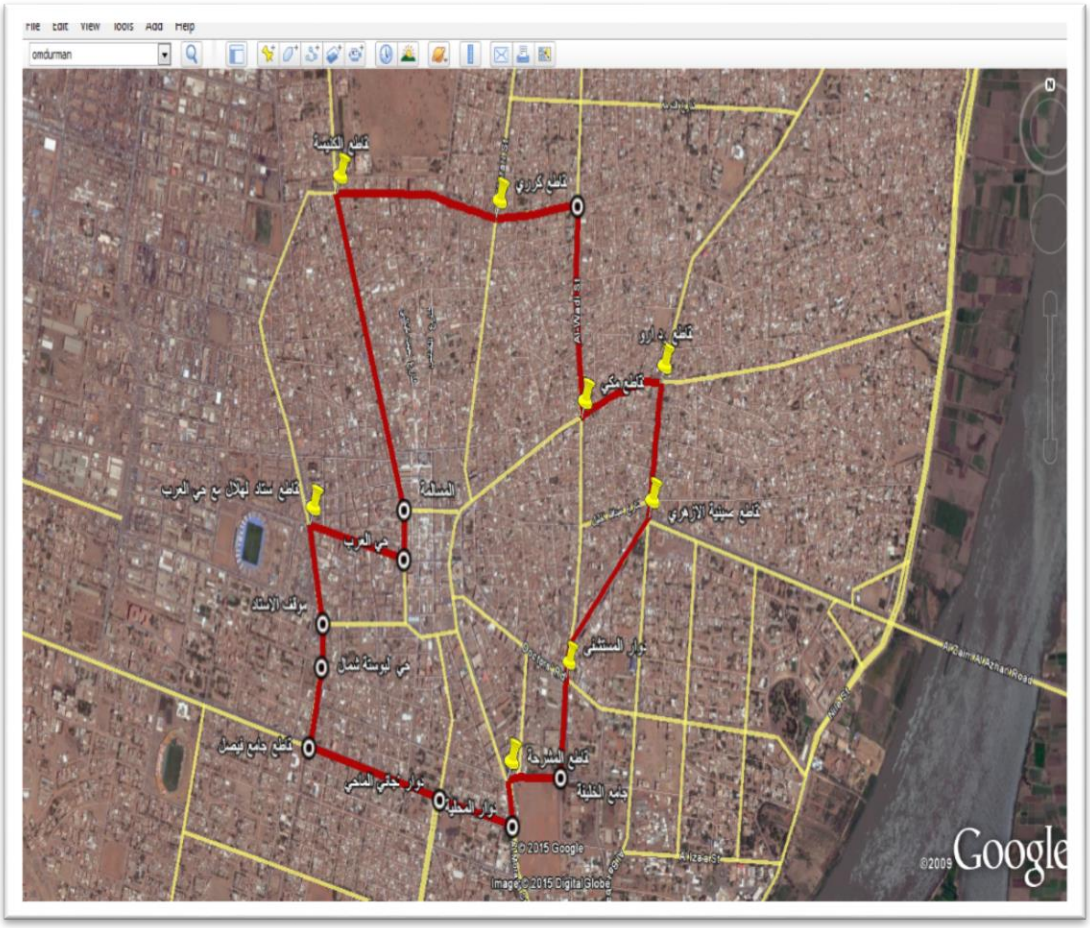


Figure 3-2 Traffic control points

3.3 Analysis methods:-

3.3.1: (SPSS statistical analysis program): after collecting questionnaires results has been introduced to SPSS statistical analysis program to analyze and extract the required results

3.3.2: (Synchro and SimTraffic programs): The traffic data collected was introduced to both Synchro and SimTraffic programs to know the current traffic situation and to figure out proposals for traffic improvement as well as the extracting the proposed traffic situation

Passenger Car Equivalent (PCE), is a metric used in Transportation Engineering, to assess traffic-flow rate on a highway. A Passenger Car Equivalent is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. For example, typical values of PCE (or PCU) are:

- private car (including taxis or pick-up) 1
- motorcycle 0.5
- bicycle 0.2
- horse-drawn vehicle 4
- bus, tractor, truck 3.5

Highway capacity is measured in PCE/hour daily Passenger Car Equivalent is also sometimes used interchangeably with Passenger car unit (PCU).

A common method used in the US is the density method. However, the PCU values derived from the density method are based on underlying homogeneous traffic concepts such as strict lane discipline, car following and a vehicle fleet that does not vary greatly in width.

On the other hand, highways in India, carry heterogeneous traffic, where road space is shared among many traffic modes with different physical dimensions. Loose lane discipline prevails; car following is not the norm. This complicates computing of PCE.

Using multiple heuristic techniques, transportation engineers convert a mixed traffic stream into a hypothetical passenger-car stream.

3.4 Planning & Analysis by Synchro and SimTraffic Software:

The Synchro products provides the best in traffic analysis, optimization, and simulation applications. The package combines the modeling capabilities of Synchro and the micro-simulation and animation capabilities of SimTraffic with our three-dimensional viewer to create the ultimate tool kit for any traffic engineer.

Synchro is a macroscopic analysis and optimization software application. Synchro supports the Highway Capacity Manual methodology (2000 & 2010 methods) for signalized intersections and roundabouts. Synchro also implements the Intersection Capacity Utilization method for determining intersection capacity. Synchro signal optimization routine allows user to weight specific phases, thus providing users more options when developing signal timing plans. Because the software is easy to use, traffic engineers are modeling within days, thus adding to the number of reasons why Synchro remains the leading traffic analysis application.

The work of the Survey promise of a traffic study area and control points for the traffic volume design has been obtained the following results of the program Synchro.

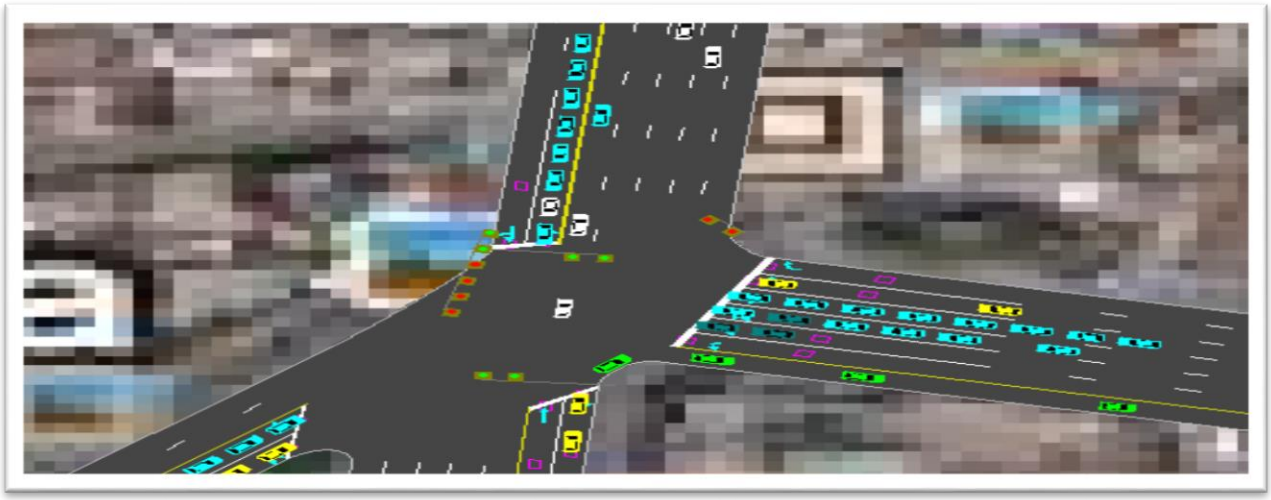


Figure 3-3 Program window

In this section has the process of clarifying the methodology used in the process of collecting information and data through questionnaires .personal interviews .field survey and the process of counting the traffic after select control point.

Then the process of analysis using the programs concerned (SPSS, Synchro).

CHAPTER 4

Calculations and Data analysis

4.1 Introduction:

Data analysis and the result discussions of the process were performed in this chapter, where it was divided in three Stages:

4.2 First stage: The visual elements of the area:

4.2.1 Analysis of the characteristics and elements of visual aesthetic of the study area:-

Through the second part of the questionnaire were analyzed and the visual aesthetic elements of the study area (downtown Omdurman) as follows:

1. Identification of visual and aesthetic properties in the city center.
2. Identification of traffic elements and condition.
3. Importance and impact of historical and heritage building.
4. Impact of new buildings and development
5. A framework design fit chime in with the general framework for the area

- **Identification of visual and aesthetic properties in the city center:**

Modern new buildings:

70% of the respondents believe that the new buildings and trade complexes are beautiful. Updating and renewal of those buildings used new materials and modern interior decoration with a new order to commensurate with modernity, and they are economically beneficial. But they did not take into account the pattern and style of the region.

Question 1: Do modern high and new buildings in the area improve the beauty?

Strongly agree		I agree		I do not know		disagree		strongly disagree	
Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
37	26.6	101	70	24	21.1	30	27.0	8	8.0

Source: (questionnaire, researcher, 2014)

Table 4-1 Survey results on question 1

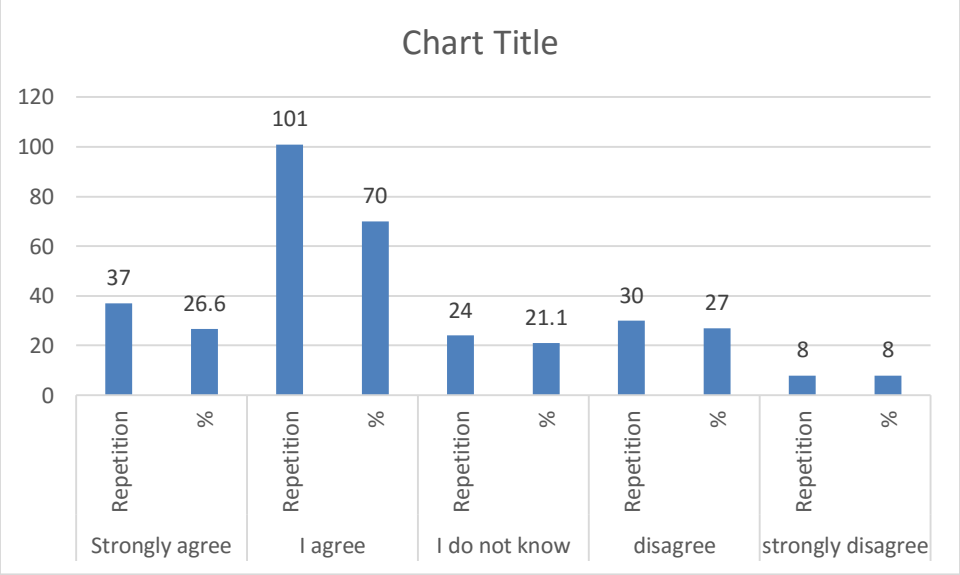


Figure 4-1 Survey results on question 1

- **Impact of new buildings and development:**

Economic growth of the city:

New buildings affect the economic growth of the city. 63.9% of the respondents believe that the new buildings and complexes have a good layout that facilitates movement inside the building and display process. New buildings are equipped with all the technological means and tools of functional and aesthetic that comfort.

Question 2: Does construction of new buildings affect the economic growth of the city center?

Strongly agree		I agree		I do not know		disagree		strongly disagree	
Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
38	21.8	95	63.9	28	20.3	31	19.6	11	9.01

Source: (questionnaire, researcher, 2014)

Table 4-2 Survey results on question 2

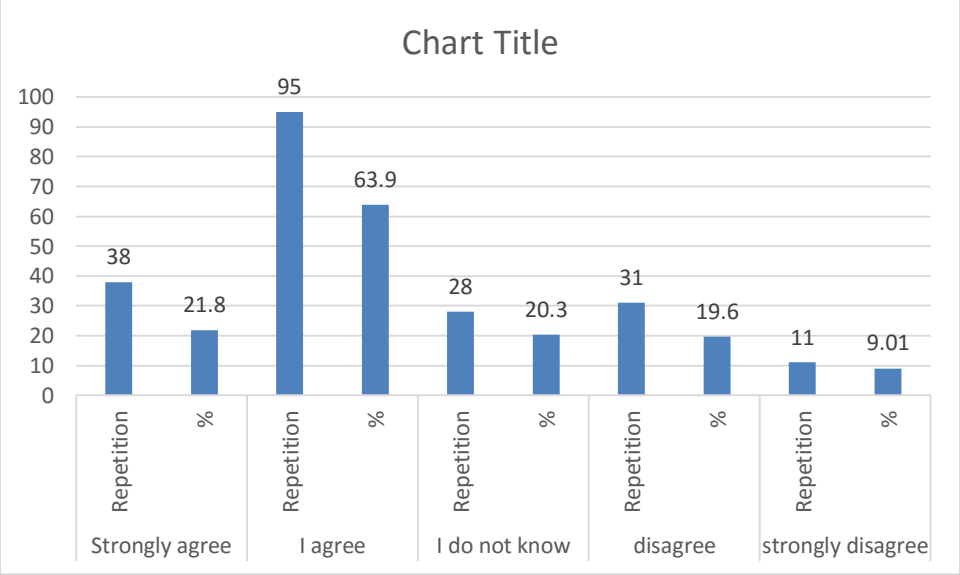


Figure 4-2 Survey results on question 2

Working to revitalize tourism:

49.6% of the respondents believe that the new building works to revive tourism as they work to market the region through aesthetic and modern things.

Questions 3: Does construction of new buildings attracts tourism

Strongly agree		I agree		I do not know		disagree		strongly disagree	
Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
42	21.6	78	49.6	24	17.9	45	28.4	11	9.0

Source: (questionnaire, researcher, 2014)

Table 4-3 Survey results on question 3

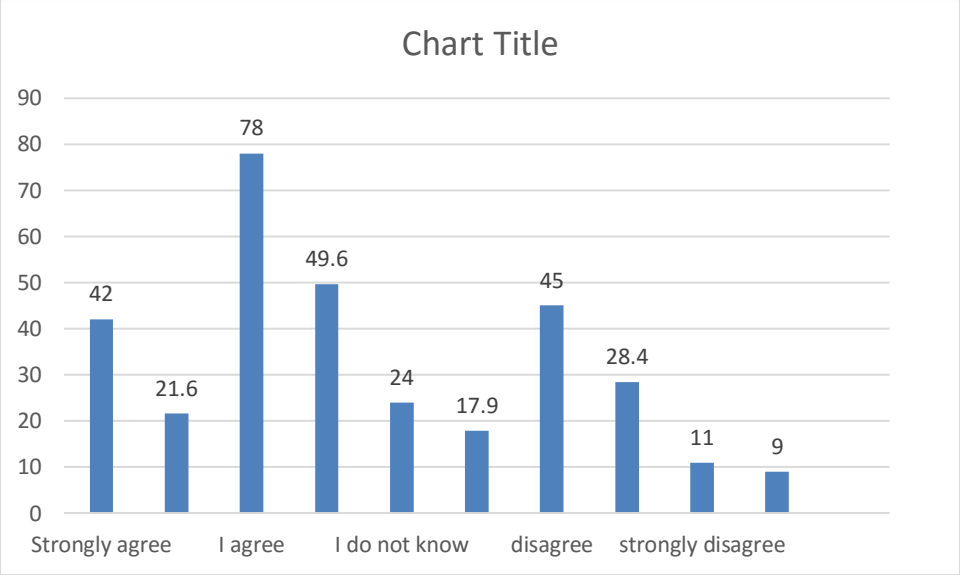


Figure 4-3 Survey results on question

Based on the foregoing, the new buildings affect the aesthetic appearance of the city Centre as well as the economic growth. They preserve the environment and reduce pollution to provide psychological comfort to man and revive tourism.

Identification of traffic elements and condition

Surveyed data reveals that Omdurman downtown has a lack of the street furniture. The street furniture is a priority to beautify the area and works to provide comfort. In this study the lack of furniture element got a high proportion between 7-

10 for priority and the more we move away the number increased to ten, with the presence of some of distributed disproportionately not deliberate and there is no follow-up of these elements.

This includes furniture, seats, trees, lighting (light poles) and preferably represents the old character like lanterns, sidewalks, small containers dimensions regular (trash bins), memorial, water elements, public toilets for men and women, parking lots, public telephones, kiosks corridors pedestrian attractive, iron separator on the sidewalks, signs and pillars, unifying colors shops (and unify work and commercial product).

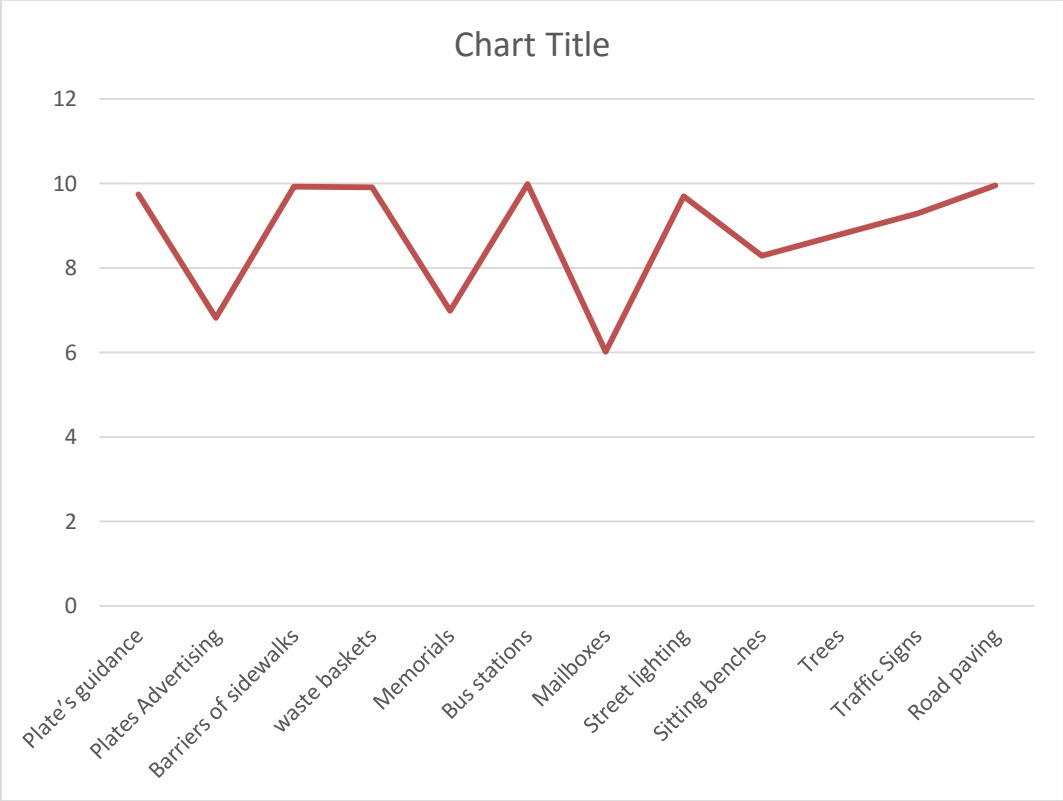


Figure 4-4 Importance of street furniture elements in the study area

- **A framework design fit chime in with the general framework for the area**

Evaluate advertising boards:

Approved about 59.4% of the respondents idea of unifying design frameworks for advertising and plates which fit and harmony with the general framework for the area where the lead to the formation of an aesthetic view of the area

Question 4: Is it important to set specifications and requirements for advertising panels?

Strongly agree		I agree		I do not know		disagree		strongly disagree	
Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
98	59.4	73	48.0	17	9.7	12	9.8	0	0.0

Source: (questionnaire, researcher, 2014)

Table 4-5 Survey results on question 4

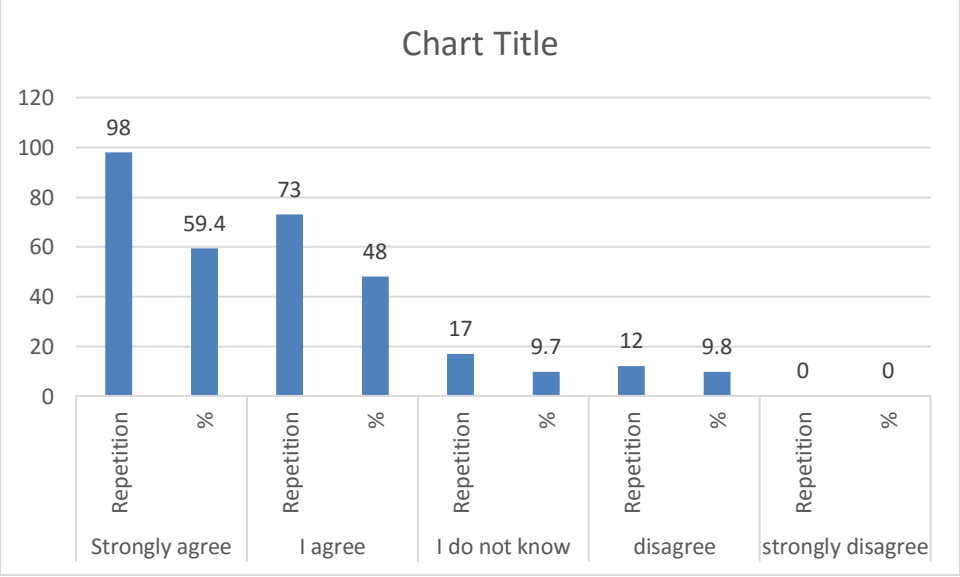


Figure 4-5 Survey results on question 4

Question 5: Do you think removal of kiosks and stalls in front of shops improves the beauty of the area?

Considered about 65.9% that the stalls have a negative impact on the view of civilization and aesthetic of the city, and lead to optical and audio pollution and impede traffic and transport movement, and some say they contribute to the revival of downtown but there must be controls to these stalls, the organized properly and orderly they confer on the specificities the old character of the city and others have seen this as stalls in a bad way affect the aesthetic and of civilization the view of the city they hide monuments in the city center.

Strongly agree		**I agree**		**I do not know**		**disagree**		**strongly disagree**	
Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
110	65.9	44	28.2	20	10.08	16	9.1	10	6.1

Source: (questionnaire, researcher, 2014)

Table 4-6 Survey results on question 5

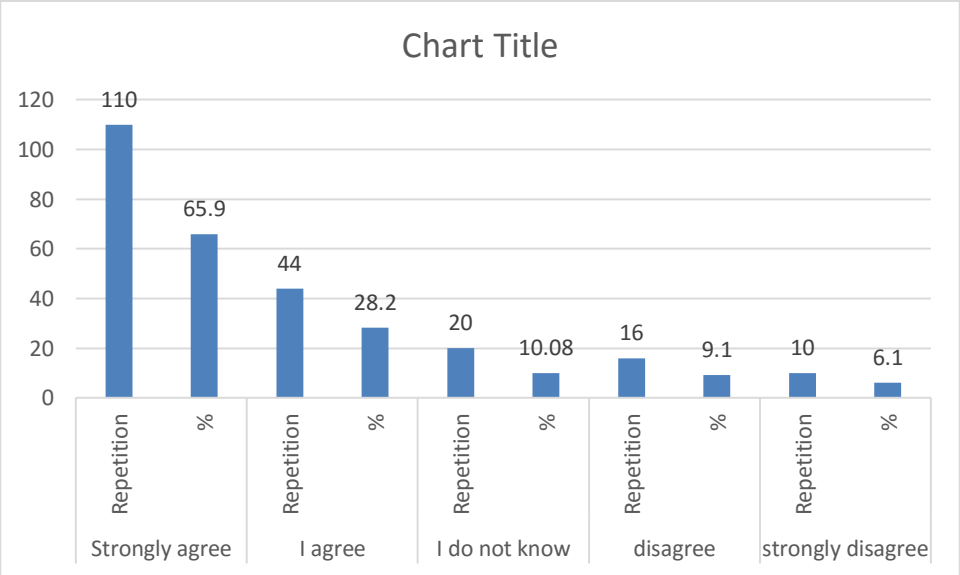


Figure 4-6 Survey results on question 5

Question 6: Do you think historical and heritage building and Memorials add to the beauty of the area?

Monument is a landmark in the area has 65.5% of the respondents consider it an aesthetic element, but these elements need to continue to maintain the continuity and sustainability of the beautiful

Strongly agree		I agree		I do not know		disagree		strongly disagree	
Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
29	18.6	100	65.0	21	19.7	40	29.8	10	19.7

Source: (questionnaire, researcher, 2014)

Table 4-7 Survey results on question 6

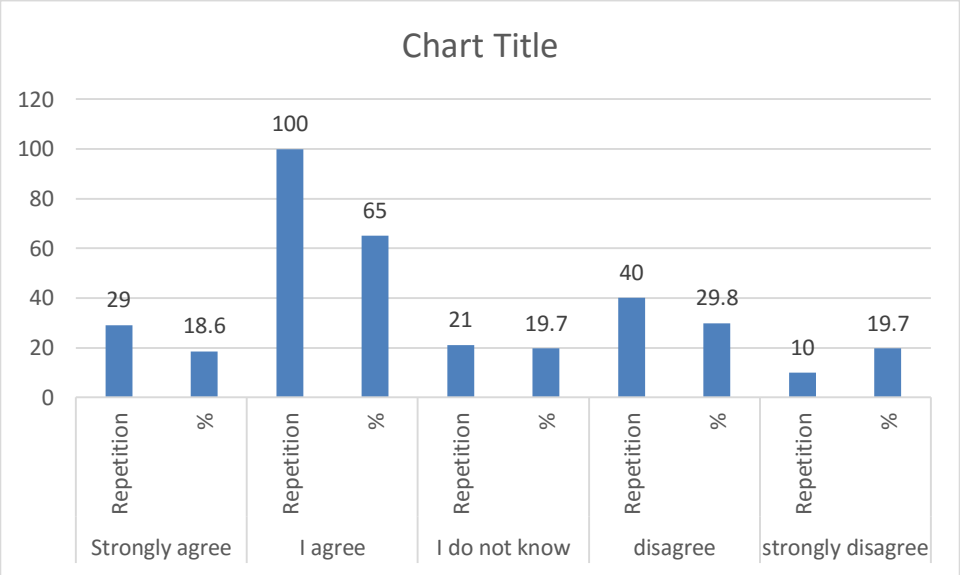


Figure 4-7 Survey results on question 6

4.3 Second stage: The field survey

There are many visual problems affecting the efficiency of the areas, and constitute a polluted visually hurting pedestrians as they walked, and can be summarized problems experienced by users of the area and that have been monitored as follows: -

1-General appearance: -

• The region's lack of afforestation and green areas.

• Lack of attention to the cleanliness of the streets after the establishment of local workers clean it.

• repeat the drill for the reform of nutrition, sanitation and maintenance shops and sidewalks in front of shops pipes which indicates poor implementation and inadequate to serve the region.

• The lack of places of visual attractions in the region

2- Buildings: -

The lack of restoration of old buildings led to the chaos which, especially to the upper floors unused (abandoned) in most of them, which is dangerous at the same time! Because these areas are always packed with people and buyers

• lack of interest in the maintenance of the facades of buildings overlooking the main street, they are suffering from dirt, dust, pollutants, posters and car exhaust, and the whiteness of the external interfaces without paying attention to change it flurried

• ruined buildings and abandoned for decades and which has become unhealthy and a dumping ground for trash and as a result of this information, it was noted that the use of these buildings does not check the condition of those buildings Identification

• lack of interest in interfaces shops both in terms of design or materials used.

• Diversity in the cladding materials within the visual scene in a single building.

• Inconsistency and facades of buildings, whether in color or texture or even rises

3- Bulletin boards: -

Banners covering the facades of buildings, structured huge and their lights and animated dissonant without taking into account coordination in the areas of urban and aesthetic between them and the facades of the surrounding buildings, which contain shades overlapping and varied, and the use of various materials and sizes, and are not subject to the bulletin boards of any regulation or restrictions, both in terms of Size, place or method of writing or materials used.

• Lack of maintenance of temporary signs, when torn not be removed or changed.

• Lack of resources used in the design of the signs, which give it in a bad image.

There is a shortage of some types of billboards important, such as that bearing the name of the street or benchmarks, as well as maps, there is no maps of the city.

Figure 4-8 Random bulletin boards

4. Shaded Areas: -

Above the shops forms and different sizes and sometimes infringe on the street, with its aggression on the overall shape of the surrounding area, and the lack of harmony with its surroundings as well as what makes them prone to collect dirt and The filth, and different forms of awnings above the shops and the colors of the doors are not responsible, leading to Hide Arch left behind.

Figure 4-9 Shape umbrellas

5. Streets and sidewalks: -

• There is a narrow street to accommodate the movement of pedestrians and traffic automation in peak time.

• Lack of attention to the pavement at all, forcing pedestrians to use the middle of the road while wandering in the area.

• Lack of interest in view of the street, whether in public hygiene or pavement (tiles) used in each of the street or sidewalk.

• Lack of clarity in places designated for pedestrian crossing.

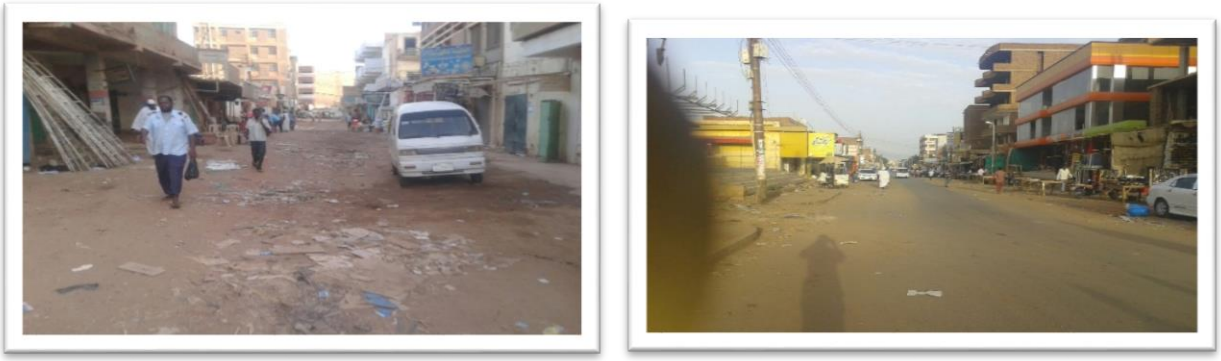


Figure 4-10 Streets and lack of interest pavement

6. Parking: -

• The lack of parking spaces for parking.

• impeding traffic due to parking on both sides of the road.

Figure 4-11 Lack of parking

7- Pedestrian traffic: -

• opposes the movement of pedestrians with traffic automation.

• Street lighting is adequate lighting.

• Lack of services and pedestrian of seats and fountains and paintings indicative numbers, and the names of the streets and shops and rubbish bins.

• Lack of pedestrian protection from extreme weather, whether hot weather or rainy.

• Showing the narrow sidewalk forcing pedestrians to use the Road.

• Noise and noise pollution resulting from the horns and street vendors..... Etc.,

Figure 4-12 Pedestrian move conflicted with traffic

8. Basic infrastructure: -

• networks nutrition and sanitation old and is able to serve the growing numbers of beneficiaries.

• The lack of fire hydrants required when there is no fire in the area.

• Lack of networks for the exchange of rain.

• The appearance of bare electrical wires, which could threaten disaster.

• Lack of adequate street lighting.

Figure 4-13 Random electrical conductivity

9- Narrow lanes

Narrow lanes alone poor modulation and is encouraging the movement of it, and the lack of pathways with special needs and their accessories, which they lack the minimum requirements with the sidewalks vary in the class covered by the different heights, due to the need for shop owners and there is no standardization of the docks

to take into account that all the age groups of the society will go on the sidewalk and the sidewalk is always a function to display other goods, a core, and we can deduce the following.

• Lack of interest in the region's private pier.

• Inadequacy of the sidewalk for pedestrians.

• Encroachment on the sidewalk stalls to establish whether or eject shops for some of the exhibits it.

• lacks pavement maintenance, forcing pedestrians to walk the Mid Road.

Figure 4-14 Lack of attention to the internal corridors

11-. Integration the interfaces and harmony among them.

• That the difference between the elevations in the interfaces ancient and modern exists, but he incorrectly thoughtful which leads to the occurrence of cut off in the movement the direction of eyesight to passers.

Figure 4-15 Highs in the ancient and modern interfaces

Figure 4-16 the height of buildings and street width

• The exploitation of and facades of buildings to display

Figure 4-17 Exploitation and facades of buildings for display and advertising

12- Stalls: -

65.9% of the respondents support the idea of removing the stalls because they have a negative impact on the landscape of cultural and aesthetic of the city lead to contamination of optical and audio and impede the flow of traffic and transportation, and some say they contribute to the revival of downtown, but there must be controls to these stalls, the organized properly and orderly they confer on the peculiarities of the old character of the city.

Others view these stalls as a bad way affect the aesthetic and cultural scene of the city they hide monuments in the city center.

Figure 4-18 Stalls

4:4 Third stage: Elements of traffic flow

After the introduction of the traffic volumes for each movement points in the design and analysis program we have acquired on the results of the current situation and the work of Corrections and processors to improve the future status as shown below in the report is extracted from the program

How to find PCU:-

Steps are summarized calculate the amount of movement and equivalence to Car equivalent in the following:

- Account the number of vehicles in each limited to points in the peak hour, taking into account the type of vehicle and the direction of movement (turn right, turn left, directly Movement)
- Collection vehicles separately taking into account the direction then convert the quantity of traffic to the unity of the vehicle and that the equivalent mean by conversion factors

Vehicle Type	Factor
Motorbike	0.25
Raksha	0.5
Minibus 14	1.25
Minibus 24	2.0
Bus	2.25
Truck	2.5

Table 4:8 Conversion factors

- After the conversion process of gathering all the vehicles in each direction on the unit to be one of the movement quantity includes all vehicles
- Enter the quantity of movement in the program

A summary of the available means of transport in the city of Omdurman, namely:

First: Taxi

Secondly - the civil bus (commercial): That the problem of these buses is the lack of space dedicated to stand often surprise the owners of private cars to park the bus when seeing the customer without being preceded by an alert or signal must be the need for reorganization of this service and for reasons including: the survival of this service is a given and the reality is difficult to change it, The bus owners offer popular dependable service by passengers addition, the owners of these buses are delivering economically efficient and high returns service for their owners as most of the bus owners covers the conduct of the service expenses in addition to the excess profit, as well as the fact that this pattern does not cost the state a government subsidy.

Third: private cars: It has to be taking into account that the car even if there was a transport network, it will continue to exist and the reasons for the acquisition of multiple and many people own cars most notably the comfort and ease of use as well as privacy for the family, In addition, for some governmental institutions or for some companies and institutions of civil buses

There must be a public transport service a sophisticated solution to the problems of congestion.

Note that the absorptive capacity of the road design as measured by the most traffic that can be received by this road traffic while maintaining an acceptable level of service and therefore the size of increasing the volume of vehicle traffic for the absorptive capacity means low traffic service level to below an acceptable level.

Traffic count:

Traffic count on selected control points was conducted on Monday13 \ 10 \ 2014 from 7.30 -8.30

Figure 4-19 control points

The traffic count results are summarized in Tables:-

Point 1: Intersection of Al Azhari

Mon	13 \ 10 \ 2014											
TIME	West			East			North			South		
	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT
7:30-8:30	149		151	469	246	908	589	791	207	417	304	

Point 2: Hospital roundabout

Mon	13 \ 10 \ 2014											
TIME	West			East			North			South		
	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT
7:30-8:30				425		52		552	233	562	55	132

Point 3: intersection of the morgue

Mon	13 \ 10 \ 2014											
TIME	West			East			North			South		
	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT
7:30-8:30	250		36	378	28		752			652	52	865

Point 4: Karari intersection

Mon	13 \ 10 \ 2014											
	West			East			North			South		
TIME	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT
7:30-8:30	225	42	25	352	52	65	852	24	35	652	26	25

Point 5: Roundabout Al Arrda

Mon	13 \ 10 \ 2014											
	West			East			North			South		
TIME	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT
7:30-8:30	752	19	82				1152	20	49	952	31	25

Point 6: Shanqeeti intersection with the market

Mon	13 \ 10 \ 2014											
	West			East			North			South		
TIME	TH	LT	RT	TH	LT	RT	TH	LT	RT	TH	LT	RT
7:30-8:30	452	52	42	424	42	42	652	55	120	452	55	45

Table 4.9 Traffic count results

SimTraffic Simulation Summary

SimTraffic software was used to assess the current level of service of the road network shown in Figure.

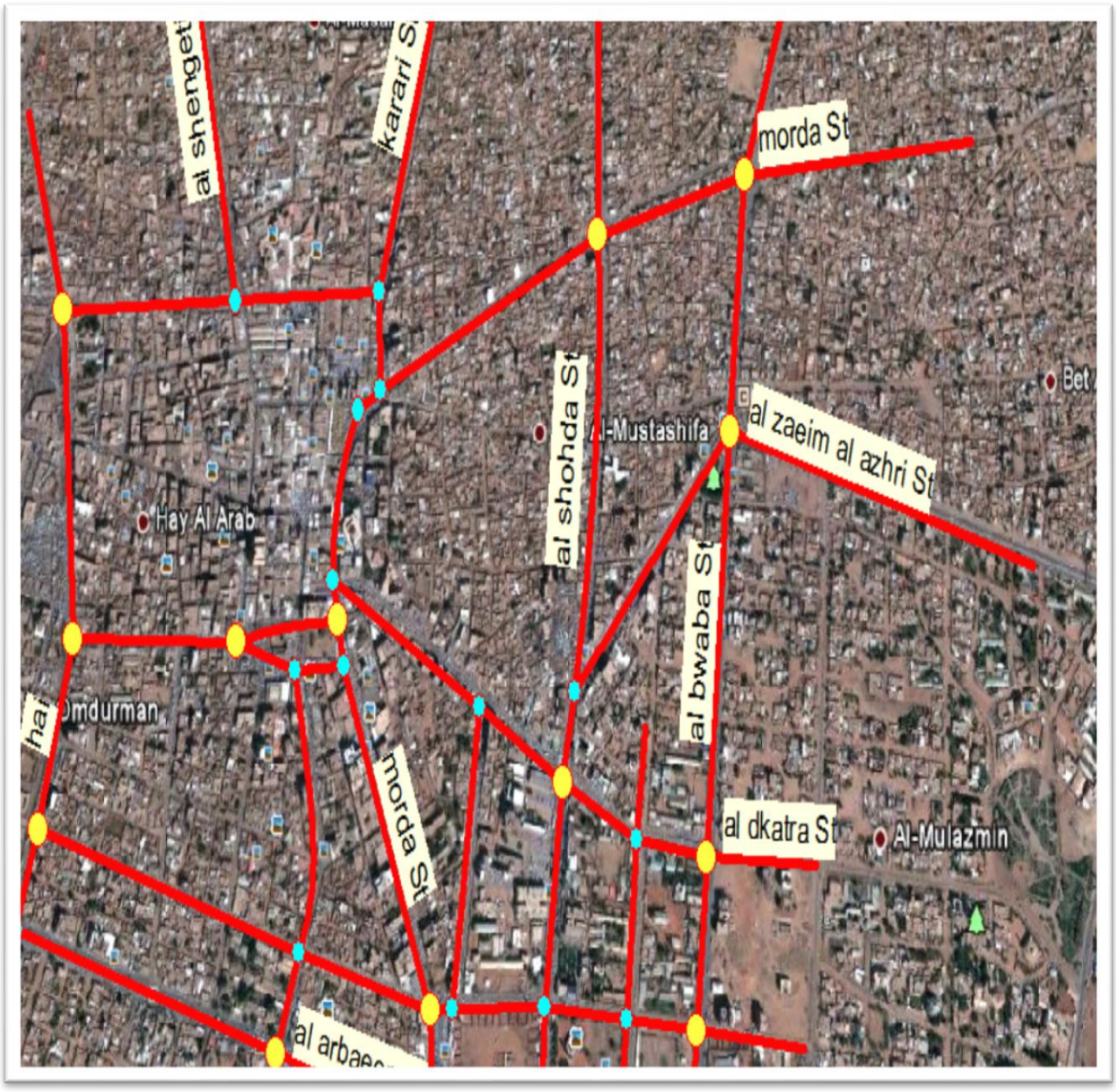


Figure 4.20 Road network

Figure 4.21 Road network, including no of lanes, road direction

- **Current status**

Baseline **05/02/2015**

Summary of All Intervals

Start Time	7:57
End Time	9:00
Total Time (min)	63
Time Recorded (min)	60
# of Intervals	5
# of Recorded Intvls	4
Vehs Entered	15008
Vehs Exited	12869
Starting Vehs	674
Ending Vehs	2813
Denied Entry Before	16
Denied Entry After	5435
Travel Distance (km)	11727
Travel Time (hr)	4087.2
Total Delay (hr)	3814.2
Total Stops	40477
Fuel Used (l)	9905.7

- **The proposed Scenario**

In this scenario it is proposed to introduce a one way traffic in the following streets:-

- The road from the intersection of Al Azhari to transport Al Shouhada
- Transport Al Shouhada Street to the intersection of Abdallah Khalil Street
- Stretch Abdallah Khalil Street into Omdurman market
- Al-Dkatra Street to the Al Bohera area
- Omdurman Hospital Street
- Morada Street to the inside of Omdurman market
- Stretch Karrari Street to the inside of Omdurman
- Stretch Al Shengeti Street to the inside of Omdurman

To increase the capacity and improve the geometric design for the following streets:-

1. Al Zaeem Al Azhari Street
2. Al Dkatra Street
3. Inside of Omdurman market Street
4. Al Wadi Street
5. Karrari Street
6. Al Shengeti Street
7. Morada Street
8. Al Shouhada Street
9. Omdurman Hospital and Asia hospital Street

The proposed scenario for the network is shown in Figure 4.22

Figure 4.22 The proposed Scenario to improve the performance of the road network

Baseline **05/02/2015**

Summary of All Intervals

Start Time	**7:57**
End Time	**9:00**
Total Time (min)	**63**
Time Recorded (min)	**60**
# of Intervals	**5**
# of Recorded Intvls	**4**
Vehs Entered	**16927**
Vehs Exited	**15212**
Starting Vehs	**693**
Ending Vehs	**2408**
Denied Entry Before	**6**
Denied Entry After	**3295**
Travel Distance (km)	**15093**
Travel Time (hr)	**3226.2**
Total Delay (hr)	**2875.2**
Total Stops	**44733**
Fuel Used (l)	**8805.9**

Table 4.10 SimTraffic Simulation Summary

Variable	Current status	proposed situation
Travel Distance (km)	11727	↑ 15093
Travel Time (hr)	4087.2	↓ 3226.2
Total Delay (hr)	3814.2	↓ 2875.2
Total Stops	40477	↑ 44733
Fuel Used (l)	9905.7	↓ 8805.9

Table 4.11 Comparison between current and proposed scenario

Economic Analysis:

	hours	day	Year	Financial value
Save fuel (gallons)	291	2,328	58,200	1,251,300
Saving time (hours)	861	6,888	13,77,600	1,377,600

Table 4.12 Economic Analysis

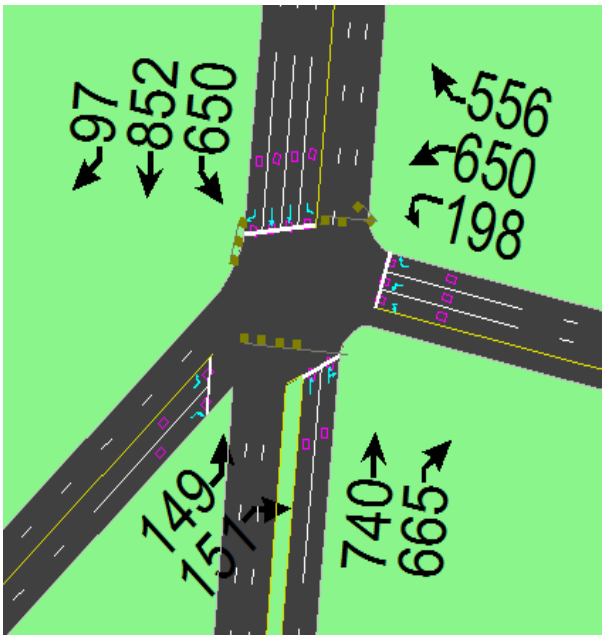
Traffic count data analysis with the traffic account program reveals that the current situation has improved a lot from the listed factors (distance, delay, spent fuel, time to stand up, travel time)

Note that (Travel Time, Total Delay Fuel Used,) has relatively improved, as for (Travel Distance, Total Stops) has increased

It is found that the level of service at intersections and roads are very bad and require an appropriate solution.

Level of service can be improved through one of two ways either by geographical engineering solution by modifying the geometric design of the ways to add a lane or more or by modifying traffic signals either through the process of adding or deleting it.

Point 1: Intersection of Al Azhari



The proposed situation

Current status

Approach	WB	NB	SB	NE	All
Total Delay (hr)	7.1	3.9	5.0	1.5	17.5
Delay / Veh (s)	113.8	138.0	107.7	108.3	115.7
Total Stops	386	118	181	55	740
Travel Dist (km)	140.2	49.4	45.2	18.0	252.8
Travel Time (hr)	10.3	5.0	6.0	1.9	23.2
Avg Speed (kph)	14	10	8	9	11
Fuel Used (l)	17.4	7.2	7.9	2.9	35.5
Fuel Eff. (kpl)	8.0	6.9	5.7	6.2	7.1
HC Emissions (g)	35	11	8	5	59
CO Emissions (g)	1101	349	332	203	1984
NOx Emissions (g)	125	38	37	17	218
Vehicles Entered	275	116	181	57	629
Vehicles Exited	178	88	152	43	461
Hourly Exit Rate	1068	528	912	258	2766
Input Volume	1623	862	1743	300	4528
% of Volume	66	61	52	86	61
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

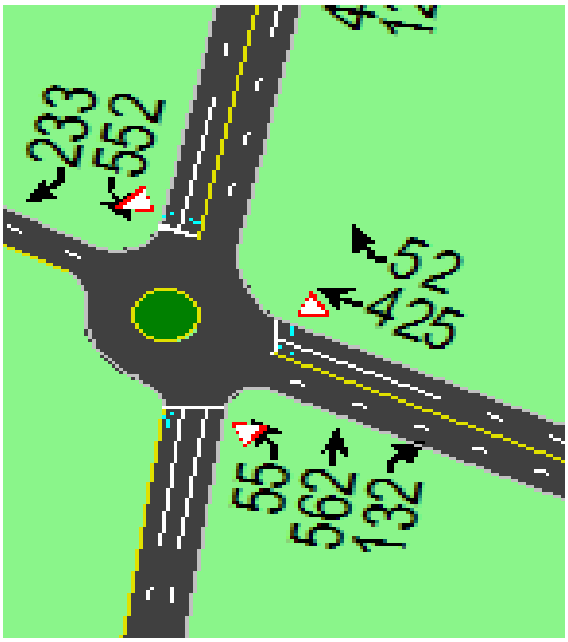
Approach	WB	NB	SB	NE	All
Total Delay (hr)	15.7	3.6	0.7	1.0	21.1
Delay / Veh (s)	355.8	97.0	23.4	89.2	169.5
Total Stops	260	214	54	52	580
Travel Dist (km)	85.9	48.4	33.2	13.7	181.2
Travel Time (hr)	17.7	4.8	1.5	1.4	25.3
Avg Speed (kph)	5	10	23	10	7
Fuel Used (l)	20.5	7.2	3.6	2.2	33.5
Fuel Eff. (kpl)	4.2	6.7	9.2	6.4	5.4
HC Emissions (g)	71	13	8	2	95
CO Emissions (g)	1601	439	332	120	2493
NOx Emissions (g)	145	46	28	9	229
Vehicles Entered	246	150	115	43	554
Vehicles Exited	73	119	111	37	340
Hourly Exit Rate	438	714	666	222	2040
Input Volume	1404	1405	1931	300	5040
% of Volume	31	51	34	74	40
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	2	0	0	2

Variable	Current status	proposed situation
Travel Distance (km)	181.2	↑ 252.8
Travel Time (hr)	25.3	↓ 23.2
Total Delay (hr)	21.1	↓ 17.5
Total Stops	580	↑ 740
Fuel Used (l)	33.3	↑ 35.5
HC emissions(g)	95	↓ 59
CO emissions(g)	2493	↓ 1984
NOx emissions(g)	229	↓ 218

Table 4.13 Comparison between current and proposed scenario at point 1

Note that (Travel Time, Total Delay) has relatively improved, as for (Travel Distance, Total Stops, Fuel Used) has increased and the ratio of emissions have decreased

Point 2: Hospital roundabout



Current status

Approach	WB	NB	SB	All
Total Delay (hr)	0.3	3.7	0.4	4.5
Delay / Veh (s)	9.6	122.7	9.6	42.7
Total Stops	61	120	79	260
Travel Dist (km)	13.7	25.6	17.4	56.7
Travel Time (hr)	0.6	4.3	0.9	5.8
Avg Speed (kph)	24	6	20	10
Fuel Used (l)	1.0	5.4	2.1	8.5
Fuel Eff. (kpl)	14.4	4.7	8.2	6.7
HC Emissions (g)	1	3	3	7
CO Emissions (g)	53	232	157	442
NOx Emissions (g)	5	19	16	40
Vehicles Entered	101	124	170	395
Vehicles Exited	99	96	163	358
Hourly Exit Rate	594	576	978	2148
Input Volume	609	749	1327	2685
% of Volume	98	77	74	80
Denied Entry Before	0	0	0	0
Denied Entry After	0	1	0	1

proposed situation

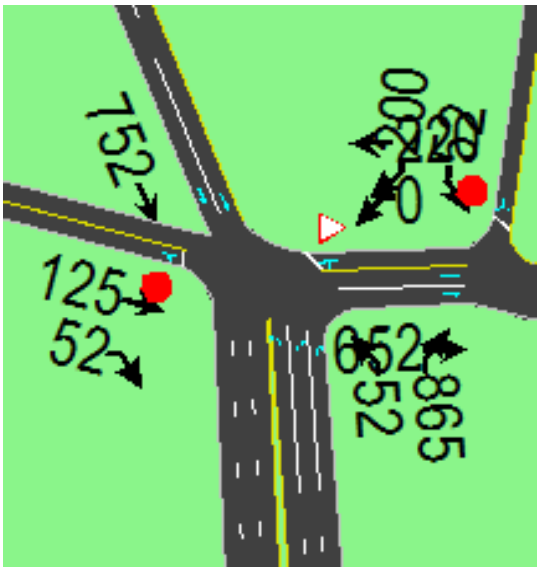
Approach	WB	NB	SB	All
Total Delay (hr)	0.2	1.3	0.2	1.7
Delay / Veh (s)	9.3	40.8	4.8	19.0
Total Stops	35	90	22	147
Travel Dist (km)	9.9	26.4	13.3	49.7
Travel Time (hr)	0.4	1.9	0.5	2.8
Avg Speed (kph)	25	14	27	18
Fuel Used (l)	0.7	3.5	1.7	5.8
Fuel Eff. (kpl)	13.4	7.7	8.1	8.5
HC Emissions (g)	1	6	4	11
CO Emissions (g)	43	286	186	515
NOx Emissions (g)	4	23	18	44
Vehicles Entered	70	119	133	322
Vehicles Exited	71	113	128	312
Hourly Exit Rate	426	678	768	1872
Input Volume	609	854	1327	2790
% of Volume	70	79	58	67
Denied Entry Before	0	0	0	0

Variable	Current status	proposed situation
Travel Distance (km)	56.7	↓ 49.7
Travel Time (hr)	5.8	↓ 2.8
Total Delay (hr)	4.5	↓ 1.7
Total Stops	260	↓ 147
Fuel Used (l)	8.5	↓ 5.8
HC emissions(g)	7	↑ 11
CO emissions(g)	442	↑ 515
NOx emissions(g)	40	↑ 44

Table 4.14 Comparison between current and proposed scenario at point 2

Note that (Travel Distance, Travel Time, Total Delay, Total Stops, Fuel Used) has relatively improved and the ratio of emitted gases have increased

Point 3: intersection of the morgue



Proposed situation

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.9	0.1	0.2	0.0	1.2
Delay / Veh (s)	103.4	10.1	3.9	0.9	11.6
Total Stops	34	20	25	1	80
Travel Dist (km)	7.3	1.3	30.9	43.4	82.9
Travel Time (hr)	1.0	0.2	1.2	1.0	3.3
Avg Speed (kph)	7	9	27	46	25
Fuel Used (l)	1.4	0.3	4.2	3.0	8.9
Fuel Eff. (kpl)	5.1	4.8	7.4	14.5	9.3
HC Emissions (g)	8	3	13	4	27
CO Emissions (g)	172	49	481	99	801
NOx Emissions (g)	16	7	51	13	88
Vehicles Entered	36	35	208	110	389
Vehicles Exited	24	35	202	102	363
Hourly Exit Rate	144	210	1212	612	2178
Input Volume	177	220	1577	887	2861
% of Volume	81	95	77	69	76
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

Current status

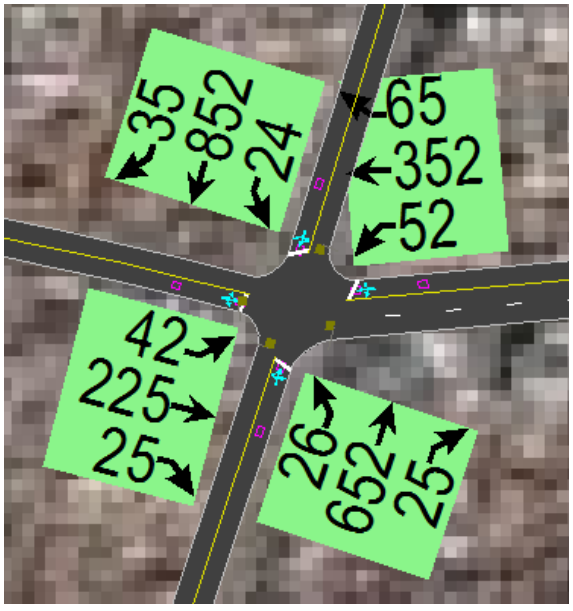
Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.6	0.1	0.2	0.1	4.0
Delay / Veh (s)	420.0	6.9	4.2	2.2	35.0
Total Stops	33	25	23	0	81
Travel Dist (km)	6.4	1.6	33.3	49.3	90.6
Travel Time (hr)	3.8	0.2	1.3	1.1	6.3
Avg Speed (kph)	2	9	26	44	17
Fuel Used (l)	3.7	0.3	4.4	3.7	12.0
Fuel Eff. (kpl)	1.8	5.9	7.6	13.5	7.6
HC Emissions (g)	17	1	11	5	34
CO Emissions (g)	307	17	441	137	903
NOx Emissions (g)	25	2	48	17	93
Vehicles Entered	36	51	212	121	420
Vehicles Exited	26	53	210	123	412
Hourly Exit Rate	156	318	1260	738	2472
Input Volume	286	378	1577	887	3128
% of Volume	55	84	80	83	79
Denied Entry Before	0	0	0	0	0
Denied Entry After	16	0	0	0	16

Variable	Current status	proposed situation
Travel Distance (km)	90.6	↓ 82.9
Travel Time (hr)	6.3	↓ 3.3
Total Delay (hr)	4.0	↓ 1.2
Total Stops	81	↓ 80
Fuel Used (l)	12.0	↓ 8.9
HC emissions(g)	27	↑ 34
CO emissions(g)	801	↑ 903
NOx emissions(g)	88	↑ 420

Table 4.15 Comparison between current and proposed scenario at point 3

Note that (Travel Distance, Travel Time, Total Delay, Total Stops, Fuel Used) has relatively improved and the ratio of emitted gases have increased

Point 4: Karari intersection



Proposed situation

Approach	EB	WB	NB	SB	All
Total Delay (hr)	2.7	0.8	4.0	6.7	14.2
Delay / Veh (s)	114.1	50.4	151.1	216.9	146.7
Total Stops	131	61	193	72	457
Travel Dist (km)	41.2	9.3	42.8	13.4	106.7
Travel Time (hr)	3.6	1.1	4.9	7.0	16.6
Avg Speed (kph)	12	9	9	6	9
Fuel Used (l)	5.9	1.8	6.6	7.2	21.4
Fuel Eff. (kpl)	7.0	5.3	6.5	1.9	5.0
HC Emissions (g)	6	7	14	5	32
CO Emissions (g)	301	180	335	158	973
NOx Emissions (g)	25	21	39	14	98
Vehicles Entered	96	61	103	107	367
Vehicles Exited	74	55	87	114	330
Hourly Exit Rate	444	330	522	684	1980
Input Volume	552	469	703	911	2635
% of Volume	80	70	74	75	75
Denied Entry Before	0	0	0	10	10
Denied Entry After	0	0	6	56	62

Current status

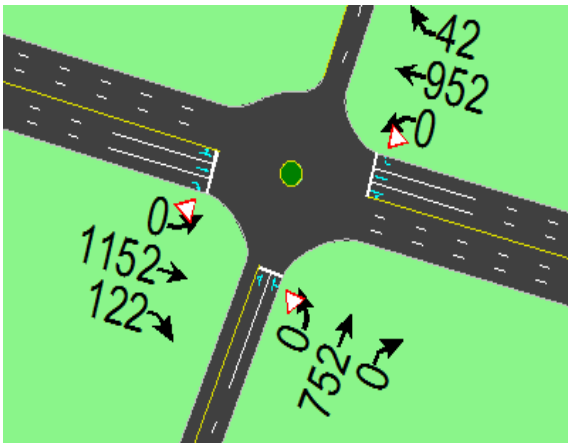
Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.0	2.7	1.9	13.1	18.7
Delay / Veh (s)	44.1	118.5	54.5	647.4	185.9
Total Stops	51	87	109	3	250
Travel Dist (km)	39.8	12.4	52.5	8.1	112.8
Travel Time (hr)	1.9	3.1	3.0	13.3	21.3
Avg Speed (kph)	21	4	17	1	8
Fuel Used (l)	4.3	3.6	5.6	12.0	25.4
Fuel Eff. (kpl)	9.3	3.5	9.4	0.7	4.4
HC Emissions (g)	9	13	16	8	46
CO Emissions (g)	296	321	428	265	1310
NOx Emissions (g)	29	29	48	10	116
Vehicles Entered	80	90	133	78	381
Vehicles Exited	82	76	118	69	345
Hourly Exit Rate	492	456	708	414	2070
Input Volume	547	531	776	946	2800
% of Volume	90	86	91	44	74
Denied Entry Before	0	0	0	10	10
Denied Entry After	0	0	0	87	87

Variable	Current status	proposed situation
Travel Distance (km)	112.8	↓ 106.7
Travel Time (hr)	21.3	↓ 16.6
Total Delay (hr)	18.7	↓ 14.2
Total Stops	250	↑ 257
Fuel Used (l)	25.4	↓ 21.4
HC emissions(g)	46	↓ 32
CO emissions(g)	1310	↓ 973
NOx emissions(g)	116	↓ 98

Table 4.16 Comparison between current and proposed scenario at point 4

Note that (Travel Distance, Travel Time, Total Delay, Fuel Used) has relatively improved, as for (Total Stops) has increased and the ratio of emissions have decreased

Point 5: Roundabout Al Arrda



Proposed situation

Approach	EB	WB	NB	All
Total Delay (hr)	0.7	0.4	6.2	7.4
Delay / Veh (s)	11.0	10.0	246.8	55.9
Total Stops	155	94	112	361
Travel Dist (km)	58.4	30.7	21.4	110.5
Travel Time (hr)	2.0	1.2	6.8	10.0
Avg Speed (kph)	29	26	3	11
Fuel Used (l)	5.9	3.4	7.4	16.8
Fuel Eff. (kpl)	9.8	8.9	2.9	6.6
HC Emissions (g)	20	6	7	33
CO Emissions (g)	691	312	305	1307
NOx Emissions (g)	69	27	25	122
Vehicles Entered	223	160	119	502
Vehicles Exited	221	163	63	447
Hourly Exit Rate	1326	978	378	2682
Input Volume	1274	994	752	3020
% of Volume	104	98	50	89
Denied Entry Before	0	0	1	1
Denied Entry After	0	0	4	4

Current status

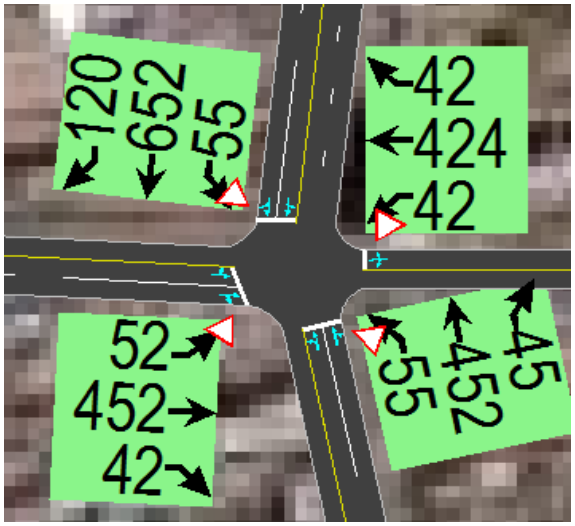
Approach	EB	WB	NB	All
Total Delay (hr)	0.7	0.3	10.9	11.8
Delay / Veh (s)	10.6	8.0	430.5	95.3
Total Stops	150	81	77	308
Travel Dist (km)	59.5	25.1	21.1	105.6
Travel Time (hr)	2.1	0.9	11.4	14.3
Avg Speed (kph)	29	28	2	8
Fuel Used (l)	6.1	2.9	11.2	20.2
Fuel Eff. (kpl)	9.8	8.7	1.9	5.2
HC Emissions (g)	17	6	2	26
CO Emissions (g)	652	297	236	1185
NOx Emissions (g)	63	27	19	110
Vehicles Entered	229	134	108	471
Vehicles Exited	220	129	74	423
Hourly Exit Rate	1320	774	444	2538
Input Volume	1274	994	752	3020
% of Volume	104	78	59	84
Denied Entry Before	0	0	0	0

Variable	Current status	proposed situation
Travel Distance (km)	105.6	110.2
Travel Time (hr)	14.3	10.0
Total Delay (hr)	11.8	7.4
Total Stops	408	361
Fuel Used (l)	16.8	20.2
HC emissions(g)	26	33
CO emissions(g)	1185	1307
NOx emissions(g)	110	112

Table 4.17 Comparison between current and proposed scenario at point 5

Note that (Travel Time, Total Stops, Total Delay) has relatively improved, as for (Travel Distance, Fuel Used) has increased and the ratio of emitted gases have increased

Point 6: Shanqeeti intersection with the market



Proposed situation

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.3	0.9	0.4	2.2	3.8
Delay / Veh (s)	12.3	58.6	14.6	68.6	38.7
Total Stops	76	57	73	64	270
Travel Dist (km)	6.6	29.3	42.5	9.5	87.9
Travel Time (hr)	0.5	1.6	1.3	2.4	5.8
Avg Speed (kph)	13	19	33	4	16
Fuel Used (l)	1.0	3.0	3.2	2.7	9.9
Fuel Eff. (kpl)	6.4	9.7	13.3	3.5	8.8
HC Emissions (g)	2	9	14	7	32
CO Emissions (g)	78	253	300	150	781
NOx Emissions (g)	10	27	38	16	91
Vehicles Entered	91	64	92	122	369
Vehicles Exited	88	52	90	104	334
Hourly Exit Rate	528	312	540	624	2004
Input Volume	565	508	574	827	2474
% of Volume	93	61	94	75	81
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	6	6

Current status

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.6	2.4	0.6	4.3	7.9
Delay / Veh (s)	20.1	159.3	22.6	142.6	79.8
Total Stops	99	72	90	44	305
Travel Dist (km)	7.4	30.4	46.6	9.1	93.4
Travel Time (hr)	0.8	3.1	1.6	4.6	10.0
Avg Speed (kph)	10	10	29	3	11
Fuel Used (l)	1.3	4.3	3.7	4.5	13.8
Fuel Eff. (kpl)	5.8	7.0	12.7	2.0	6.8
HC Emissions (g)	3	12	10	1	27
CO Emissions (g)	98	293	252	89	732
NOx Emissions (g)	13	37	30	8	87
Vehicles Entered	103	65	94	117	379
Vehicles Exited	95	45	92	102	334
Hourly Exit Rate	570	270	552	612	2004
Input Volume	546	508	552	827	2433
% of Volume	104	53	100	74	82
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	22	22

Variable	Current status	proposed situation
Travel Distance (km)	93.4	↓ 87.9
Travel Time (hr)	10.0	↓ 5.8
Total Delay (hr)	7.9	↓ 3.8
Total Stops	305	↓ 270
Fuel Used (l)	13.8	↓ 9.9
HC emissions(g)	27	↑ 32
CO emissions(g)	732	↑ 781
NOx emissions(g)	87	↑ 91

Table 4.18 Comparison between current and proposed scenario at point 6

Note that (Travel Distance, Travel Time, Total Delay, Total Stops, Fuel Used) has relatively improved and the ratio of emitted gases have increased

In this section calculations and Data analysis in three stages was performed:

- The first stage: visual elements of the area by entering the results of the questionnaires and personal interviews in the statistical analysis program SPSS.
- The second stage: Survey, Where the researcher out field survey to find out the obstacles facing the region.
- Third stage: Elements traffic flow, by creating the equivalent amount of movement then introduced into the program Synchro to see the current situation of the movement and find a new proposal for the development of movement

CHAPTER 5

Proposals to Improve Traffic Flow and Aesthetic in the Center of Omdurman

5. 1 Introduction:

This chapter aims to develop a set of proposals from which we can highlight the most important proposals, which emerged through the questionnaire and the views and observations of field survey opinions and suggestions from shop owners and personal interviews.

Where proposals rely on the development of the downtown area and restore it by solving the problems in the region and put development projects to develop the entrepreneurial spirit of the city's residents and encourage the private sector to invest in property development in the region through the restoration and re-use of heritage buildings that provide new benefit to the local community, and new services such as cultural, social and recreational services, which provides an outlet for the city's residents and enhance employment opportunities in the region as well as returning income to the property owner or investment.

This Spirit can be developed among residents of the city and the private sector through the provision of appropriate infrastructure and provide the necessary technical expertise.

Here comes the importance of the study of the development of urban centers, because they tend to consider the human needs and provide plans to provide a residential environment and urban and suitable atmosphere befitting their humanity, and emphasizes the role of the municipality and the role of the private sector and the city's population in these projects, with the participatory role of the citizens of the city and the owners of real estate investors and civil society organizations wishing to participate, so that they have the opportunity to contribute to the proposed projects for the development of the city.

The management of each of the proposed projects will be under the supervision of local control to ensure the achievement of the overall objectives of the projects and to ensure a certain level of services that are supposed to provide through this project, and also the development process needs to involve young people and children's category in the proposed development projects through guidance and it will be the provision of appropriate facilities for this category, which will increase the familiarity with of the place, which will interact with them and makes them a part of the living memories and interests that would betray my desire to maintain these places, and thus increase their awareness of the value of these historical places and increase their association with their city.

5. 2 Proposals Development:

The importance of these proposals is of being sought to provide human comfort, while maintaining the aesthetic and visual, auditory and functional, recreational and cultural elements of the area, through a combination of the following proposals.

5. 2. 1 Traffic flow in the study area:

Re-examine the movement of vehicles in the area and the need to close some streets in specific hours to check a magnet for people in the use of these spaces, and for being the main commercial center, which will be for a person in particular, including the closure of the main street in front of the movement of transport in specific times and tiling or internal streets pavement from the beginning of the market offer the street until the positions out, transportation and integrate the sidewalk Street with identifying a specific place in one direction width of 3 meters for the passage of cars and loading and downloading goods to the owners of the shops in time for it, and add the streets needed for the area furniture and commensurate with the region, especially in the broad areas of the street from the

central area of the station to into the market, although the street display suitable for cars and for pedestrians and possible to use part of it for the seats or green spaces, sessions cultural evenings note that the region and the city lacks a national or public park.

After looking at the program outputs, we found that there are some intersections and a street has been improved in terms of the level of service. Also some streets and intersections did not give any effect. We found that the most appropriate way to increase road capacity is by increasing the width of the road noting that there are occasional areas on both sides needs excess roads as well as adding a traffic signals and traffic signs on the roads.

5. 2. 3 Road furniture

Streets and public plazas, parks fields are the places where people practiced their activities, and need to be equipped with furniture in the context of holistic design recreational for citizens and include, seats, fountains, waved advertising, traffic signals , barriers pedestrians, waste baskets, parasols cars, fire hydrants, and devices lighting.

5. 2. 4 Utilization of spaces

Strengthening human relationship with Spaces, the changes in the blanks from the public to the Privacy and modifying squares and streets, so that human feel respect to them and encourage the use of these spaces.

5. 2. 5 Restoration of old and historical buildings

Restoration of the upper floors in good condition buildings, restoration of special mission buildings in the area and re-functional use their services in the community**.**

5. 2. 6 Billboards and sheds

Reformulation of billboards and standardize their sizes and colors in some disciplines, as well as sheds and doors of shops that conform to local laws, and fit and in harmony with the aesthetically and visually. The local authority must put a number of laws to preserve the beauty of the region and the preservation of citizens' safety and develop technical and structural requirements for billboards, sheds and shops doors colors.

1. Get a license from the local authority for sheds and colors shops' doors of various kinds.
2. Billboards and doors should not hinder or block traffic or visibility of roads and sidewalks to the public road.
3. Billboards and awnings and doors should have no impact on sight as a result of colors and compositions.
4. Taking into account the installation of billboards and awnings, doors artistically to ensures consistency with the other, and that it does not affect the civilized facade and overall shape of the region.
5. The local should control the billboards and awnings and doors with regard to maintenance and cleanliness as it should be with the sound and should be maintained and preserved in good condition.
6. The design and installation of billboards and awnings and doors should be according to the technical and safety requirements.
7. The total area of the substantive ads not exceeds a specific interface for 20% of the area of this interface.

According to the survey 59.4% of the respondents supported the idea of unifying framework for the design of advertising boards that proportional and consistent with

the general framework of the region, leading to the formation of an aesthetic view of the area and breaking the dull monotony by color or lighting.

50.3% supported the idea of unifying framework design of the sheds in terms of shape and size and visibility while maintaining the font type and the lighting and color of these sheds without pillars on the ground hinder the movement of pedestrians.

The existing sheds within the area do not subject to the laws and aesthetic elements so safety is missing and ongoing preventive maintenance does not exist, a good idea should be studied that does not affect the aesthetic element, it is possible to work diversity with unity and harmony and consistency (the unification of the emergence of umbrellas, the different fonts and colors) and without monotone frameworks boring and restrictive regulations and compatible with street View, the existence of regulations good but not necessarily work for all unified diversity produces more aesthetic harmony and can result in the emergence of creativity and the opportunity to compete.

65.9% support the idea of the color scheme to the doors of shops that gives aesthetic image to and the surrounding area.

5. 2. 7 Improve City Centre outlook

The need to consolidate the shops in the area and refined them so as to achieve the region architectural Identification, and the coordination of interfaces and reshape some of them to provide continuity between buildings in a line of sight to passers-by to reflect the desired identity of the region.

In this section Solutions and proposals for the development and regulation of the properties and aesthetic elements and traffic to the center of Omdurman.

This has included the development proposal: Study the movement of vehicles in the area, provide the area with furniture ,Organizing spaces and squares, Restoration of old and historic buildings, Improvement Billboards, awnings, doors and shops and Restructure and coordinate interfaces

CHAPTER 6

Conclusion & Recommendations

6. 1 Conclusion

Through the field study of Omdurman city center in light of the questionnaire analysis and interviews with specialists we can conclude the following results:

1. Non-flowing traffic, leading to congestions in the area
2. Existing buildings in the study area and surrounding the main street have one two floors so it can be exploited through the removal or upgrade to create commercial complexes.
3. The buildings in the area with its distinctive architectural character and harmonious is beautiful.
4. No spaces occasional excess roadside unused in the discharge or even increase in the width of the road, with a lack of ways to intraday parking and temporary and the permanent parking
5. Sheds, billboards and gates in front of shops have become a polluted and distorted element of sight.
6. Sidewalks are used for selling goods and hence reducing the movement of people forcing them to use the road and hence causing traffic congestion. The area lacks an element of safety because of:

• Sidewalks have irregular heights.
• Difficult to walk on the sidewalks because of the goods.
• Poor drainage system on the roads.
• Difficult to use by disabled, children and elderly people.

7. Study area reveals that no green areas, water elements to urban spaces.
8. Lack of organizing, aesthetic elements and furniture located in the area.
9. Not to adopt the urban development in the form vertical structures had a significant impact on the increase in urban area

10. Stalls became a reality in the area and it have double-edged sword. With a (637) unrolled in the area in addition to the shop owners stalls, the advantage is the economic reviving of the downtown and the disadvantage is the distortion of the downtown through visual pollution and impede the movement of pedestrians (acoustic pollution source) inconvenience and environmental pollution.

11.Low level of service in some streets and intersections leading to traffic jams

12. Lack of good planning for roads and traffic design suitable for signals and traffic intersections leading to the failure to use the roads in terms of traffic

13. The streets needs rehabilitation in terms of construction, drainage and road Furniture (lighting, traffic signs extension).

6. 2 Recommendations

In light of the above results, we can drive out a number of recommendations, including:

1. Need for concerted efforts from the decision-making institutions (local, county, state institutions and civil society organizations) in the activation of the Committee of the revival of the city that has been previously formed by the local authority and the community and representatives of trade unions in the area
2. Re-examination of transportation system in the area and work to convert some of the streets and the closure of the some street and turn the side streets outside the city center.
3. With reference to the results of the program outputs can improve the traffic situation by modifying the geometric design of roads and by adding lane where needed
4. Also can prevent stopping in certain areas of the roads where these places are considered the entrances and exits through the bottlenecks by setting rules for not

stop, and also can select a specific time to stop in some places, or the work of a particular Tariff of to stop in these areas

5. For the conduct traffic propose some solutions to improve the level of service in the study area, where we found in some of the control points that can increase the capacity of the campus of road enough to accommodate the amount of vehicles as in (Roundabout Al Arrda ,Hospital roundabout, Intersection of Al Azhari) but At some points it is desirable to establish traffic signals as in (Intersection of the morgue, Karari intersection, Shanqeeti intersection with the market).
6. Coordination between local administrations with each other and coordinate with the institutions and stakeholders outside the local and the community.
7. Work on identifying special areas for cars parking and rehabilitation of public toilets and to identify areas for the stalls and privatization.
8. Work on the rehabilitation and restoration of buildings.
9. Not to give licenses for new high buildings in the area and if licenses are given then the new building exterior must be suitable and consistent with existing interfaces.
10. Develop laws to standardize the design frameworks for sheds, billboards, and the unification of commercial doors for shops colors.
11. Training and qualification of specialized personnel in the field of design.
12. Formulate laws to unify the sidewalks in terms of (height, width) and refer to the local authorities for any amendment needed.
13. Put laws and regulations concerned with the protection of historical and archaeological areas in general
14. Work on programmable optical signals according to traffic pressure in order to improve traffic flow by creating a follow-up a traffic control center and equipped with the latest technologies Such as cameras along roads that provide

this center with information on the status of the road it is possible to put electronic score boards on both sides of the roads connected to the traffic control center Provide road users with clear information on the status of the road in front of them and Perhaps that be a reason to avoid the use of some of this road by searching for other ways alternative

15. The eligibility buses To be working on the development of those buses as can cooperate mass transit company with the owners of these buses by buying new buses be a substitute for the civil buses as it must find parking for these buses points instead of the current method, which surprises us drivers of these buses to stand the sudden has been incidents because of this stand up the sudden
16. Also can prevent stopping in certain areas of the roads where these places are considered the entrances and exits through the bottlenecks by setting rules for not stop, and also can select a specific time to stop in some places, or the work of a particular Tariff of to stop in these areas.
17. Charging for the high congestion areas, this thing positively affect the flow of traffic.
18. Applied to the system put fee are calculated according to the size of congestion in area. (Congestion Pricing) and therefore are paying these fees for those who wish to enter the area where the traffic congestion. The fees are deducted by electronic cards are placed in the windshield of the vehicle. Be the electronic painting that shows the value of the fees in a clear place in front of the entrance to the road so that the driver to determine whether these fees would have been paid or will exhibits another way longer distance of the area to which he refers.
19. Transforming the market area to pedestrian corridors.
20. Close all roads described in front of all vehicles.
21. Application plan and a one-way roads to the downtown area of Omdurman.
22. Transform the road market to one Ways direction.

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- **First: Foreign References.**
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- Supplement No. 1 resolution model.
- Supplement No. 2 personal interview model.
- Supplement no. 3 traffic account
- Appendix (4) the results of the analysis of the first part of the questionnaire (general information).

Appendix

Supplement No. 1 resolution model.

بسم الله الرحمن الرحيم

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليا
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نموذج الاستبانة.

نموذج استبانة

إرشاد :

أنا محمد اسماعيل محمد ابراهيم طالب في كلية الدراسات العليا/ برامج الماجستير في الطرق و النقل، أقوم بإعداد أطروحة ماجستير بعنوان:

"تطوير وتحسين العناصر الجمالية والتدفق المروري لوسط مدينة امدرمان"

حدود المنطقة المركزية: منطقة وسط امدرمان و يمكن تحديدها (مقابراحمد شرفي – صنية العرضة - استاد الهلال – الهجرة).

هدف الاستبانة :

تهدف الاستبانة إلى الحصول على معلومات تساعد الباحث على تحديد الخصائص الجمالية والبصرية و المروريةالتي من خلالها نستطيع تطوير وتحسين العناصر ألبصريه والجمالية و المرورية في منطقة مدينة امدرمان.

أولا: المعلومات العامة:

ضع إشارة* في المكان المخصص:-
:العمربين (-).
الجنس : ذكر ( ). أنثى ( ).
الحالة الزوجية : أعزب ( ). متزوج ( ).
المؤهل الاكاديمي : حدد ( ).
المهنة: موظف ( ). تاجر ( ). اعمال حرة ( ). طالب ( ).غير ذلك ( ).
مكان السكن : المدينة ( ). الضواحي ( ). القرية ( ).

ثانيا : معلومات حول الخصائص والعناصر البصرية والجمالية لمنطقة الدراسة(وسط مدينة امدرمان):

ضع إشارة (x) في المكان المخصص للإجابة :

1-هل تعتقد أن العناصر التالية جميلة:

الرقم	الاختيارات	الاجابة				
		أوافق بشدة	أوافق	لا ادري	أعارض	أعارض بشدة
أ-	المناطق القديمة الموجودة والموزعة بالمنطقة (أثرية)					
ب -	المباني الحديثة والجديدة والمرتفعة					
ت -	ميدان البوستة					
ث -	النصب التذكاري					
ج -	أشكال المباني والواجهات الخارجية					

2 – هل تعتقد أن المباني الجديدة تؤثر على:

الرقم	الاختيارات	الإجابة				
		أوافق بشدة	أوافق	لا ادري	أعارض	أعارض بشدة
أ	المظهر الجمالي لوسط المدينة					
ب	النمو الاقتصادي للمدينة					
ت	الحفاظ على البيئة والتقليل من التلوث					
ث	توفير الراحة النفسية للإنسان					
ج	تعمل على إنعاش الحركة السياحية					

3 -أهم عناصر أثاث الشوارع التالية التي يفتقر إليها وسط المدينة وتفضل وجودها وسط المدينة ،(يمكن إضافة عناصر أخرى).

الرقم	العناصر	اوافق	اعارض	لا ادري
أ-	الأشجار			
ب -	مقاعد الجلوس العامة			
ت -	إنارة الشوارع المختلفة			
ث -	صناديق بريد			
ج -	أكشاك هواتف عامة			
ح -	النصب التذكاري			
خ -	العناصر المائيةوالنوافير			
د-	سلال نفايات			
ذ-	حمامات عامة			
ز -	حواجز الأرصفة			
ر -	لوحات الدعايةوالإعلان			
م	لوحات إرشادية			

7 – أجب على الأسئلة التالية:

الرقم	الاختيارات	الإجابة				
		أوافق بشدة	أوافق	لا ادري	أعارض	أعارض بشدة
أ-	وضع أسس تصميميه للوحا ت الدعاية والإعلان وفق نظام محدد (الحجم، الخط، مساحات).					
ب-	هل تؤيد فكرة وضع اسس تصميمية للمظلات (شكلها، مساحتها، وبروزاتها).					
ت-	هل تؤيد فكرة وضع اسس تصميمية وفق نظام لألوان بوابات للمحلات التجارية.					
ث-	هل تؤيد فكرة إزالة البسطات و الاكشاك و الباعة المتجولون من وسط المدينة ومن أبواب المحلات.					
ج -	هل تؤيد فكرة إزالة محلات الدجاج الذبح من وسط المدينة ووضع مذبح خاص لذلك .					
ح -	هل تؤيد فكرة إغلاق بعض الشوارع الرئيسية من بداية السوق الي حي العرب او الى منطقة الهجرة أم ان محركات السيارات تفتح في ساعات معينة وتؤهل وهل عملية اغلاق و فتح بعض الشوارع يؤدي الى توفير كافة العناصر الجمالية للمنطقة لتبقى منطقة جذب سياحي اقتصادي ثقافي.					

*****انتهت الأسئلة*****

مع جزيل الشكر والتقدير لتعاونكم واهتمامكم

Supplement No. 2 personal interview model.

بسم الله الرحمن الرحيم

جامعة السودان للعلوم والتكنولوجيا

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نموذج مقابلة شخصية

إرشاد :

أنا محمد اسماعيل محمد ابراهيم طالب في كلية الدراسات العليا برامج الماجستير في الطرق و النقل، أقوم بإعداد أطروحة ماجستير بعنوان:

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حدود المنطقة المركزية: منطقة وسط امدرمان و يمكن تحديدها (مقابراحمد شرفي – صنية العرضة - استاد الهلال – الهجرة).

هدف المقابلة :

تهدف المقابلة إلى الحصول على المعلومات التي من خلالها تطوير وتحسين العناصر ألبصريه والجمالية و المرورية في منطقة مدينة امدرمان والاستفادة من الخبرات والتجارب السابقة في مجال التخطيط والعمارة بهدف تطوير المظهر الجمالي والبصري لوسط المدينة (المنطقة سوق امدرمان).

أولا : المعلومات العامة :

الاسم : ( ).

العمر : (-).

الجنس : ( ).

المهنة : ( ) التخصص ( ).

الدرجة العلمية :( ).

مكان السكن : ( ).

ثانيا : معلومات حول الخصائص والعناصر البصرية والجمالية لوسط مدينة امدرمان :

هل يوجد في وسط مدينة امدرمان عناصر بصرية وجمالية ؟ما هو تقييمك لهذه العناصر من الناحية المعمارية والتخطيطية و المرورية؟

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من الناحية التخطيطية ما هي الصعوبات التي تواجه منطقة وسط المدينة ؟

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ما هي الطرق الأنسب للتغلب على المشاكل التخطيطية والمعمارية و المرورية لوسط مدينة امدرمان ؟

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من هي المؤسسات و الجهات التي من خلالها ممكن أن تتعاون لتحسين وسط مدينة مدرمان ويقع على عاتقها المتابعة (البلدية ،الحكم المحلي ،الشرطة لتنفيذ القوانين، المؤسسات المحلية، الأهالي ،وغير ذلك) ؟

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تعتبر عناصر أثاث الشوارع من أهم العناصر التجميلية للمدن مع الأخذ بعين الاعتبار الناحية الوظيفية لها.ما هي العناصر التي يفتقر لها وسط مدينة امدرمان؟

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ما تقييمك لما قامت به محلية امدرمان من تغيير شكل مداخل و مخارج السوق الناحية الجمالية والبصرية والوظيفية والمرورية بالتحديد باعتباره كأحد المعالم المميزة لوسط (Land Mark) مدينة امدرمان ؟

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هل تؤيد فكرة وضع اطر تصميمية للوحات الدعاية والإعلان وفق نظام ومقاس محدد ،للحجم ،واللون، ونوع الخط، والإنارة، وألوان أبواب المحلات، وتوحيد بروز المظلات ومناطق البيع و الشراء .الأمر الذي يضفي لمحة جمالية للشوارع يعمل على تناغم الشكل الجمالي لوسط المدينة؟

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ما هي الأمور التي تعتقد أن الاهتمام بها يعمل على تطوير الظهر الجمالي والبصري لوسط مدينة امدرمان؟

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برأيك كيف تؤثر مواقف المواصلات على إبراز العناصر الجمالية والبصرية لوسط مدينة امدرمان ؟

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مقترحات إضافية من خلالها نستطيع نعمل على تطوير وتحسين وسط مدينة امدرمان ونعمل على استدامتها ؟

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هل يحتاج سوق امدرمان الى اعادة تخطيط او الي عملية تعديل .و هل المواقف تفي في الغرض بداخله؟.....

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*****انتهت الأسئلة*****

مع جزيل الشكر والتقدير

لتعاونكم واهتمامكم

Supplement no. 3 traffic account

بسم الله الرحمن الرحيم

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليا
مدرسة الهندسة المدنية
ماجستير طرق و نقل
ص.ب72 الديوم الشرقية ت
0155144366

Sudan University of Science & Technology
College of Engineering
SCHOOL OF CIVIL ENGINEERING
P.O. Box 72 Eastern Daim Tel.
0155144366

حصر المرور

الموقع: اسم الراصد:

التاريخ: بداية الحصر:

المنطقة: المحافظة:

الحصر يوم .....من .....-.....شهر.....سنة.....في اتجاه.....

موتر	ركشة	ملاكي+امجاد+بوكس	حافلة14	حافلة24	بص	شاحنة مفردة

المقابلات

تم خلال الفترة (2014/8/14- 2014/10/11) إجراء المقـابلات مـع الأشـخاص التاليـة أسماؤهم:

الرقم	الاسم	التخصص	المهنة/جهة العمل
.1	إسماعيل محمد إبراهيم المطبعجى	مهندس	جامعه السودان
.2	حسن مبارك حسن الصافي	قانون	محامي (مكتب الطيب هارون)
.3	مبارك حسن الصافي محمد	اقتصاد	عمل خاص
.4	يوسف عبد الوهاب يوسف	مهندس مدني	مكتب استشاري
.5	احمد الأمين محمد احمد حمراي	مهندس مدني	وزارة التخطيط العمراني
.6	أمين ابراهيم محمد ابراهيم	مهندس مدني	شركة صادق للطرق والجسور
.7	علاء الدين احمد عبد السلام	ماجستير طرق و نقل	قطاع خاص
.8	مسرة صلاح عمر ابراهيم	مهندس مدني	مكتب استشاري
.9	الهاشمي عبدالله الهاشمي	مهندس مدني	مكتب استشاري
.10	ريله عبد القادر العوض	مهندس مدني	مكتب استشاري
.11	فانة عبد الله عبد الرحيم	مهندس مدني	السكة حديد
.12	حمد بادي	موظف المحلية	محلية امدرمان
.13	احمد بادي	مهندس مدني	وزارة التخطيط العمراني
.14	مشتهى الطيب	مهندس مدني	شركة مقاولات
.15	عثمان صلاح	ضابط	وزارة الدفاع
.16	اشرف فتح الرحمن عبيد	ضابط	وزارة الدفاع
.17	أمير عمر محمد عبد الرحمن	مهندس معماري	عمل خاص
.18	احمد سنهوري	موظف اللجان الشعبية	محلية امدرمان
.19	ابو هريرة	ضابط	المساحة العسكرية
.20	الفاضل ادم علي احمد	ماجيستير طرق و نقل	جامعة نيالا
.21	احمد مبارك	طالب هندسة	جامعة السودان
.22	حسن شمت	طالب هندسة	جامعة السودان
.23	لبنى اسماعيل	موظفه المحلية	محلية امدرمان