

CAR PARKING SPACE IN HOSANNA TOWN (CASE OF ARADA SUB CITY), HADIYA ZONE, SNNPRG

NAME; TUMISO HEREGO SEDEBO



A Thesis Submitted to the Department of Urban Planning and Design
School of Civil Engineering and Architectural Office of Graduate Studies

Presented in Partial Fulfilment of the Requirement for the Degree of Master's in
Urban Planning and Design

Office of the Graduate Studies in
Adama Science and Technology University

July/2021
Adama, Ethiopia

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Declaration

I hereby declare that the work which is being presented in this thesis entitled: CAR PARKING SPACE in Hossana, Hadiya Zone, SNNPR case of Arada Sub City is original work of my own, has not been presented for a degree of any other University and all the resources of Materials used for this thesis work has been properly acknowledged.

By

Tumiso Herego: Signature_____ date_____

Recommendation

I, the advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled “-CAR PARKING SPACE IN HOSSANA TOWN IN SNNPR,(CASE OF ARADA SUB CITY)” prepared under my guidance by Tuniso Herego submitted in partial fulfillment of the requirements for the degree of Master’s of Science in Urban Planning and Design. Therefore, I recommend the submission of revised version of the thesis to the department following the applicable procedures

Major Advisor _____ Signature _____ Date _____

Approval of the Thesis

I, the advisor of the thesis entitled “Car Parking Space in Hossana Town Case of Arada Sub City” and developed by Tumiso Herego, hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis. Major Advisor Samson Kassahun Lema Signature _____ Date _____

We, the undersigned, members of the Board of Examiners of the thesis by Tumiso Herego have read and evaluated the thesis entitled Car Parking Space in Hossana Town Case of Arada Sub City” and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Urban Planning and Design.

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Finally, approval and acceptance of the thesis is contingent upon submission of its final copy to the Office of Postgraduate Studies (OPGS) through the Department Graduate Council (DGC) and School Graduate Committee (SGC).

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ACKNOWLEDGMENT

First and for most glory be to almighty God: Who gave enormous endurance and health from beginning to the end of my task. Next to God, I would like to express my deepest gratitude to my advisor Professor Samson Kassahun for his supportive suggestion and experience sharing the professional research working and give materials that helping to how to improve the progress of the research after giving his comment from time to time. Next to my advisor, I like to thank, my wife Tsaganet Addis for her strong prayer, and all my family had supported my idea and giving supportive suggestions to finish the research work on time.

Finally, I like to thanks, my postgraduate classmate Aron G/Egzehgber Hogos, for giving me important data about what I want from him and architectural pieces of training, because he had the assistant lecturer in our department, my intimate and model for me, during every academic journey in the University.

ABSTRACT

Car parking is stopping of the car at the end of the journey or at the destination of the place where driver moved and Car parking space is also paved or unpaved place of spacefic place for parking purpose as individual or group parking of car. Nowadays in Hosanna Town, many challenges are mainly concerned with the shortage of Car parking space provision on the transportation system especially in the study area in Arada Sub City. Such as Traffic congestion due to imbalance of on-street Car parking space and increasing the number of different vehicles from time to time and their flow on 15-meter existing main asphalt Road, Traffic accident due to the traffic Congestion, idle of the drivers by waiting for parking space, fuel consumption and Obstruction to firefighting operations were known in Study area. To determine and measure the above challenges on the Town, the existing car parking space provision, parking space problems, parking space selection criteria on the town, and effects by the shortage of car parking space provision on the transport system had analyzed based on the structured and semi-structured questionnaire, Interview, and direct purposively selected congested and CBD area 500meter on-street Asphalt and five Hotels and parking provision system observation had been surveyed on this study. Qualitative and quantitative data collection methods had used to get primary and secondary data. The main part of Car parking space provision on the transport system had to analyze the factors affecting the provision of the parking space, those were parking angles, size of the vehicles, circulation system, and some vehicles that were parked were counted by license plate survey method from seven respective weekdays and weekends and as result researcher, determined that the accumulation rate and efficiency on the 500meter asphalt road that had selected by the researcher judgmentally by the road congestion and business center of the town taken as the criteria. But, even the analysis shows the on-street parking was efficient, depending on the Analyses of seven days counting of the traffic duration, the researcher concluded the following option, in addition to the result from the questioner, interview and field observations, the off-street car parking space provision recommendation had prepared as the urban design intervention to bring accessibility for all parking as the option.

Keywords; *Parking, Parking Space, Congestion, Accommodation, Accident, Efficient*

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ACRONYMS AND ABBREVIATIONS

ASTU	Adama Science and Technology University
CBD	Central Business District
CSA	Central Statistical Agency
FGD	Focal Group Discussion
GIS	Geographic Information System
HIPP	Hosanna Town Integrated Plan Preparation
IHT	Inheritance Tax Threshold
MS Excel	Microsoft Excel
RAC	Royal Automobile Club
SPSS	Statically Package for Social Science Software
WHO	World Health Organization

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CHAPTER ONE

1. INTRODUCTION

Car parking space is one of the very important transportation elements in urban developing and developed countries in the world, because of the rapid increase in their vehicle population which lead unbalance of the demand and supply of car parking space provision (H. Ibrahim 2017). And also, Car parking space can be provided in three forms; on-street parking (curb parking), off-street parking (parking lot), and parking structures which may be in two types; either as a single or double floors constituting the building basement (if underground) or podium (if above ground) or as an individual structure (multi-story garage (Shubham Naik, 2017). In the world, the car parking space challenge leads to many different problems because the lack of infrastructure and weak maintenance exerts extra stress on these growing traffic flows with congestion; pollution, and low road safety levels as result (Rust et al., 2008, Cohen, 2004, Gwilliam, 2003).

So the transportation system research on commuting has invested effort on the car parking space challenges based on the considered congestions, accident pedestrian safety, and Social and environmental challenges caused by rapid increasing the vehicles in the Town. More over this result in a greater demand for parking space in the central business district (CBD) and other areas where the activities are concentrated. There is a significant and tremendous increase in the demand for parking spaces due to the increase of road traffic during the last decade in small cities as well and also, as seen about, in the entire developed and developing country cities car parking space challenge is common (Cohen, 2004). So this study will answer the questions like the existing car parking system challenges, selecting criteria' of parking space, and how factors those affecting provision of parking space will be identified and tested well on the standard of parking design. In Hosanna town car owners, especially in the study area, there is a facing challenge in the provision of parking space especially most of the time car parking seen on street and it creates a great challenge of pedestrian movements and it needs detail study.

1.1. Background of the study

Now a day more parking spaces are required as the population of cars worldwide continues to increase, so efficient parking space is becoming an important issue (Kumar Ghosh, Hyderabad & Sankata Rusty, 2018). Also, a high urbanization rate in combination with the intense desire for car ownership in developing countries causes rapid growth of motorization and on the other hand, a lack of infrastructure and weak maintenance exerts extra stress on these growing traffic flows with congestion, pollution, and a low road safety level as a result (Gakenheimer, 1999). Car parking space is also one of the infrastructural components of urban cities in every car trip and plays a major role in the transportation system in the whole world since all vehicles require parking space when they reach their destiny (Transport report, 2014, Adam, J.pel, et al. 2016, RAC Foundation, 2004, & Hossam El-Din I. S. Ahmed, 2017).

In addition to economic growth questions and development movements in developing countries, providing available car parking space is must be an issue of urban planners, designers, and traffic managers need to take into consideration because of this rapid change in traffic measures will be undertaken to the traffic congestion (Nicole Taheri et al, 2015). Most resarchers must do researched around this field as much as in the entire world to minimize the challenges above mentioned, because more parking space challenges show closed relation with traffic congestion, traffic accident, and environmental pollution (Yuejun Liu et al. 2012). This situation has worsened for developing regions due to unplanned cities, poor discipline, poor traffic law enforcement, lack of alternate traffic means, design budget shortage (Vipin Jain Polytechnic Institute, 2012).

It is known that Ethiopia is one of the developing countries from Africa, that the increasing traffic flow and traffic congestion must be considered in urban planners and traffic managers need to take into consideration this rapid change in traffic, so as to take corrective measures will be undertaken to curb the traffic challenges will be addressed by car parking space provision study and this research helps to provide available parking space to minimize the above car parking related challenges (Ajay & Fanny, 2008).

Generally as seen in the world scholars above, depending on reality observed in the different countries, Car parking space study, is the mandatory and main issue to research in Hosanna Town, recently Hosanna town facing all the above problems, like traffic congestion, time

consumption, traffic accidents, environmental pollution, fuel consumptions, and different negative consequences are visible at Hosanna town, especially in the study area of Arada Sub City.

Mainly, in the corridors of the central business district (CBD), narrow roads, parking near the buildings, parking on the open spaces where people enjoy, and other areas where the activities are concentrated must be researched well and improving the parking space situation. Because of the significant and tremendous increase in the demand for parking spaces due to the increase of road traffic starting from the last year in Arada Sub City. So this study will answer the questions of parking space and related challenges depending on the objectives of this research like, first analyzing existing car parking space system, selection criteria and determining existing parking space problems, second measuring effects of parking space provision shortage on the transportation system and third examining the factors affecting the provision of parking space depending on the standards of the urban design. Finally recommending design options to the parking space provision to balance the demand and supply of space.

1.2. Statement of the Problem

The fast-growing vehicles in the cities and developing countries formed a sharp contradiction and caused the phenomena of parking space provision difficulty and parking disorderly, especially in CBD areas and the reality of the most developing and developed countries show that inadequacy of car parking space is one and very serious part of urban infrastructure and lack of this in most of the urban cities lead to huge challenges like road congestion, Traffic accident, environmental pollution, and air pollution, time consumption, fuel consumption, Socially and economically negative consequences on the movements of car owners, pedestrians and drivers (Yen-ling, et al., 2016). Parking space is one of the major challenges created by increasing road traffic, it has an impact on transport development and the availability of less space in urban areas has increased the demand for parking space, especially in CBD areas (Oyedepo, (2016).

When looking at Hosanna as the study area, Hosanna is the capital of the Hadiya zone and it is a highly commercial town. Surrounding the town there is no additional large town for to enjoy to live a better life. So most people enter Hosanna Town in the form of internal migration from the rural woredas and kebeles to get and enjoy a better life and job

opportunities. This leads the town to be highly populated and became congested by the owner of the vehicles. The number of vehicles increasing from time to time in Hosanna, because of the most youth population parts almost from all the households of the town at least of one boy will migrate to South Africa; and as they get better work and better life, because of this out-migration to South Africa, the economy of migrating family in this town is improving and the number of cars increasing from year to year and even from season to season with high rate. This increasing number of car and pedestrians, also creates challenges of car parking space and lack of available parking space and narrow roads on the Town leads to, traffic congestion, Time consumption, traffic accidents, environmental pollution, fuel consumptions, and Social and economic negative consequences are seen at study area with high rate. Researching on car parking space is very essential in Hosanna town especially in the study area of Arada Sub City to achieve day to day activities and to ensure overall developments in Sub City by providing adequate document about parking space in the Town (Hosanna Town Finance and Economic Development Office yearly socio-economic data, 2018).

Starting from the above challenges in the town, the researcher refers to different researches and literature like (Taye Abu, Shivakumar Mahto, 2019) study about Evaluation of Parking Problems for Transportation System in Addis Ababa city, and his recommendation was creating smart parking was his conclusion (Mengistu Manaye,2018) from Addis Ababa University, done analysing and optimizing on car parking options and modeling by mathematical method, and his finding depends on the optimization of the parking area, also his recommendation was after calculating modelling recommend it for next designers to design. (Hagare Yilma, 2017) from Addis Ababa University, researched on the case of Lidata sub City, the study on overall traffic management practices as the case for parking solution and her recommendation was an assessment of best solutions for the traffic light and curb the traffic problems must be fulfilled by Addis Ababa Road authority.

So the researcher is interested to conduct car parking space provision in Hossana town, because, no one has still researched on this similar title on the study area especially in Arada Sub City. To conduct this research researcher organized the best methodology and study objectives to achieve the research and all the recommendations from the previous researchers will be taken as the tools, to fill the gaps of car parking space provision

including different questionnaires' and interviewee will be prepared to analyse existing challenges and system of parking space provision. And after identification of the challenges on parking space, the researcher will prepare well organized and standardized parking space design to minimize the challenges of the car parking space in this study area, especially in Arada Sub City.

1.3. Motivation for the Study

Hosanna is the big Town of the south nation nationality. It is also known as the center for trade, multi-culture and depending on the good Air condition of the town, many governmental and spiritual conferences and short period training will happen.

But in the Town, even if, it is a big Town, many challenges are facing because of the poor design of the street. And this leads to a shortage of car parking space, Road congestion, traffic accidents, Economic, social and cultural weakness, air pollution and many other challenges are facing highly in the Town. To minimize and improving the above and related challenges, the researcher motivated to research the shortage of parking space in Hosanna town, Case of Arada Sub City.

1.4. Objective of the study

1.4.1. General Objective

The general objective of this research is to assess the Car parking Space in Hosanna Town by taking Arada Sub City as the case.

1.4.2. Specific objectives the research

The specific objective of the research is

To analyse the existing car parking system activities? Parking Space selection criteria

To Measure the effects of parking lot shortage on the transportation system

To identify the determining factors affecting the parking space provision in the study area

1.5. Research questions?

What are the car parking space activities in the study area?

How can we measure the effects of parking lot shortage on the transportation system?

What determining factors affecting the parking space provision?

1.6. Significance of the study

This study attempts to the car parking space and explores different options to the challenges depending on parking space shortage in Hosanna by taking Arada Sub City as the case. It is, therefore, hoped and expected to provide insights that have some gap in the future strategy on the structural plan revision of Hosanna Town. Accordingly, this study will contribute significant information on the following issues

1. It would provide insights in an attempt to revise this car parking space provision design document during the structural plan revision at 2015G.C of Hosanna Town that will be up to date and efficient for the Town under this study.
2. The results of this study help to have organized and designed documents for the car parking space and transport system and to show the opportunities in the formation of parking lot spaces in the transportation sector.
3. Also conducting the researcher on the study, benefits to concluding MSC Program

1.7. Scope of the study

A. Thematic scope: of the paper is to study car parking space challenges in Hosanna Town; especially in Arada sub city because no one had studied the satisfactory of car parking space challenges in the study area. The total area of Hossana Town is 10542 hectors and from this, the Total area of the Arada Sub City is 31 hectors.

B. the Spatial scope of this research, the research is conducted in Arada sub-city

C. Temporal scope; the research conducted from February to June 2021

1.7. Limitation of the study

This research limited to one sub-city that means only in Arada Sub City, from six Sub Cites of Hosanna town due to limitation of time, and also Coved -19 was one and difficult cause to get direct contact information in group interview and discussion to get full information .

1.8. Organization of the Paper

1. Chapter one; in this part, the introduction and background of the study area and field of the study has been discussed and explained well.
2. Chapter two; on this part of the paper; the related field of the papers, concepts, definitions, formulas, and different other related documents had been referred.
3. Chapter three; on this methodology part, the research approach, the research sampling techniques, sampling frame, sampling size, Types of the data sources and data gathering

instruments(structured and semi-structured questionnaire, interview, observations), data analysis, and data presentation became organized on this part

4. Chapter four; this part is the core and main processing of the research work at all. Sand on this part organizing the analysis work and analysing the questioners depending on the objectives and observation had done.

5. Chapter five; in this part, the recommendation and discussion processed depending on the result of the analysis and interpretation of the research work.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

This chapter aims to present general facts of previous findings, ambiguity, and arguments about the concept that has been researched and researches on the related field from the trends of different countries will be reviewed. Here also explain, more about the parking space Conceptual framework depending on the parking standards, parking design, depending by evaluating the existing car parking space and providing available optional parking space by referring, materials like the structural plan of the town and responses of the user community to satisfy demands of the car parking space.

2.2. Definitions

2.2.1. Parking

A Parking is an area of natural, semi-natural, or planted space set aside for human enjoyment and recreation or the protection of wildlife or natural habitats. It may consist of grassy areas, rocks, soil, and trees, but may also contain buildings and other artifacts such as monuments, fountains, or playground structures. Parks belong to a vast category of land uses termed public open places. These places cover a broad range of purposes that are devoted to serving the needs and interests of diverse groups and many subdivisions of the population. They are geared towards fulfilling the leisure, recreational and educational needs of the young and old, male and female, rich and poor, and people of varying abilities. Public areas and facilities can be publicly and privately owned or owned through a public-private partnership. All these types of public areas can be divided into two broad families of spaces: plazas, streets, and parks (Byrne, J and J Wolch, 2009)

2.2.2. What is Car Parking?

Parking is an essential component in every car trip especially in the urban area context and plays a major role in the transport system since all vehicles require a parking location when they are not being used. In many research, parking system has been studied regarding the following different factors which are mode of choice, location accessibility, and network

performance due to congestion of traffic and parking location choices behaviors of drivers depend on the factors of access time to parking location, parking fees, walking distance to the final destination and several socio-economic characteristics of the driver. It is defined as parking is a service where some operators in the system and provide parking service for the customers such as motor vehicles, passenger cars, and truck vehicles. The services were given based on an hourly, daily, or monthly basis. The service areas are parking garages, parking stations, and valet parking, and Car parks operated by councils are excluded from this industry (Report, 2014, 2016).

2.2.3. Parking Space

It is a location that is designated for parking, either paved or unpaved. It can be in a parking garage, in a parking lot, or on a city street. Space may be delineated by road surface markings. The automobile fits inside the space, either by parallel parking, perpendicular parking, or angled parking. Depending on the location of the parking space, the time allowed to park may be fixed by regulation, and a fee may be required to use the parking space. It may be designated for free parking. When the demand for spaces outstrips supply vehicles may overspill park onto the sidewalk, grass verges, and other places that were not designed for the purpose (Michigan Administrative Code, 1979).

2.3. Different Modes of Car Parking system;

There are three modes of parking space based on the positioning of the vehicles

2.3.1. Parallel Parking

It is very difficult to access space in parallel mode of parking. In this mode of parking, cars are arranged in line with the front of one vehicle facing the rear side of the other vehicles. Dimension of the parallel parking is $2.4 \times 6.1\text{m} = 14.85 \text{ m}^2$. Area standard for one car space area standard (Kirti Mohan. P &Mridui Jain, 2017).

2.3.2. Perpendicular Parking

In this kind of parking, vehicles are parked alongside each other which are perpendicular to the curb or a wall. Generally, vehicles are parked in this mode way they may facing towards the shop and building that provide enough space for it. Dimension of this type of parking

standard will be $5.5 \times 2.7 \text{m} = 15.125 \text{m}^2$; it is only for the single-car space it holds wide space (Kirti Mohan Sharma, parmsh. P & Mridui Jain, 2017)

2.3.3. Angular Parking

This type of parking uses in the common parking lot, Because it takes low space when comparing with the other types and easier to access Most of the time this type of parking uses in Hotels, stadiums, etc., also it can be used on the street if the road is adequate. The dimension of the angular parking is $4.9 \times 2.4 \text{m}^2 = 11.76 \text{m}^2$ (Sharma, parmsh, et al., 2017)

2.4. Factors those Affecting the Car Parking space:-

1. Number of vehicles that need to be accommodated
2. The parking angel that to be designed
3. The circulation system of the vehicles on the parking space
4. The vehicle size that to be parked must be known

Basic formulas to calculating the parallel and the angle parking lot designs

$$\text{Parallel parking lot area} = 2.5 \times 5.9 \text{ m per car P No. } \frac{L}{5.9}$$

$$30^\circ \text{ angle parking area} = 5 \times 2.5 \text{ m P No. } = \frac{L - 1.25}{5}$$

$$45^\circ \text{ angle parking } 5 \times 2.5 \text{ m P No. } = \frac{L - 1.77}{3.54}$$

$$60^\circ \text{ angle parking } 5 \times 2.5 \text{ m} = \text{P No.} = \frac{L - 2.16}{2.89}$$

$$90^\circ \text{ angle parking } 5 \times 2.5 \text{ m} = \text{P No.} = \frac{L}{2.5}$$

L = Length of Kerb, P No. = Number of parking space

2.4.1. Parking space and Standards?

A. Off-street of the carriageway

Stopping points should be provided along major traffic lines at a distance of 400 - 500m and endpoints of bus trips. In many urban centers, some areas are exclusively allotted for parking which will be at some distance away from the mainstream of traffic. Such parking is referred to as off-street parking. They may be operated by either public agencies or private firms (Mathew, 2014)

B. On-street

On-street parking means the vehicles are parked on the sides of the street itself. This will be usually controlled by government agencies themselves. Common types of on-street parking areas are listed below. This classification is based on the angle at which the vehicles are parked concerning the road alignment. As per IRC, the standard dimensions of a car are taken as 5× 2.5 meters, and that for a truck is 3.75× 7.5 meters (Addis Ababa structure plan components, 2002).

2.5. Norms and standards of the urban design

Table 1 Norms and standards for the angles of parking

Measurement					
	A	B	C	D	E
Parking Angle (Degrees)	Space Width	Space Depth	Aisle Width (2-Way)	Aisle Width (1-Way)	Depth of Interlocking Spaces
Parallel 0°	8'	22'	18'	12'	n/a
45°	8.5'	17'	18'	12'	28.25'
60°	8.5'	18'	18'	16'	32'
90°	8.5'	18.5'	22'	20'	35'
Perpendicular 90°	8.5'	18'	24'	24'	36'

Source: Addis Ababa structure plan components, 2002

Table 2 Parking and maneuvering layout

Measurement		
	A	B
Parking Angle (Degrees)	Space Width	Space Depth
Parallel 0°	7.5'	18'
45°	7.5'	15.5'
60°	7.5'	16.25'
75°	7.5'	16.5'
Perpendicular 90°	7.5'	15.5'

2.5.1. Building type and parking requirement standards

There are some minimum parking requirements for different types of buildings. For residential plot area less than 300 Esq. require only community parking space. For residential plot area from 500 to 1000 sq., a minimum of one-fourth of the open area should be reserved for parking. Offices may require at least one space for every 70 sq. as a parking area. One parking space is enough for 10 seats in a restaurant whereas theatres and cinema halls need to keep only 1 parking space for 20 seats. Thus, the parking requirements are different for different land use zones (Addis Ababa structure plan components, 2002).

Table 3 Building type and parking requirement standards

Building type	Parking requirement
Flats in rental apartments and condominium housing	1 parking/flat
Offices	1 parking/every 40 m ² floor space
Supermarkets, Department stores, trade fares, etc.	1 parking/every 60 m ² floor space
Primary and secondary schools	1 parking/2 classroom
Universities	1 parking/every 5 employees
Hospitals	1 parking/every 40 m ² floor space
Museums and libraries	1 parking/every 40 m ² floor space
Hotels and motels	1 parking/every 5 beds
Theatres and Cinemas	1 parking/every 10 sitting spaces
Stadium	1 parking/every 10 spectator
Restaurants, bars, coffee houses, pastries, etc.	1 parking/every 10 sitting spaces

(Addis Ababa structure plan components, 2002)

2.4.2. Standard widths for Bus and taxi bays

The length of the recess should be about 15 m for the single bus with an additional length of 15 m for every additional bus.

The length of the recess for mini-bus taxi should be 7 m

The taper on either side should be about 8:1m

A separate bay with passage provision should have widths of 6.0 to 6.5 m for mini-buses and buses respectively (Addis Ababa structure plan components, 2002).

2.6. Effects of the car Parking space

2.6.1. Congestion:

Parking is a magnet that attracts traffic. More parking, more traffic jams. Congestion and parking are also interrelated since looking for a parking space (called cruising) creates additional delays and impairs local circulation. In central areas of large cities, cruising may account for more than 10% of the local circulation is not inadequate supply; it is inefficient management and Congestion and parking are also interrelated since looking for a parking space (called cruising) creates additional delays and impairs local circulation. In central areas of large cities, cruising may account for more than 10% of the local circulation (KeertanaDaliparthy, Laxmana Rapol, 2016, Huachun Tan. etal.2012).In Nigeria because of the narrow road and lack of sufficient off-street parking challenges of traffic congestion is happening from time to time(Asiyanbola&couple 2012, Olorofim,2013).

2.6.2. Accidents:

Careless maneuvering of parking and parking leads to accidents which are referred to as parking accidents. A common type of parking accidents occur while driving out a car from the parking area, the careless opening of the doors of parked cars, and while bringing in the vehicle to the parking lot for parking (Prashant Kumar Chandel, Bhavna Panwar,2018)

2.6.3. Environmental pollution:

They also cause pollution to the environment because stopping and starting vehicles while parking and un-parking results in noise and fumes. They also affect the aesthetic beauty of the buildings because a car parked at every available space creates a feeling that the building rises from a plinth of cars.

2.6.4. Obstruction to firefighting operations:

Parked vehicles may obstruct the movement of firefighting vehicles. Sometimes they block access to hydrants and access to buildings (Traffic Engineering Laboratory, 2014)

2.7. The Role of Parking Spaces for Urban Development

In relation to the study field, the following were referred as the benefits of the car parking space

2.7.1. Economic benefits;

Municipality may get a great parking fee as per types of vehicles and as the type of parking by the parking space price. When income from parking space increasing, the municipality or city authority will add another income-generating field, during this additional source of income for urban increasing (Sofia, 2020)

2.7.2. Job opportunity;

In most of the world, people migrate from rural areas to urban cities by searching for a job. Since parking area development by private as well as public needs labor man and he or she is lit rated or not use control the parking space by salary (<https://www.ato.gov.au>).

2.7.3. Reduce traffic Congestion and increase safety of mobility

In urban and transport Birro of Addis ababa studied that when parking facility become available in the city, then the mobility will be safe and road congestion will reduce as much as possible(UTS, 2005).

2.8. Annual reports of total vehicles in Hosanna Town transport system

Table 4 Total Vehicles in Hossana Town from 2009_2012 Etc.

Year	type of Vehicles									
	Code1 (Tax)	perc enta ge	Code 2	percentage	Code3	percent age	Code4	percentag e	Freight er	percent age
2009	1722	20%	398	16%	579	18%	413	20%	319	17.3%
2010	1892	21%	492	19%	682	215%	502	24%	406	22.7%
2011	2161	25%	653	26%	814	25%	602	28%	513	28%
2012	2869	33%	1006	39%	1083	34%	605	28%	602	32%
total	8649	100	2549	100%	3158	100	2122	100	1840	100

Source: Data collected by researchers from Hadiya Zone Road and Transport Department
2021

Table 5 Recorded traffic incident in Hossana Town from 2009_2012 Etc

Year	Death	percentage	High incident	percentage	Medium incident	percentage
2009	19	19%	51	19%	93	12%
2010	22	22%	66	25%	108	14%
2011	28	28%	71	26%	241	32%
2012	32	32%	82	30%	319	42%
Total	101	100%	270	100%	761	100%

Source: Data Collected from Hadiya Zone Police Station by the researcher at 2021

2.9. Parking statistics

2.9.1. Parking Generation

Parking generation is a trip of one way person movement with original destination and a tripe generation is a production and attraction of trips by original destination also parking is the derivative of the trip generation (Methane W., 2004).

2.9.2. Parking study and parking demand

Data regarding availability of parking space extent of its uses, parking demand will be essential and parking demand study refers to the amount of the parking that would be used by the particular time, place and price. Parking demand is affected by the trip vehicle owners, split mode, duration, geographic location workshops, recreational areas, parking demand peaks at weekdays at office buildings and restaurants, and theaters(Borough council,2012).

2.9.3. Parking demand Analysis

Parking statistic must be done to access parking demand and need

2.9.4. Parking accumulation:

It is the number of vehicles parked at a given instant of time normally it is expressed by accumulation curve (Kirshanna, .k, 2016)

2.9.5. Parking Volume:

The total number of vehicles parked at a given time interval but not repeated (Mathew,.t.Kirshanna,.k,2016)

2.9.6. Parking index

It is calculated by parking load/parking Capacity*100=parking index

2.9.7. Parking turnover

It is the ratio of the number of vehicles parked in duration to the number of parking bays available. This can be expressed as the number of vehicles per day per time duration (Mathew,.t.Kirshanna,.k,2016).

2.10. Parking Capacity estimation

Generally estimating parking capacity will be divided into two methods

1. Origin destination method (OD) and the theoretical parking capacity estimation method

Origin destination method (OD) survey data: It depends on the vehicle accumulation profile (VAP) and by the principles of arrival and departure of vehicles using data at O_D survey by type of the vehicles.

2. Theoretical parking capacity estimation method (TPC): it is directly derived from VAP and corresponding maximum value over the day or maximum value of each hour (Diablo & Sunnie ,2012).

2.10.1. Parking Survey

It is a means of collecting data by the all above statistics methods to determine the demand and the supply of the parking space and which is counted by three surveying methods

1. In- Out survey: it is a type of survey by counting from the selected lot by the beginning and leaving vehicles also taken, final occupancy has also taken (Diallo,.Saunier, N,2012).

2. Fixed period survey: it is the type of survey that counting will be done at the interval of the fixed period and it is similar to the In-Out survey but the number may miss by an interval of 15minutes to 1 hour (Diallo,.Saunier, N,2012).

3. License Plate survey: it is the best, accurate and fast way of counting occupancy because all the occupancy will be monitored at the continuous-time interval between 15minutes or 30minutes intervals; missing chance of counting is very less on this survey type (IBD).

2.10.2. Occupancy rate and Parking load calculating

Method of the survey will be conducted by the License Plate survey

- $$1. \text{ Occupancy rate} = \frac{\text{Maximumparkingaccumulation}}{\text{Maximumparkingspace}} * 100\%$$
2. Parking Load= (Accumulation at each interval*30minutes)* hourly time interval
3. Total parking Load =sum of parking load =
4. Parking efficiency= (total parking load/total parking space)*100%

2.11. International selecting criteria of parking space

These criteria will be the best international way how to select study area especially for car parking spaces and pave mental designs in Road and transport engineering with weighting through developed countries criteria (S.Anil Kumar et al., 2009)

A, B, C, D, E, and ARE F are letters that represent the study area to be selected by this and additional criteria scored weight

Table 6 Developing and developed countries parking space selection criteria

Criteria of parking lot selection	Weight %	A	B	C	D	E	F
Road, bus links	16						
Parking Lease or rent costs	15						
Staff parking	15						
Proximity to market or client	12						
Proximity to labor supply	11						
Customer or visitor parking	11						
Bus links	6						
Proximity to goods or services	5						
Traffic Noise	3						
Proximity to competitors	3						
Air quality	3						

2.12. Trends in Ethiopia, depending on challenges of car parking space

Considering the overall traffic management practices of the city and its flaws the following recommendations are made to curb the traffic problems and also sustain the city transportation system as a whole. Cities require a high-quality road network. However, experience shows that new roads alone will not be a long-term solution and that even with new roads, there is a need to cater for efficiency, to address safety, and to ensure that the road network is used effectively. Thus Traffic management is essential to meet these needs (HagareYilma, 2014)

He had done analyzing and optimizing the car parking area. In this study, the current parking situation of the city has been analyzed and allocating optimal parking location based on local and international parking site selection criteria with the help of AH, P methods, and mathematical LP- model to maximize parking capacity performance for Addis Ketema sub-city (Mangistu Manaye, 2018).

2.12.1. Problems of Car Parking in Addis Ababa

Addis Ababa City Administration had formulated a strategy to develop parking lots throughout the city to solve the parking space shortages and the administration would construct parking facilities within a short period. However, due to unknown reasons, the city is still going without sufficient parking spaces. Parking places remain a serious problem adversely affecting drivers, pedestrians, and the business community. (Capital magazine in February 2012).The existing parking service is inadequate and suffers from structural problems, mainly street parking and it is consequently, lack of sufficient parking places has contributed to inefficient utilization of the road network, safety hazards, and congestion problems and this leads the city to park remains one of the critical issues that need to be urgently addressed through optimum transport planning of the city Capital magazine in February 2012.

Addis Ababa city is located at the center of the country and is among the most important commercial city with a highly concentrated population in Ethiopia and recent, study shows that the morphology (form) of the city has changed very rapidly beyond the ability of the city administration to recover its original status, For example, the construction of different activities attract more people with a private vehicle who often visit the areas for leisure, employment, and other services. On the contrary, parking space is not enough to

accommodate the number of clients visiting the areas. Parking challenges occurring in Capital city will continue to be the major problem due to poor parking policies, poor planning of the city, population growth, increase of car to mention in a few and finally increase urbanization is one of the problems to parking space challenge(Bundara, 2010).

Rapid Urbanization: rapid urbanization is one of the problems of car parking space shortage resin in Addis Ababa and the population in Addis Ababa has been changing very rapidly at a rate of 2.1% per year. For example, according to the Addis Ababa transport branch office, the 2003 – 2007 strategic plan shows that human settlement and population in Addis Ababa will estimate to be 4.5 million people in 2012E.etc (CSA, 2010).

2.12.2. Trend from Tanzania Dar es Salaam in Tanzania

Coast and is among the most important commercial city with a highly concentrated population in Tanzania. Recently, a study shows that the morphology of the city has changed very rapidly beyond the ability of municipalities to recover their original status. For example, the construction of offices and hotel premises in Kariakoo and Kivukoni areas attract more people with private cars who often visit the areas for leisure, employment, and other services. On the contrary, parking spaces available are not enough to accommodate the number of clients visiting the areas. The city's residents travel short distances but with much difficulty because of the inadequacy of parking. Parking challenges occurring in the central city of Dares Salaam will continue to be the major problem due to poor parking policies, poor planning of the city, population growth, an increase of car to mention in a few (Bundara, 2010, Mkurunzinza.A2013 &Transport Policy 2008).

1. Urbanization and motorization for parking challenges; just like congestion, traffic accident, and environmental pollution, the parking problems are the production of urban urbanization and motorization; they are a concentrated expression of the contradiction between car transitional needs and environmental conditions. New York, London, Tokyo, and other major cities in the process of urbanization, also face serious parking problems, which result in frequent and multiple traffic congestion and traffic accidents.(Yuejun Liu & al,2012).

2. Parking policy

Parking policy at best is an opaque balance between revenue-raising activities to local authorities and desire to avoid discouraging visitors, to maintain the urban vitality and capacity to handle the increase of transport demand. Enormous theoretical literature is investigating the challenges of parking supply and management, as well as empirical studies that hypothesized parking including those studied conducted. (Coombe et al.,1997, Bates et al., 1997, Yong Thompson & Taylor 1991)

2.12.3. Trend in China (Beijing) on Car parking space challenges

With the rapid development of the economy, vehicles have become an indispensable tool in people's daily life. However, solving the 'parking difficulty' problem is now an emergent issue. Detecting the status of parking spaces in a parking lot is the most fundamental prerequisite in modern intelligent Parking management and guidance systems. To acquire accurate information of parking status, a magnetic field sensing technique is adopted to detect Magnetic variation in the parking spaces in real-time, since ferromagnetic materials are easily magnetized when placed in a magnetic field and magnetized ferromagnetic objects (for example, vehicles) are capable of changing the surrounding geomagnetic field. The contribution of our work is three-fold. The main reasons for parking problems in Beijing can be concluded as the disparity between the supply of parking facilities and parking demand. The parking demand is very urgently which can be explained as high speed of growth, the high intension of using, and high density of gathering. The key issues of parking problems in Beijing are discussed as the following. The disparity between the rapid increment of a motor vehicle and limited new parking facilities results in the parking difficulty directly (YuejunLiu.et al. HongweiGuo, 2012)

1. Controlling total parking demand and parking supply according to economic levers

Charging congestion fees to the vehicles and raising vehicle usage costs can ease the traffic jam in Beijing and reduce the parking demands in peak hours. Economic levers are an unavoidable selection to solve the congestion problem. Traffic Committee of Beijing will introduce the “Overall Plan of Relieving Traffic Jam in Beijing (2015-2020) in 2015, and in the next 5 years, the commuting time of taking public transportation will be less than one hour in a central urban area (Wang Yen-ling, et.al, 2013, Jin, X.Q., 2013&Cheng, S.H., 2013)

2. Planning solution for inadequate car parking space

The stage of preparing the parking plan is very important and influential as a part of the Structural plan of the city. The primary step in planning solutions is calculating the area required for parking for different districts in the city plan according to the government regulations which specify the minimum number of parking spaces that must be provided for every land use. (Hossam el-din i. &s. Ahmed, 2017).

2.12.4. Parking management

Parking Management solutions tend to reduce most parking challenges, providing a higher range of benefits and so are supported by more comprehensive planning. It is also necessary to define parking challenges carefully to provide solutions. If people complain about a parking problem, for example, it is important to determine exactly what type of challenges on car parking happen, and where, when, and to whom it occurs. Increasing supply simply helps reduce parking congestion and spillover problems but increases most other challenges (Edwards, 2002)

2.12.5. Parking policy

It is a method of controlling parking words like who, where, when and whom, and how long vehicles may park at a particular place or space in a period to prioritize in parking facility for the users like, 5minutes on-road, 1 to 2 hours in moles, etc. will be seen on this type of regulation. And it is the regulating tool for the use of cars in urban areas, it plays a vital role in defying urban planning and transport policy also making appropriate requirements about the amount of parking supplied influences system and even the characteristics of market (Institute of Transport Engineering, 2012).

2.12.6. Shared parking

This type of parking is one and the main type of parking to maximize parking in urban cities. Because of this result, multiple users and destinations will be seen in such a type of parking. For example, motorists must share parking space with four well driving especially in the areas of theater, hotels, Buildings, etc., because of safe and efficient type of parking(R.Ebihart.Misawa, 2013).

2.12.7. Parking Maximizing

This means excessive parking supply by imposing parking tax, on the areas of urban cities to encourage private sectors to join on the investment of parking lot preparing by facilitating regulation of the temporary time limit (R.Ebihart.Msigwa, 2013).

2.12.8. Smart growth

This means in most of the cities road congestion is increasing by private vehicles especially in CBD areas, so to minimize congestion and to maximizing parking space, it is better to encourage public bus transport (R.Ebihart.Msigwa, 2013)

2.12.9. Remote or Shuttle Parking service promoting

This type of parking is to allow freedom of pricing parking space especially for shuttle uses like shuttle buses and public transports and office, employs restaurants for the customers (R.Ebihart.Msigwa, 2013).

2.13.0. Parking pricing

This is an important and best method of management for the parking regulating even motorists will leave the parking space on time to not pay more by taking overtime on one space. During pricing, parking prices may depend on the location and size of vehicles and urban parking management regulation (R.Ebihart.Msigwa, 2013).

2.14. Conceptual framework

Based on the review of the car parking space provision challenges, the conceptual framework is prepared in the following way.

This framework comprises four criteria to achieving adequate parking space, sufficient parking space, parking management, parking pricing management, the role of parking. These criteria will be used in the analysis of existing parking space provisions on the transport system. These frameworks tested from on-street and off-street parking challenges on different studies are;-

Inadequate parking
The weak policy of parking
Lack of parking technology
Ineffective use of off-street parking

2.15. Lesson and Gap of the Literature

2. 15.1. Lesson from the literature

Here most of the literature, journals, and reviews showed me very interesting ideas to how to write about the related study of car parking space provision. From the above-referred literature, the researcher got different gaps of the study from the readings, how to organizing the paper of the proposal, how to reviewing important reading materials on chapters, books to referring and depending on the literature review to the next research. Generally, lessons from the literature review parts are, what are the selection criteria of parking space, how to calculate parking space provision areas, the factors affecting parking space provision and the methodology of the analyzing research data, totally the researcher got many knowledge and lessons to the next proposed research, that is car parking space provision in Hossana, Case of Arada Sub City.

2.15.2. Gap of Literature

The major findings of the article reviews are summarized as follows: - on the above literature parts so many researchers and articles had referred to the car parking challenges. For example, (Mengistu Manaye,2018), done analyzing and optimizing car parking areas, and his finding depends on the optimization of parking space,(Hagar Yilma, 2014). She, study on overall traffic management practices of the city and her, recommendations were to curb the traffic problems must be done good traffic lighting. Finally, from, Tanzania Darussalam city study about demand and supply will affect parking space provision, (Taye Abu, Shivakumar Mahto, 2019) study about Evaluation of Parking Problems for Transportation System. But still, they have studied only on-street parking evaluation and congestion. So the gap is helpful to prepare a well-organized document and designing optional parking space in the Arada sub-city

CHAPTER THREE

3. MATERIALS and METHODS

3.1. Introduction

This chapter of the research consists of research type to be applied, approaches of research to be adapted, data sources to be used, data gathering techniques, research design, data sampling method, data collection procedures, data analysis, and presentation approaches used had conducted on this research

3.2. Research methods and materials

3.2.1. Description of the study area

The current total population of Hosanna town is 184,286 and the average family size in each household is 5 (Hosanna Town Finance and Economic Development Office, 2018). The absolute geographic location of Hosaena town is 7° 33' North latitude 37° 51' East longitudes. The administrative area of Hosaena town is 10,414.3 hectares. Hosanna Town is located southwest of Addis Ababa 232km away via the Alemgena-Butajira route, 280km from via Wolkite route, and 305km via Ziway. The town is also located 168km away from Hawassa (the capital of SNNPR) via Halaba-Angecha and 203km via Halaba. These are Addis Ababa and Ziway in the northeastern, Shashemene, Sodo, and Arba-Minch in the southern, and Wolkite and Jimma in the northern directions. In general, it is a major transportation node, being at the centre of six national and regional transport routes. Hosanna town comprises six sub-cities (2018). Climate also, with AN altitude of the city ranges from 2340m and 2435m above mean sea level. This shows that the city is mainly characterized by highland ('Dega') climatic conditions. The annual average temperature is 16.5⁰c (2018).

Location map of the study area

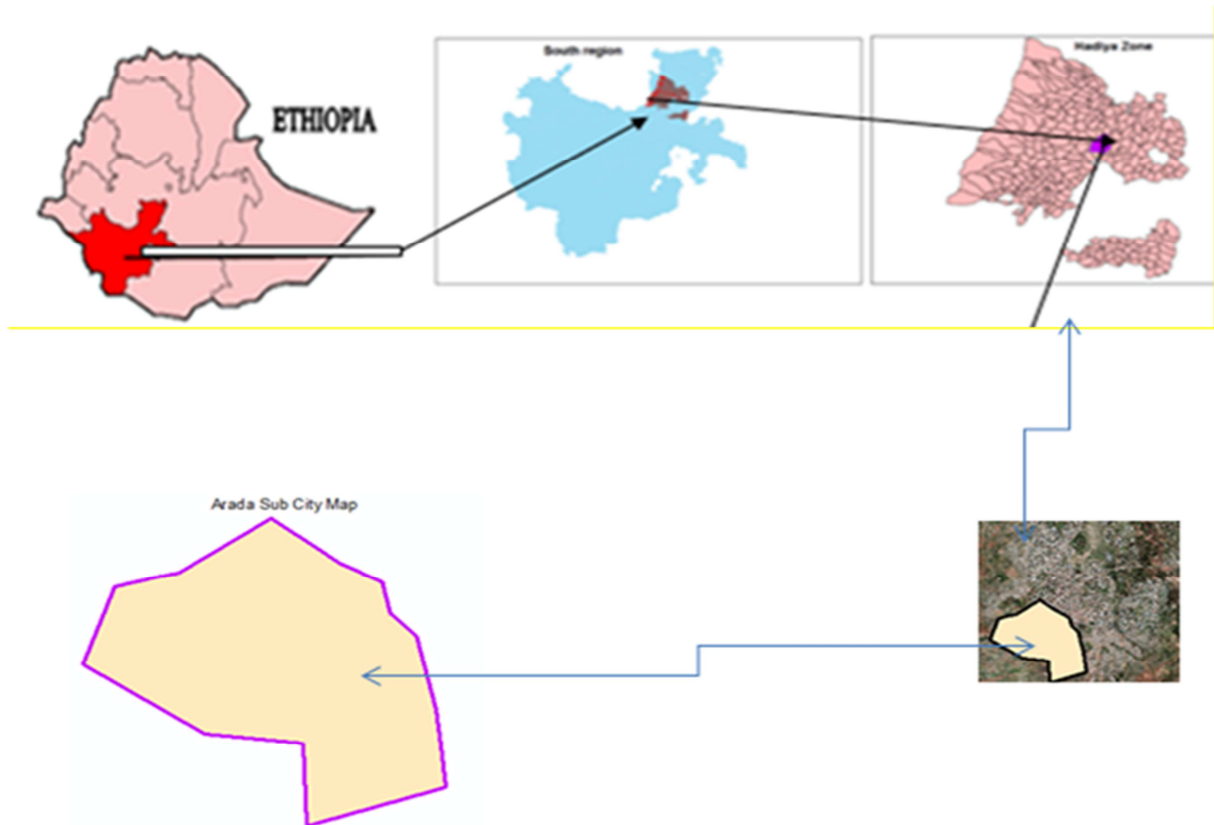


Figure 1 Location map of the study area (researcher produce from orthophoto, 2021)

3.3. Research Design

This part had used to describe the procedures that had used in conducting the research. It describes the research designed such as research approach, research type, methods of data collection, sampling techniques such as population or universe, sampling frame, sampling unit, sampling size, source of data such as primary and secondary data sources, data collection tools (instruments), data analysis and interpretations had described on this part.

3.3.1. Research approach

This research was adopted based on the deductive approach, why parking space provision research needed to start from general issues depending on design, concept, and analysis of the system to reach the specific research area concept.

3.3.2. Research type

This research had conducted based on descriptive research type because it was more appropriate to describe the existing condition of the car parking space situation depending on the three specific objectives of the research about car parking space in Arada Sub City. And researcher had used both qualitative and quantitative methods (mixed research approach) depending on objectives. A qualitative approach was used to analyze the data gathered by questioners from drivers and interviews from different professionals. And quantitative methods were used to analyze the factors affecting the provision of car parking space, observed and measurements taken from the hotels, and data taken from the 500meter Asphalt road were used.

3.3.3. Sampling design

This sample design was used to the method of selecting items to be observed for the given study. In this study, sample design was referred to produce adopted in selecting an appropriate sample as drawn from or selected population for the research. This section incorporated the target population sample frame, sample unit, sample techniques, and sample size to conduct the intended research.

3.3.4. Sampling Frame

According to (C.R.Kothari, 2004), the sampling frame was a list that consists of all the categories of the sampling units or units of analysis. So for this specific study, the sampling frame was from the members of drivers, Professionals conserving to the study field, street observation, and measurement, and hotel observation from the Arada Sub City. For this research, the researcher used a non-probable sampling method and it had visually impaired people as well as people with both impairments who suffer in accessing public spaces, and from the 3 government organization offices identified officials and technical staffs, and from the selected from on streets by own criteria and service centers from the Arada Sub City were involved.

3.3.5. Sample Unit

For the reason of manageability of the study, the researcher tried to identify the portion of the population to which there was access to drivers in the Arada Sub City, selected street observation and measurement, and interview from some professionals because of the field

conserving and sample for the study from each type of impairment had been selected. The sample refers to the number of the population that had been selected from the universe to constitute a sample. So as a descriptive type of this research, the sample unit was Car drivers for questionnaire survey, street type selected by congestion area and the more load-carrying site had selected, about 500meter asphalt from the main road to be measured and some Hotels had selected and observed and the interview had been taken from the Construction office, Road Authority, Municipality, and Arada Sub City Administration head.

3.4. Sampling Techniques

This study depending on the nature of the objectives of the research, it was implemented following the non-probability sampling techniques. And the sample selection of the study had been; purposive (judgmental) and connivance sampling techniques. Purposeful sampling had selected strategically and purposefully portion which had a higher degree of information (Patton, 2002, Maxwell, 1996).these were Hotels and 500meter asphalt road had selected purposively to study about car parking space provision and challenges. And the Drivers and governmental offices those had skill and knowledge about the study area had been surveyed by the sampling method of convenience (Cyprus, 2019).

3.4.1. Sample size

So as the study area was convenient to the drivers and professionals, so as mentioned above-participated drivers on this questionnaire were 95 drivers only, because of the nature of the non-probable sampling, the data amount had fixed or saturated at about data numbers 95, and 13 professionals also had interviewed because of they had convenient for the study area and have enough knowledge about the car parking space. And, for this study, the researcher deliberately or conveniently selected drivers by code like code 1, drivers from code two, drivers from code 4, drivers from code 3, and drivers from the heavy vehicle were selected, totally of 108 sample size had participated on the questionnaire and interview. Also, judgmentally 500-meter asphalt from the main road had selected depending on the selection criteria of the researcher like traffic congestion, high load occupancy site and commercially high crowded area to be studied. .Finally, five known Hotels were observed and analyzed by

comparing the urban design standard concerning bedroom to parking space had observed and analyzed well. As mentioned above the total sampling size depending on the nature of non-probable sampling it had depended on saturation of the data and repetition of similar data to be stopped. It means data collection had continued, till the saturation level, which means up to the similar response increasing sample size unit level limitation was depended on saturation level or data reputation show accurate data amount (Guest, 2020).

3.5. Methods of Data Collection and Instruments

In this study, the data had collected by using the methods both, primary and secondary data collection methods. The primary data had collected from, drivers, using a closed-ended and open-ended questionnaire and it had analyzed and the data from the professionals who knew about the information of the study area and the field of the study asked by the organized interview and it had analyzed. Finally, the observation and measurement from the on-street and Hotels were analyzed. And the secondary data is collected from sources such as related documents from Road and Transport office, Zonal Police station, and Municipality like satellite imagery, reports, books, and other related published and unpublished sources had been referred and used.

3.5.1 Sources of data

In this study, both primary and secondary data sources were used to get qualitative and quantitative data depending on the objectives selected, which were necessary to study car parking space in Hosanna Town, especially in the study area Arada sub-city.

3.5.2. Primary data sources

For this study, primary data sources were used to get first-hand information to meet the research objectives from drivers and Professionals.

1. Questioners

The primary data had collected by using a survey with closed-ended as well as open-ended questioners not limited the opinion of the respondent to get reliable and operationally valid answers from drivers about the car parking space in Arada Sub City.

2. Interview

Structured and semi-structured interview questions were used for officials and experts such as Municipality Planners and Urban Engineers, Road and Transport professionals and

Construction experts, and Arada Sub City traffic and parking coordinators related to the professionals especially related to infrastructure and plan preparation and implementation interviews to get formal information about Arada Sub City car parking system.

3. Field observation

In addition to the above two methods, field observation to take measurements, especially from on-street corridors were used, by using, video camera, meter, photography, and using orthophoto to conduct design issue about the existing situation of parking space and to supplement data gathered through questioner and interview to get information about Arada Sub City car parking system.

3.5.3. Secondary Data Collection

1. Books and papers:

Review of books and research papers on the car parking system which journals articles, manual reports, books, Seminar reports, project papers related to the car parking lot development, dissertation and thesis papers and review of the different parking strategy and parking management police in the world as well as in the country were referred as much as possible.

2. Documents: The relevant document data already collected and documented for office reference purpose was used directly from the Hosanna municipality, for parking system standard document and Hosanna traffic and parking management office such as reports, manuals, worked project documents on the parking, and police documents of about traffic incident, impacts, and traffic counts from the government.

3.6. Data Analysis and Presentation

3.6.1. Data analysis

This data was analyzed by using descriptive statistics those were mainly frequency counts and percentages. Before analysis started, data collected from primary and secondary sources processed began with editing errors; coding, and order based on objectives, first, the data collected had classified into qualitative and quantitative data, second, processed data had determined in the form of tabulations, before analyzed for easy manipulation of data analysis (C.R.Kothari, 2004). Finally, processed and observed data from the above discussions, based on the questioners and interviews became tested before analyzed.

After passed the test, the quantitative accepted the level of significance for precision and interpretation data, and then proceed to analysis and after analysis, but the result of quantitative data by using percentages, ratios, figures, and other statistical analysis tools such as mean and mode form. And for the qualitative data, the analysis result had been described and interpreted in descriptive text and table and report forms.

3.6.2. Presentation of the study

The result of the analysis based on the questions and interviews were prepared or described qualitatively and quantitatively as mean, and median. Mode, percentage, and tabular forms and description of text forms

3.6.3. Instruments and software had used

1. MS EXCEL: the purpose of this thesis was to draw pie charts, histograms, and to calculate drivers' questionnaire response data.
2. SPSS: To draw the Histogram to prioritize the main car parking challenges in Hosanna based on the drivers' questionnaire response and calculate any statistic works in a good way rather than Ms. Excel, GIS ,AUTOCAD ,and dobe Illustrator soft wares used to digitize and prepare a map and analyzing attribute table to statically summary on map and analysis.
4. Micro soft office used to text preparation and presentation

3.7. Ethical Consideration

The researcher was got permission to conduct the study from the Office of Hosanna town municipality and others by showing a legal letter written from the Hadiya Zone Urban and Construction Department. After having the permission, the researcher used an informed consent form for getting the acceptance of the respondents. Also, the culture of respondents was similar to the researcher's to adopt regards.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Introduction

In this chapter part, there were questionnaires by drivers and interviews from professionals had analyzed about car parking space provision system in Hossana Town especially in Arada Sub City. Here also selection criteria of car parking space had analyzed well by road and transport office professionals depending on the International selection criteria for the Arada Sub City.

4.2. Demographic Characteristics of the respondents

Table 7 Total participants on questioners and interview

Sex	participants	Percentage (%)
Male	71	65.75%
Female	37	34.25%
Total	108	100

So as seen in the tables 7 above, the total participants on the questionnaire were total of 95 and total of 13 were participated on interview that means 71 (65.74%) Males and 37(34.25%) Females and the total number 108 respondents had participated in the structured and semi-structured questionnaire and interview.

Table 8 ages of participants in the questionnaire

Interval		Frequency	Percent
	18_25 years	26	27.4
	26_30 years	29	30.5
	31_40 years	33	34.7
	41_50 years	4	4.2
	51_60 years	3	3.2
	Total	95	100.0

From the above table 8, age is a very important issue for driving. Here High score age boundary on respondents was at an interval of 31_40 years age and their age percentage was scored 34.7% with a total number 33 from the 95, and next to this age interval, 26_30 and the second scored age interval was at 30.5% and their number was 29. So drivers participate dominated by 31 up 40 years old age intervals.

Table 9 educational level of the drivers

Educational Level			
		Frequency	Percent
Valid	Grades 4_8	18	18.9
	Grades 9_12	22	23.2
	Certificate	27	28.4
	Diploma/TEVT	7	7.4
	BSc/BA/Degree	6	6.3
	M.Sc./MA/Masters	9	9.5
	Ph.D./Doctorate	6	6.3
	Total	95	100.0

Table 9 shows that, the educational level of the drivers. So 27 (28.4%) out of 95 drivers are certificate holders, 22 (23.2%) are drivers those have grades 9_12 grades and their number was 22, drivers 18 (18.9%) were from grades 4_8, and the remaining were low in number.

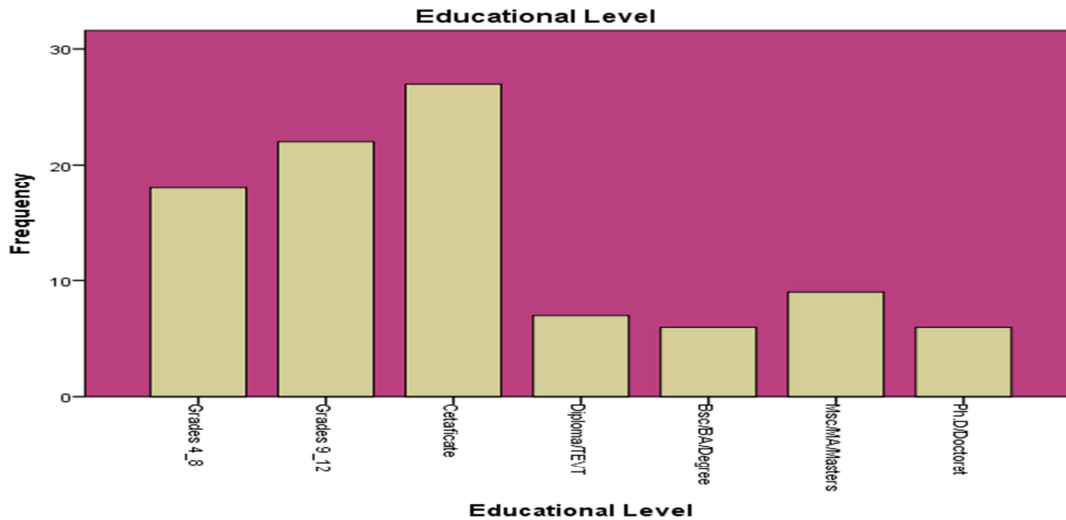


Figure 2 experience of Drivers



The figure 4, elaborates that 23(24.2%) drivers had holders of experience 2_5 years, 30 (31.6%) 6_10 years expreanced,33 (34.75) were 11_20 years of experienced, 6(6.3%) holds of 21_30 Years of Experience, and finally 3 (3.2%) experienced. The Experience of the drivers plays a great role to minimize traffic congestion/jam, traffic incidents and to get the best solution when the incident happens. So from the 95 drivers, 33 of them are 11_20 Years of experience holders and their parentage score had 34.7% and next to them 6_10 years of experience holders are at 31.6% and their number was 30 out of 95 drivers. And others were low experienced and new drivers as the data show.

Table 7 driver's license level			
		Frequency	Percent
	Automobile	10	10.5
	Tax	15	15.8
	Passenger one	19	20.0
	passenger two	26	27.4
	passenger three	12	12.6
	freighter one	8	8.4
	freighter two	5	5.3
	Total	95	100.0

Table 10 shows that the driving license of the respondents. Passenger two levels which were 26 out of 95 respondents and 27.4%, 19 (20.0%) is passenger one licensed, (15) 15.8% is Tax licensed lever12 (12.6%) are also passenger three licensed drivers and the others are low in number. In the Town, many Passengers have considered at large percent. so here passengers used car parking at higher percent.

4.2.1. Discussion of the questionnaire and Interviewer on Demographical characterizes' responses

Based on the characteristics of the questionnaire, the car parking space on existing car parking situation analysis done based on surveyed data on the different demographic characteristics from 95 drivers data like ages of drivers, educational level, license level and type of car they driving were analyzed and it was necessary for detail work of the research. And Interview were taken from 13 professionals based on their profession and relativity of their field by similar demography of the above drivers.

4.3. To analyse the existing car parking system activities? Car parking space selection criteria on study area

4.3.1. International Car parking space Criteria

First of all the car parking space has to pass through the developed and developing countries selection criteria manual. So depending on the developed countries' criteria to know how to select, area of the study from the Hossana Town, 6 Sub cities by scored weighting through developed countries criteria (S.Anil Kumar ital., 2009) was mandatory. Depending on these criteria, using some Haddiya Zone Road and transport department professionals to fill the table of developed countries selection criteria by considering the existing condition of Hosanna Town and depending on the high score weight from six sub-cities one had selected with high score as seen on table 1. Please when you put weight value example, if you select very high=5 it means very highly important study area it represents and if you say very low=1, it needs little selection criteria to study. So please consider the score value, and then if the number is high, it will be the study area.

Put ranks in the table as 1= very Low, 2=Low, 3=moderate 4=high 5=very high

Table 11 Criteria of selecting parking space

Criteria	Weig ht%	Sech Duna		Lich Amba		Heto		Arada		Bobicho		Neremo	
Road, bus links	16	3	48	1	16	2	32	4	64	2	32	3	48
Lease or rent costs	15	2	30	4	60	2	30	5	75	2	30	1	15
Staff parking	15	4	60	4	60	2	30	3	45	3	45	3	45
to market	12	5	60	2	24	1	12	3	36	2	24	2	24
to labor	11	1	1	2	22	3	33	3	33	2	22	4	44
Customer	11	2	2	1	11	3	33	4	44	1	11	2	22
Bus links	6	3	8	1	6	5	30	5	30	3	18	2	12
Proximity servise	5	1	5	3	15	1	5	4	20	2	12	3	15
Traffic Noise	3	2	6	3	9	2	6	4	12	1	3	3	9
road	3	3	9	2	6	3	9	3	9		6		6
Air quality	3	2	6	3	9	3	9	1	3		9		12
Total			27 5		238		229		371		212		252

4.3.2 Discussion on International Selection criteria

Analyses of car parking space, selected by Hadiya zone road and transport authority professionals based on the developed and developing countries selection criteria discussed, as the result of the selection criteria, the score weight number multiplying with each of weighted by professional's number and some up each and total result on each sub-cities, and finally the sum of the high score criteria weighted had been the best study area from six sub-cities in addition to the researcher's selection viewpoint as seen below.

Score sum of Naramo Sub City was=252, Sum of Sech Duna was=275

Sum of Arada Sub City was=371, Sum of Lich amba was =238

So the best study area for the parking space provision had selected based on the selection criteria became, Arada sub-city. Because of the sum of the sub-city score 371 and it was a very high score, so their selection had very relative to the researcher's study area selection when compared to the international criteria.

4.3.3 .Results of Existing car parking on transportation system activities? Problems

Table 12 Ownership of the Car

Result		Frequency	Percent
	Yes	32	33.7
	No	63	66.3
	Total	95	100.0

Table12 shows that the ownership of the Car plays a great role in parking space provision. So as the responses of the drivers above, only 33.7% are owners of the car and 66.3% are employed drivers. This shows that there may be a problem of parking shortage because owners may contact governmental offices to provide the challenges of Parking space more than employees.

Table 13 Job of the respondents

		Frequency	Percent
Job	Private	40	42
	Employ	55	58
	Total	95	100.0

Table13 this shows that almost above half of the drivers 55 (58%) are employed and 40 (42%) are private workers. So the parking users in the study area are dominated by Employed drivers.

Table 14 Users of parking space

Alternative		Frequency	Percent
Use	Yes	67	70.5
	No	19	20.0
	Some times	9	9.5
	Total	95	100.0

Table14 shows that most of the drivers were Parking space users these are almost (67) 70.5% and the others are (19) 20% are didn't use parking and (9) 9.5% are used some times. So there must be provision of the parking space on the on every destination of the drivers

Table 15 Number of using one parking space per day			
		Frequency	Percent
	Twice	23	24.2
	Once	24	25.3
	Three times	29	30.5
	I don't Visit	19	20.0
	Total	95	100.0

Table 15 shows that the arrival of parking space by the drivers, three times per day on was dominant because (29) 30.5% drivers arrive three times and (23) 24.2% are visited twice, (24) 25.3% are visited once per day, and finally, (19) 20% choice they wouldn't visit Parking space per day. So the most visitors from the 95 respondents were three times visitors and this shows there is the tax service and passengers car in the Town next to tax service. So it shows also, existing parking space is not available for the future parking.

Table 16 Parking Space Type used

Type of Parking		Frequency	Percent
	On-street parking	59	62.1
	Off-street Parking	17	17.9
	Garage Parking	19	20.0
	Smart		
Total		95	100

Table 16 shows that most of the parking spaces are dominated by on-street parking users that are (59) 62.1%, (19) 20% uses garage parking, (17) 17.9% are off-street parking users and no one had a choice the smart parking. Here the analysis result shows that still there is no technology is started to use smart parking in the Town and on-street parking is adopted. This also shows off-street parking shortage in the Town.

Table 17 Parking space facility at every destination of the Sub City

		Frequency	Percent
Valid	Yes	27	28.4
	No	55	57.9
	Some times	13	13.7
	Total	95	100.0

Table 17 shows parking facility reality depends on the drivers' responses. So from the table, (55) 57.9% drivers chose no parking facility at every destination, (27) 28.4% are responded yes we can get to our destination, and only (13) 13.7% are responded we can get some times. So as seen on the table, there is no available parking space facility at every destination because 57.9% are responded No at every destination parking space facility. This shows parking space shortage in the Sub City. Figure 3 Solution of the drivers during lack of parking space on their destination

Figure 4 Drivers Option on the Shortage of Parking Space

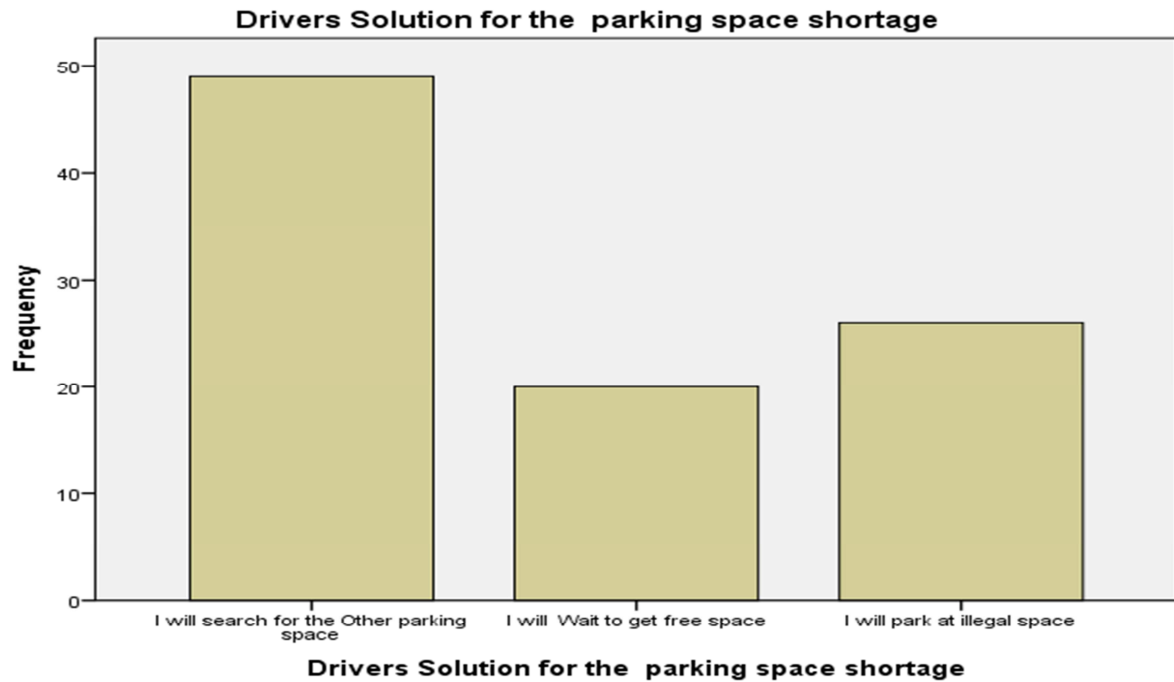


Figure 6 shows that 48% of the respondents responded searching for the other parking space, 26% of the respondents have responded that parking at illegal space and finally 20% of the respondents are said we will wait to get free space. This shows that searching for other parking will kill the time and fuel consumption in addition to congestion/jam. And also those choices waiting to the free parking space are created traffic incident and road jam.

Table 18 demand and supply of existing car parking space

Response		Frequency	Percent
Valid	yes	20	21.1%
	No	75	78.9
	Total	95	100.0

Table 18 shows that most of the respondents almost (75) 78.9% responded that not available supply for the demand and only (20) 21.1% of respondents responded that the existing parking space is available or enough. The result of most respondents shows that there is no sufficient existing parking space provided for the current demand in Arada sub City.

Table 19 private or public car parking space by fee

Response		Frequency	Percent
V al id	Yes	31	32.6
	No	64	67.4
	Total	95	100.0

Table 19 shows that (64) 67.4% didn't get private or public parking by price and some of the drivers up to (31) 32.6% can park by price. So existing car parking in Hosanna Town didn't have supplied parking by the option of the drivers. But as little respondent's response, there is little parking by price in the areas of the fuel station and Lema International Hotel.

Table 20 places where the car parking space shortage seen in Arada Sub City

Area	frequency	parent
Hotels	27	28.4
Office	15	15.8
On-street	30	31.6
Commercial areas	23	24.2
Total	95	100.0

Table 20 this shows that most of the time the, parking space shortage seen as by the respondents' responses (30) 31.6% on-street space shortage, (27) 28.4% in Hotels, (23) 24.25% at commercial centers, and (15)15.8% seen at the office areas. This shows that parking space shortage is highly seen on street, because most drivers like parking. Parking on street will be accessible, sometimes it is available to park and free from fee as explained in table 22.

Table 21 drivers' car parking space selection criteria

		Frequency	Percent
Valid	Available parking space	39	41.1
	Safe and security of parking space	25	26.3
	Walking time to destination	15	15.8
	Nearest to road and all services	16	16.8
	Total	95	100.0

Table 21 shows that the respondents respond, the selection criteria of individual driver's interest depending on their choice as following. Those selected to Availability of parking space are (39) 41.1%, safe and secure parking space by (25) 26.3%, walking distances to the destination (15) 15.8%, respondents and finally, nearest to the road and all service areas are (16) 16.8%. This shows, most of the drivers need depends on the availability of parking space and next to it, safe and secure space was selected.

Table 22 is there benefit of parking space to the Town

Response		Frequency	Percent
Valid	yes	58	61.1
	No	23	24.2
	Some times	14	14.7
	Total	95	100.0

Table 22 shows that (58) 61.1% of the respondents believe that parking space benefits the Town, (23) 24.2% didn't believe that parking space benefits the Town, and only (14)14.7% of respondents are believed that parking space may sometimes benefit the Town. This shows maximum drivers know that parking space gives benefits to the study area.

Table 23 Type of parking space benefits to the T won

Response		Frequency	Percent
	Economic benefit	27	28.4
	Aesthetical benefit	8	8.4
	Job opportunity creation	26	27.4
	Socio-economic benefit	13	13.7
	All	21	22.1
	Total	95	100.0

Table23 shows that (27) 28.4% responded as Economic benefit, (26) 27.4% responded as Job opportunity,(13) 13.7% responded as a socio-economic benefit, (8) 8.4% responded as the aesthetical benefit, and (21) 22.1% responded as the all the above responded are benefits of are parking space to the Town. So from this response analysis researcher considered that all the above choices are benefits of parking space but the economic benefit is higher graded because most drivers responded to it.

3.4. Results of measuring the effects of parking lot shortage on the transportation system

Table 24 parking space shortage will be the cause of Traffic congestion

Response		Frequency	Percent
Val id	Yes	53	55.8
	No	22	23.2
	Partially	20	21.1
	Total	95	100.0

Table 24From the above shows that (53) 55.8% of respondents responded that the shortage of parking space provision will create traffic congestion,(22) 23.2% selected there is no traffic congestion even if there is a shortage of parking space and finally only (20) 21.1% of respondents respond yes partially create a traffic jam. This shows most of the drivers know about the effect of parking space provision shortage will create congestion.

Table 25 Impacts of parking space shortage

Response		Frequency	Percent
Valid	Traffic Congestion	19	20.0
	Accident	18	18.9
	Fuel Consumption	8	8.4
	Work time Wastage	16	16.8
	Air pollution	10	10.5
	Economic and social effects	6	6.3
	All	18	18.9
	Total	95	100.0

Table 25 shows that respondents asked to determine the effects of car parking space shortage on them. So depending on the question their responses were (19) 20% responded traffic congestion, (18) 18.9% responded Traffic accident, those choices all of the above effects were 18.9%, fuel consumption was (8) 16.8% and as seen above on the table all are the effects happening by the shortage of parking space in Arada sub City. But Traffic congestion was the dominating effect as the responses of most respondents.

Table 26 the reasons for the Traffic accident and Congestion in the Sub City

		Frequency	Percent
Valid	Shortage of Parking space	28	29.5
	Narrow Road	21	22.1
	Drivers Experience problems and carelessness	16	16.8
	All	30	31.6
	Total	95	100

Table 26 shows that the respondents responded the reason for the Traffic accident and Congestion, the shortage of parking space (28) 29.5% respondents, (21) 22.1% reason out as narrow road, (16) 16.8% reason out as experience problem of the drivers and (30) 31.6% are responded as all the above choices are the reason for the traffic congestion and accidents.

Here depending on the responses the maximum traffic congestion and accidents happen by the above reasons at most these are the reason in the whole world not only in Arada sub City.

Table 27Level of traffic accident and Congestion					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very high	25	26.3	26.3	26.3
	High	30	31.6	31.6	57.9
	Mediu m	23	24.2	24.2	82.1
	Low	8	8.4	8.4	90.5
	Very Low	9	9.5	9.5	100.0
	Total	95	100.0	100.0	

Table 27 here on the above figure, the respondents respond about the level of traffic jam or congestion, they respond that high score (30) 31.6%, level of traffic congestion is very High (25) 26.3% responded medium (23) 24.2%, low (8) 8.4% and very low,(9) 9.5% respondents. This shows that the traffic congestion in Arada Sub City is seen as high level as the respondents respond

Professional groups to interview about the parking space provision and parking space shortage effects in Arada Sub City. The table showed that the position of the interviewee was very important and relative to the study field of parking space provision and design.

4.5. DISCUSSION

4.5.1. Open-ended and closed-ended questionnaire results

In Hosanna Town, as we knew, the main Road width is very narrow when we compare it to the Current structural plan road width of the Town to resist; these all amount of increasing vehicles to be parked on-street. Especially Arada as the center of business and commercially active area, all the vehicles need to park on-street in Arada Sub City. This parking on street creates most of the time, traffic congestion and accidents in the Town. And the selection criteria of the drivers depended on the linkage with business and commercial areas to be more active than the other part of the hosanna Town; that is why Arada is more congested than other sub-cities. Finally, they suggested that the governmental bodies didn't care about the car parking space shortage and road traffic congestion, and even the impact related to the congestion. As shown on the above questionnaire analysis, almost 70% of respondents answered that there is a shortage of car parking space options except for some Hotels and on-street parking facilities. From the respondent's response researcher considered that there is a gap in street parking awareness in governmental offices and private sectors.

4.5.2. Suggested future solution by Drivers

Governmental and private bodies should have to consider, the road congestion, impact of the congestion and by considering the above challenges, they have to facilitate well-designed off-street parking space even by price and free options and they should have designed the wide road width proposal to minimize accident and illegal parking in the Town especially at main pass road. Most of the time parking on _street became the trend of the drivers, because of the proximity to the market area, proximity to the customers, proximity to the commercial areas, and restaurants. To minimize and legalize the recent parking situation, all private and government organizations must build off-street car parking space and basement under high rise buildings additionally government must organize small micro-enterprises by facilitating the common parking spaces, even by pricing, Like in Addis Ababa City will also minimize the shortage of parking space and congestion of the traffic jam, etc.

4.6. Focus Group Discussion

4.6.1. Group discussion with the five (5) municipality professionals

Discussion based on the structural plan and LDP regarding to the Car parking space, if any revitalization had prepared, land uses include car parking space, is there available car parking space in the town as well as study area and finally future solution and suggestion of the planners and urban engineers?

4.6.2. Result of group one discussion

Existing asphalt Road was not similar to structural plan, so LDP can't change the problem, because of Compensation problem, we couldn't prepare Revitalization on the Town, since the Road is Congested and Traffic incident is increasing and the Asphalt Road width is also 15meter is , very narrow, and it needs improvement by compensation

4.6.3. Group Two interview with Road and Transportation Department

Discussion based on the reasons and solution of the increasing Traffic Congestion and Traffic Accidents in Arada Sub City and Car parking space conditions depending on lay bay, road signals, and Road width even the future Solution of the professionals to improve Car parking space shortage and minimizing Traffic congestion too.

4.6.4. Result of group two

1. It must be Painted Lay bay and road Signals
2. Narrow Road width must be changed based on structural plan and all stake Holders should participate well
3. Road must be Constructed and Designed based on structural plan

4.6.5. Group discussion of the three (3) Construction professionals

Discussion based on the Rules and regulations of construction management awareness creating ,especially during delivering of the construction license to the private or governmental Builders and majors of professionals to improve the challenges of application and Supervision during construction phase.

4.6.6. Result of Group three

Ratio of room number to the Car parking space in Hotels will be included during delivery but clients didn't need and care about parking space

Even they Rent the Basements to the Shops and stores ,because there is the shortage of car parking in Hotels, Restaurants and even on office areas finally ,best option or recommendation of the construction professionals

4.6.7. Discussion on interview result

In Hossana Town, there considered huge car parking space shortage challenges and related impacts, that must be revised by the government. Because the previous structural plan of the Hossana Town didn't consider recent car parking and related impacts to have happened, Even if the width of the structural plan of the road became wide enough, but the recent road width is narrow to resisted driving way and on-street parking bay. The previous structural plan of the Town didn't consider car parking and open spaces rather than commercial, mixed, residential, and other service areas than transport system provision as the respondents' response. And as Construction office professionals respond to the construction license delivery and supervision based on the ratio of car parking to the bedroom and basements under high rise buildings must be to the car parking space during construction. But the as the professional's response, private sectors like to take the only license by their interest to use the land only to their renting and store function, but the rule and regulation of the urban construction must include the car parking ratio with relation to the building rooms for the customer service. Because of this type of weak consideration of the private and governmental sectors to the car parking space provision, created the on-street traffic congestion and traffic accidents in Hosanna Town, especially in Arada Sub-city, because, Arada is the CBD area more than the remaining five Sub Cities of the Town. Also as Road and transport professionals response, in the Town there considering only on-street parking became known. But this type of parking and the increasing number of vehicles ownership from time to time, even the narrow road also main causes of the road Congestion and traffic accident in the Town. Finally, there must be traffic signals and symbols on the roadside and traffic light available on street but recently there is the little amount of the signals and light on the street especially in Arada Sub City.

4.6.8. Future Suggested solution by professionals

In current, the Hossana Town Main road width didn't consider the structural plan width of the road because the structural plan of the town contains 40meter width of the Road but the

existing width of the Asphalt road is 15meter width and private sectors on high rise buildings, they didn't use basements for car parking purpose, rather than renting for the shop and stores purposes and their revenue only, even Governmental office in the Town has no trends of organizing small micro-enterprises to manage car parking space and space supply for the demands of the parking space. To minimize challenges and shortage of parking space provision, all stakeholders must consider and Participate in the car parking space provision, For example, Municipality by supplying the land to the private or small interposes to lot providers, designers design well sustainable parking space for the clients and Urban planners also revised the previous structural plan of the town to accommodate all the land uses including transportation system to minimize traffic congestion and the related impacts. Generally, all stakeholders must give attention to the off-street car parking space provision to bring accessible, safe, and secure maneuvering on the transport system, minimizing traffic congestion and Traffic accidents.

4.7. Identify the determining factors affecting the parking space provision in the study area, by analysing two main Factors

1. Field observation on five (5) Hotels
2. Observation on 500meters Asphalt Road to check traffic Counting

4.7. Observation result in Hotels

4.7.1. Five observed Hotels and their analytical results in Arada Sub City

The researcher takes Five Hotels purposively based on the methodology for the sampling, to check Hotels under the urban design standards about Car Parking space provision and structural plan implementation shown on the table below.

Table 28 Hotels and existing Car parking space data was observed first

No	Hotel name	bed Room	Parking space	Standard
1	International Hotel	56	7	12
2	Hotel Barakat	49	6	10
3	Hamda Hotel No1.	34	4	7
4	YeabSira Hotel	30	4	6
5	Tsebalu Hotel	26	4	5

Source: direct interview and survey from hotel managers 2021

4.7.2. Discussion from Hotels

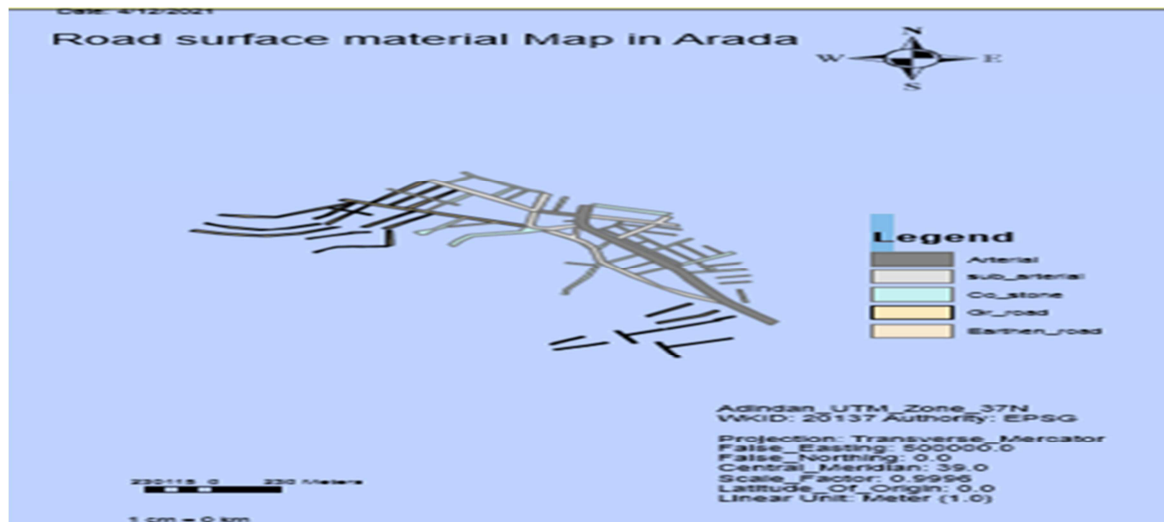
From the above table researcher considered that hotel owners didn't care about Customers Car parking space challenge. As seen from the above table existing hotels, parking space provision was below the urban design standards, the bedroom to parking ratio, because the bedroom to the parking ratio is one parking space needed to the 5-bed room (1:5) was the standard in hotels, if they rent bed rooms. So here researcher saw that most of the Hotel owners and Construction stakeholders didn't consider car parking spaces in the hotels and some other service areas. These hotels taken as the one challenge area of the car parking space in Arada sub City for the Guests and customers.

4.7.3. On-street parking Observation analysis (500meter Asphalt)

The observation was done to check the existing parking situation on the street as proposed in chapter three above. Evaluating the existing parking condition of the Hossana Town, especially, Arada Sub City parking space provision and by comparing with the Structural plan of the Town by taking 500meter road as the sample purposively.

500meter Road selection by surface material in the Sub city

Figure 5 road surface materials map prepared from the structural plan



Source; prepared by researcher 2021

When the proposed Road and existing Asphalt road were compared by physical measurement, the existing main Asphalt road measured was 15meter width, and also when digitizing it from orthophoto, it became the same measurement of the width on an existing road. But the structural

plan of the Town was prepared with 40meters width of the same road. This was one of the main challenges of the town to provide car parking space, in addition to the above Hotels standard problems; the road width also might be the effect of road congestion and shortage of the Parking space as analyzed on the questioner.

Table 29 Total road surface materials in Arada Sub City

No	materials	Area (M2)	Distance (km)
1	Gravel	8.7x104	16.7km
2	Cobblestone	11.86x104	17km
3	Earthen material	-	26km
4.asphalt	1.Arterial	6.2x104	3.2km
	2.Sub arterial	7.2x104	5.7km
	Total asphalt	13.42x104	8.9km

There are four main factors to providing car parking space. These are

1. Number of vehicles to be parked
2. Parking angels
3. The circulation system in the parking lot
4. Vehicle size that will be parked

Observation of the street Location, depends on the Road Surface material and high traffic Congestion jam site

First of all the observation process, selecting on street observation area from the total asphalt length be the first one. So from the above, total 3.2kms asphalt surface materials, only 500meters was selected. For the question, why Researcher selected asphalt road and only 0.5km? It was because to get deep analysis and the Location was known by high congested, main pass road and it is known business center.

Steps of determining parking space provision factors

Calculating the Duration of the time and recording the number of arrival of vehicles on each interval of the 30 minutes. Repeat it for seven days of the week

Counting will be by five counters on 100m length interval arrivals in an interval of 30 minutes for seven days of the week starting from Monday, April 05/2021 up to Sunday,

April 11/2021. Counting starting from Hossana Commercial bank branch Up to Absira Hotel on-street parking (500m length) Locations...

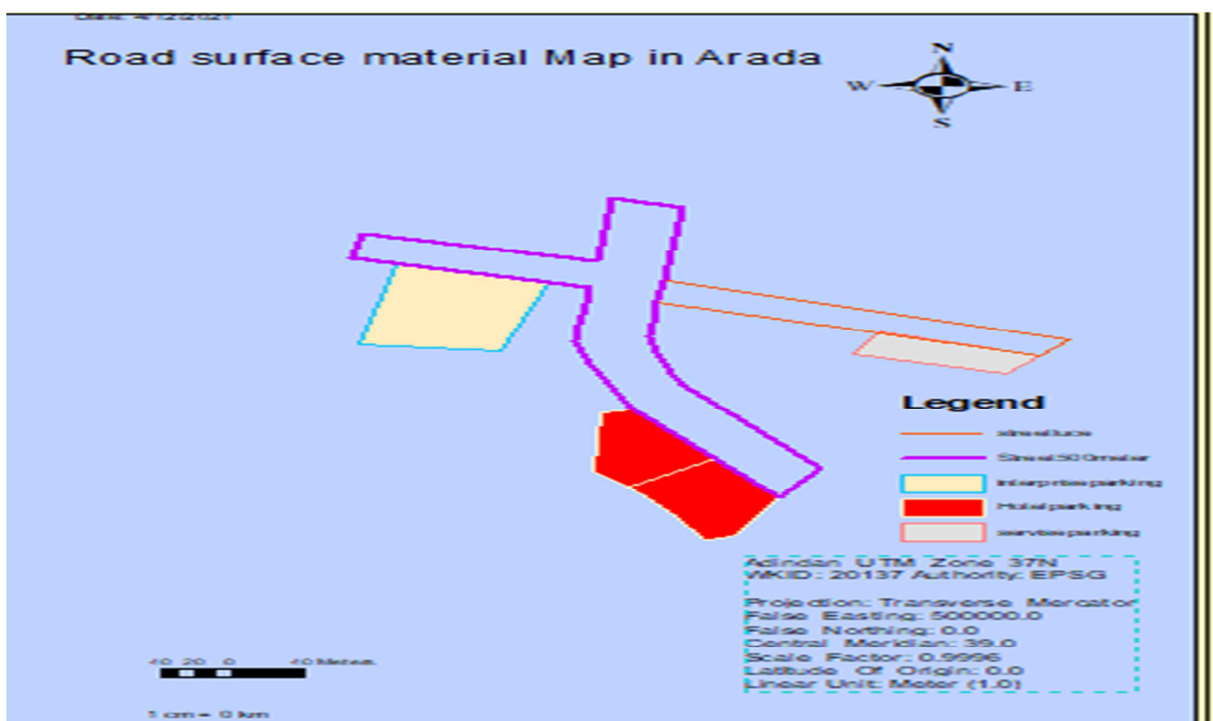
Location one; Hosanna commercial bank branch or Arada Bank

Location Two; Time Café and Restaurant

Location three; Yetabeberut and Barakat international

Location Four ;Gebratsadik front area

Location five; Yeab sira Hotel Area, and each of them divided into 100meters interval with one counter on each points



Source; 500meter interval 2021

Steps had followed

1. Type of four wheel drive vehicles had recorded on these locations
2. Maximum parking average time and Minimum average parking time was recorded during counting by table format
3. Dividing 500metes in interval of 100meters by 5 locations based on the purpose of minimizing miss counting and accuracy during counting. So as explained above, the existing road width was measured 15meter and a two-lane road, and one lane was 7meter width.

4. So it is known that from 30 degree to 90 degree parking angles would be the design formula angles for on street car parking space calculation depending on the width of the road.

But in this case car parallel parking space formula had selected, because of the narrow of the existing asphalt road to analyze the on street parking situation.

4.7.4. Equation for the calculating parking space

A. Parallel parking lot area = 2.5 x 5.9 m per car P No. = $\frac{L}{5.9}$ -----equation....1

B. If the road existing asphalt width was wide

90° angle parking 5 x 2.5 m per car P No = $\frac{L}{2.5}$ -----equation 2

L = Length of Kerb P No = Number of parking spaces

Checking the existing Car Parking Space capacity on interval of selected 500meters

So selected Asphalt length from the total asphalt surface 3.2kms was only 0.5km or 500meters, selected purposively by above criteria

P. No. = $\frac{500}{5.9}$ = 84 spaces on the one side

And parking 84 spaces were on the opposite side and a total of 168 spaces available on both sides on the parallel formula by U.S Standard for on- street parking.

But if the width of the street was wide, angle parking increase the space number like

P No = $\frac{500}{2.5}$ = 200 spaces at one side and 2*200=400 space at both sides.

Seven days car arrival Counting Schedule

Table 30 From Monday, April 05/2021 up to Sunday, April 11/2021

Interval of time to counters	
From 2am _ 6 am local time.	From 10 am to 12pm Local time
From 7am _ 9am Local time.	From 1pm to 2 pm Local time

4.7.4. Occupancy rate and Parking load calculating

$$\text{So, Occupancy rate} = \frac{\text{Maximumparkingaccumulation}}{\text{Maximumparkingspace}} * 100\%$$

Example on Monday occupancy rate = $96/164 * 100\% = 58.5\%$

2. Parking Load = (Accumulation at each interval * 30 minutes) * hourly time interval

Example Monday, load = $96 * 30 = (2880) * 4 \text{ time interval} = 11,520$

Total parking Load on Monday = sum of parking load = $31,800/12 = 26500/30 = 88.3\% \text{ v/h/m}$

Parking efficiency = (total parking load / total parking space) * 100% = $(88.3\% / 164) = 54\%$, it was available and its below efficient use of parking space on the day on street, even if it was available for the time being, it needs off street parking intervention and optiona design, because of on-street car parking is not advisable in urban design concept to minimize traffic jam and accidents and to create the pedestrian friendly road and road should be accessible for all kind of mobility rather than only car parking. But some public busses and passengers may be parked for limited with allowable minutes.

4.7.5. Seven Days car parking duration counting

Seen on Appendix tables from Tables 31 to table 37 that was From Monday to Sunday on interval of 500 meters

4.8. Discussion of on street Observation on weekdays

1. Analysis of on-street car parking during weekdays (Monday to Friday) had;

As summarized on the above tables 12 to table 15, the road was congested in the morning and afternoon on weekdays, which means starting from 8am. _ 12pm and from 3 pm. _ 6 pm afternoon, because during mooring drivers visited their business area at the mooring and public servants to the office. And during the afternoon, drivers visited home, back to the lunch and, also it is the business time on shoppers and also tax service may increase traffic congesting of the road during the afternoon of weekdays. As researcher observed in the site or in interval of the observation Locations, the road had congested by three wheel vehicles, that was TVs Bajaj as the tax service, specially mooring and during lunch time, they occupy the road space, more than cars on street.

4.9. Discussion on street Observation on weekends

On weekends as seen on tables table and table 7, the road congestion had very low on Sunday. Because in Hosanna Town, there is no business work and any movements are active on Sunday. But on Saturday the occupancy of the parking space became high during the interval of 3 pm. to 6 pm, because on Saturday, there is the huge and known market day in Hosanna Town, especially, around the Arada Sub City as it is the, main business center of the market. Not only that but also in the afternoon all the people from the market and some peoples moving for the entertainment driving increasing and also it is the, lunch time. So, congestion will be very high on Saturday when compared to the other days. This shows that even the on-street parking was high efficient on some weekdays, and weekends for the existing demand of the parking, but as the researcher observed or collected secondary data from the different governmental departments of annual traffic and related reports, there were two known increments in the town. One the number of traffic accident increasing from time to time and the number of vehicles increasing from day to day's to the challenges of off street parking space shortage in the study area needs, the recommendation of best design options for the future demand will be mandatory in the town.

4.9.1. Observed Vehicles parked on an interval of the 500 meters

1. Pick cups cars were very high in number
2. Min buses
3. High price (passengers)
4. Chino truckers
5. 5.Even if it had no part of the research, three wheel TVs Bajaj tax were very know and high in number and case for Traffic accident and Road Jam

4.9.2. Maximum and minimum parking time in interval of 500meters

Around the interval of observation Locations the maximum average parking time from the 30 minutes pic hour was 1hour and the minimum of parking hours were 5 minutes. So most of the time this street location on both sides known with the full of hotels, restaurants and gust houses to be car parking long time and it is CBD area of the town

.

5. CONCLUSION AND THE RECOMMENDATION

5.1. CONCLUSION

Currently in Hosanna Town especially in the study area, Arada Sub City, there is a huge challenge, which is mainly concerned with the car parking space provision. The main problem of the parking space provision depends on the list view of the government and private sectors, technically and economically about car parking space provision on the transport system. As seen in chapter four, depending on the analysis of this research title and specific Objectives, the existing situation of the town, facing the provision of off-street and on-street car parking space and this challenges lead to the Traffic congestion, traffic accidents, parking space searching affecting work time and Air pollutions are main effects of the town. Not only that but also, an increasing number of vehicle population leads the Town to be crowded and high demanded of car parking space. Even if there had some illegal and legal parking spaces in some areas, there had no private or public car parking by price or fee. Also, this facing the town, to didn't improve the transportation system .free supply of Car parking space leads the town to have youth with low economic, socially demoralized, low-income peoples will be high in the town because there is no job opportunity for them.

So before recommending the research, many existing evaluations had tested.

First, five known hotels depending on the urban design standard and parking to bed ratio had tested by physical observation. But researcher couldn't find any hotel standard fulfill the above even 50% of urban design standards.

Observational analysis on existing street car parking had parking tested by selecting the road by surface materials and the place of commercially active areas. So based on the surface material of the existing asphalt road were compared by physical measurement, the existing main Asphalt road measured as 15meter width, and also when digitizing it from orthophoto, it became the same measurement of the width on an existing road. It was taken as the one case of the Traffic congestion and traffic accident in the town as checked it was 15-meter asphalt road couldn't accommodate traffic flow and car parking.

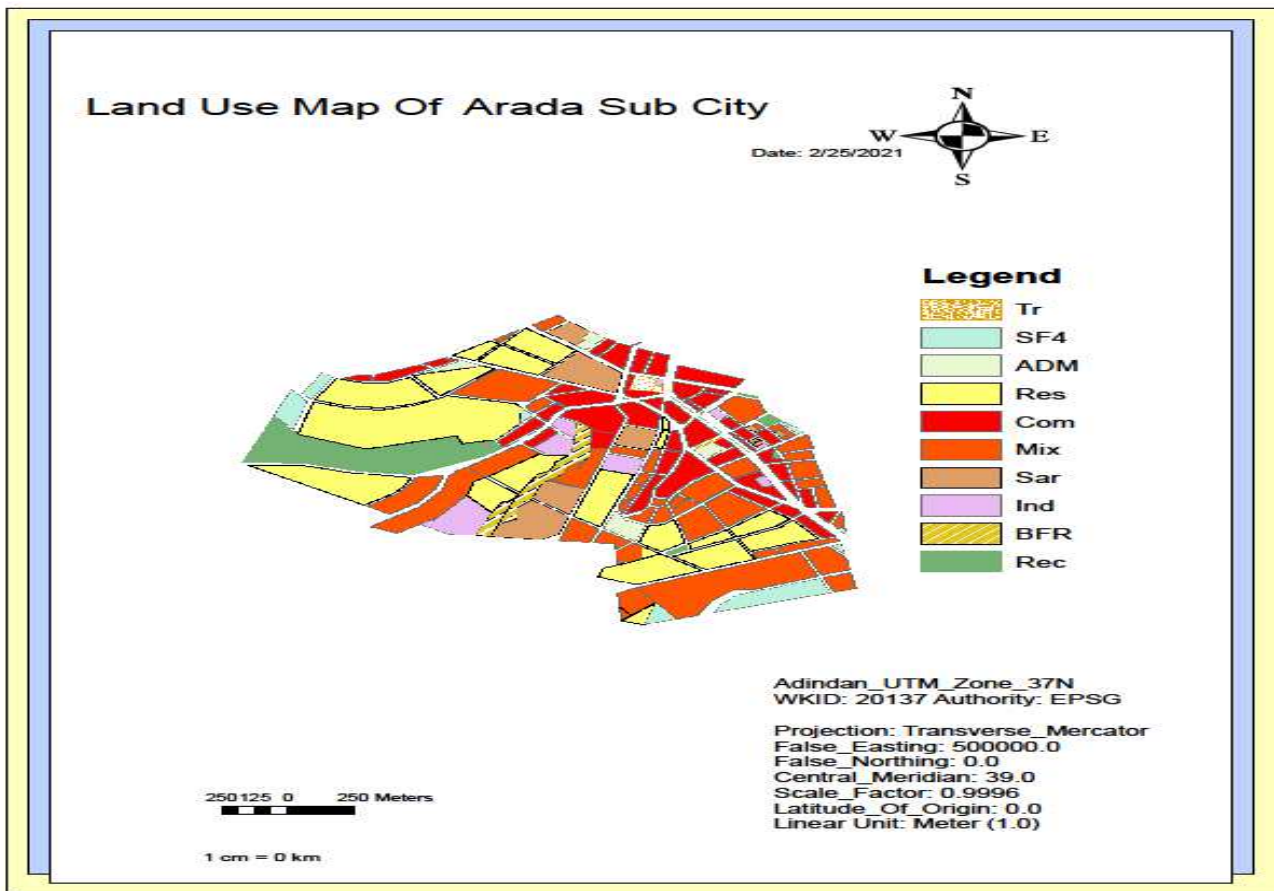
On this selected road, only 500meters are divided into 5 locations interval traffic counting tested traffic occupancy load, traffic rate, and an efficiency rate of parking on the area. Even if the place or space was available on the street parking to the existing demand around the interval, it is not recommendable on-street parking. Because of the huge amount of traffic

and Bajaj tax was very high on the location, so it would increase jam and accident in the area. To minimize the shortage of the parking provision on the town and to be accessible to all, recommending different types of off-street parking options will be very important on researcher's conclusion.

5.2. Recommendation by design intervention

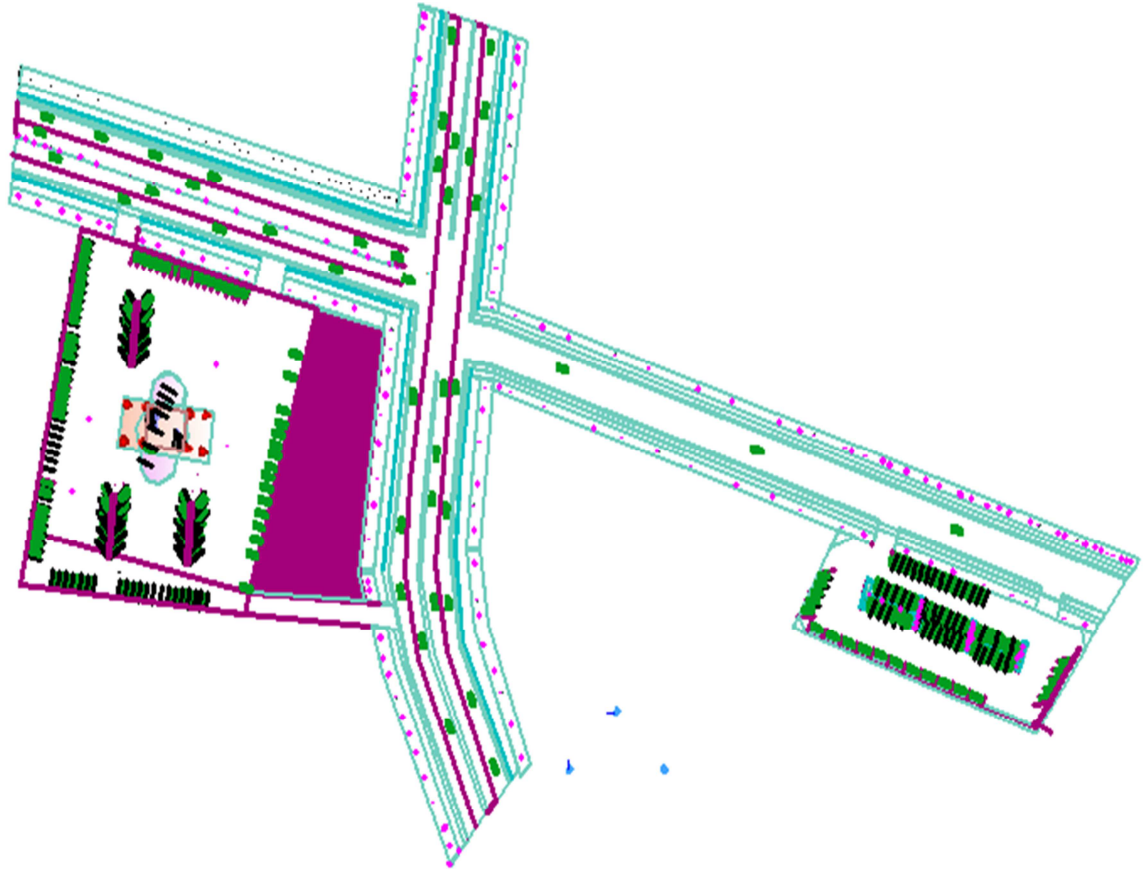
Before recommending any design intervention land use map of the site from the structural plan ha digitized as Figure 5 fig land use map of the site shown

Unfortunately, the recommended site land use had commercial and transport



Source: Figure 5 digitized .from structural plan 202

2D of the site



Source: Figure 6 prepared 2D of the research site at 2021

5.3. Calculating off street parking space layout

Before preparing lay bay of the car parking space there are the following steps

1. The total parking space lot area must be calculated
2. Size of the car must be calculated

Single space must be calculated per car parking space

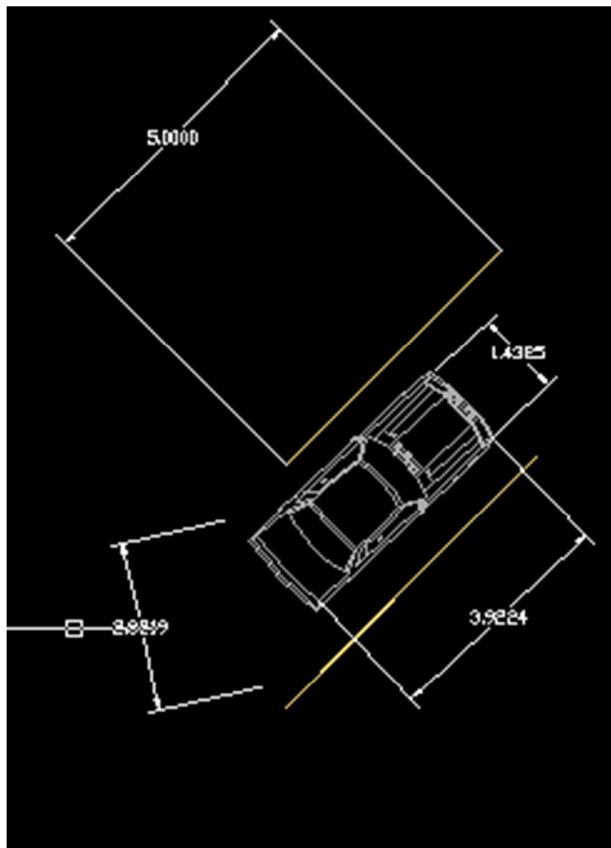
3. Total space must be known

Total area of selected site for car parking space

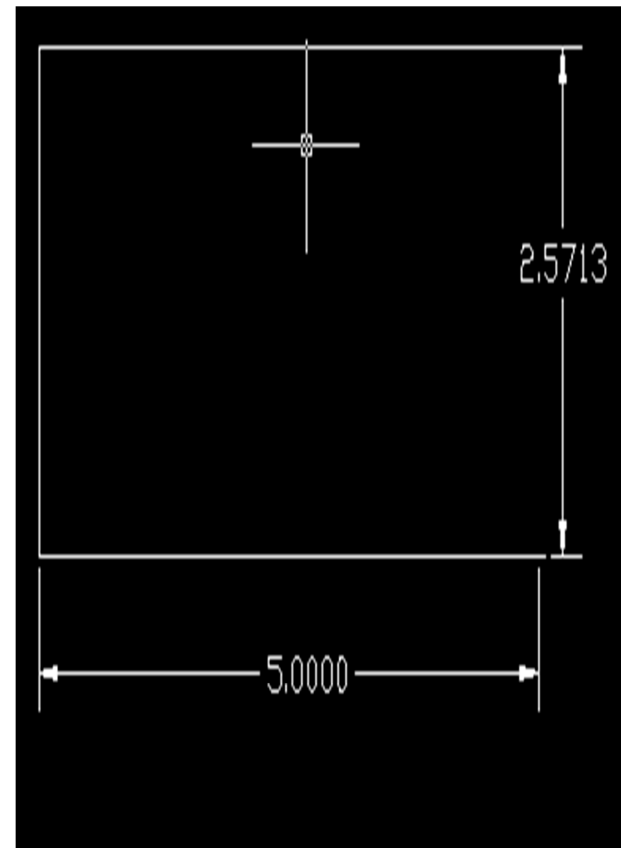
Site one 8281.2031 m2 Compensation free land and total space will be by design standard

Site two 2765.4845 m2 Compensation free and total space will be by design standard

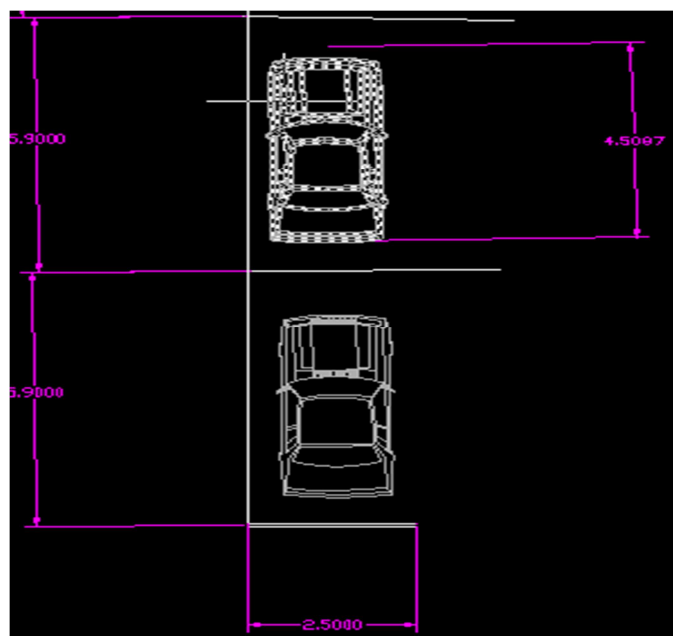
45 degree parking



90 degree parking



Parallel car parking type



5.4. Recommendation on street based on Structural plan of the town and land use

Here recommended street was 40-meter width from on structural plan of the Town

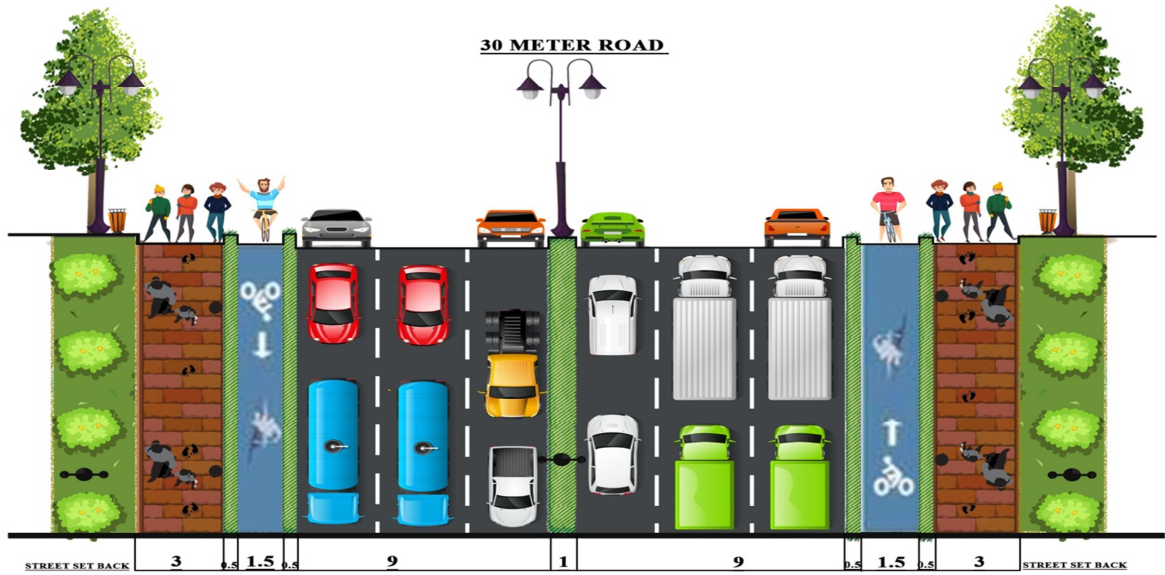
1. Three lane asphalt road was proposed
2. Free from car parking except for passengers and city bus at limited Locations
3. Pedestrian-friendly
4. Cycle based and walking will be motivated
5. Accessible for all mobility
6. It will be safe for any mobility
7. Advantage, it will minimize road congestion because no more car parking on the street,

Source: Street design prepared at 2021



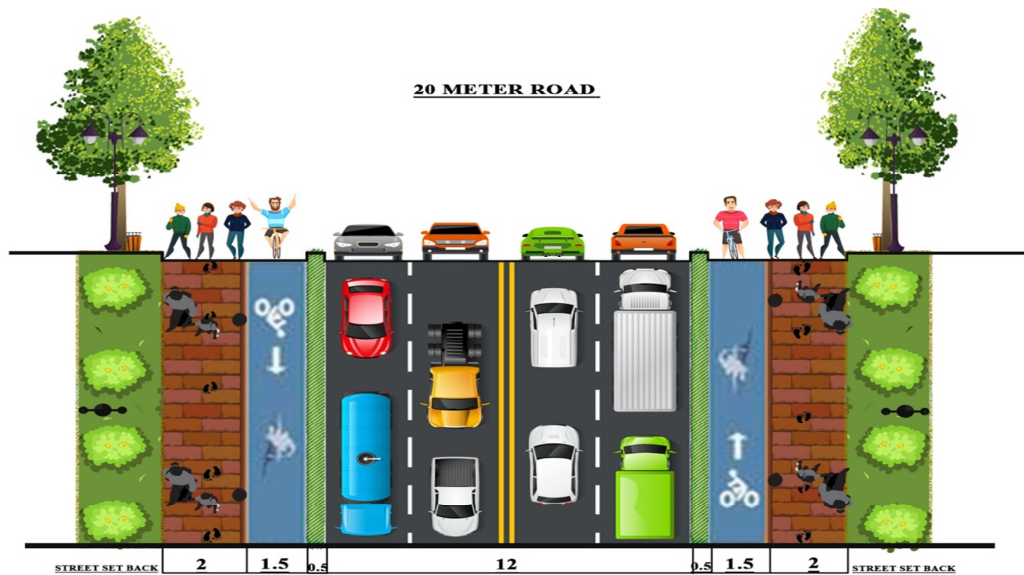
Source: Figure 7 on street car parking design 2021

5.5. 30 meter Road Section



Source Figure 8

5.6. 20 meter Road section 2021



Source Figure 9 30 meter street section 2021

5.7. Recommended off-street parking for micro-enterprises

Here the advantage of this kind of car parking may help the government as well as people as follows

1. The road congestion will be minimized
2. The accident of the traffic during maneuvering will be decrease
3. The space number will be increased because degrees of 30,45,60,90, and 00 had proposed
4. The Job opportunity will be increased for micro-enterprises
5. Disabled car parking space provided as the urban design standard Like;
6. Car washing will be one of the job opportunities

Parking fee per minute to parking space as the regulation of the government

Safe and secure for the drivers and their car

There is a café and restaurant in the off-street parking provided area

Internet access to the users and different functions designed



Source;Figure 10 off street car parking design 2021



Source; figure 11 Prepared by researcher 2021

5.8. Recommended car parking space design, on Hosanna Town market

Advantages

1. The road congestion will be minimized because the area is known by business
2. The accident of the traffic during maneuvering will be decrease
3. The space number will be 900, and parallel because the plot was safe to design perpendicular and paralleled angles.
4. The Job opportunity will be increased for micro-enterprises too
5. Disabled car parking space provided as the urban design standard Like;
6. Parking fee per minute to parking as the regulation of the government, Safe and secure for the drivers and their car

Composition free but only implementation will be expected

Future research recommendation

Preparing smart car parking research and Compact City model related design

Evaluating the all Hosanna town car parking system fuction and implementation

Researching stakeholders role in the implementation of car parking space provision

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APPENDICES I

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
SCHOOL OF CIVIL ENGINEERING AND ARCHITECTURE
DEPARTMENT OF URBAN PLANNING AND DESIGN
MSC PROGRAM

Dear respondent, thank you in advance for your unreserved cooperation.

This questionnaire is designed to gather data for research purpose to the fulfillment of MSC in the field of Urban Planning and Design by the title, Car parking space in Hossana Town taken Arada as the case study. Accordingly, your genuine responses are extremely important for the purpose of this research and the result of this data will be used for the research purpose only. Hence, you are kindly requested to feel free and respond all the open ended and closed questions.

Part I questionnaire for the professionals (drivers)

Personal information

☐ Male

☐ Female

Level of education

A. Grades 4_8 B. Grades 9-12 C. Certificate D .Diploma/TVET E. Degree F. MSC/MBA G.PHD

Name of the office_____

Profession_____

Your position_____

Part II questionnaires for the drivers

1. Do you believe, is there the sufficient Car parking space supply in Hossana Town, specifically in Arada?

A. Yes B. No C. moderate

2. If your answer is “No” what will be the reason for the shortage of parking space? Explain you as the professional

3. Where do you facing parking lot shortage at large in Arada? By observation

A. In Hotels B. In Offices C. On Street D. all

4. Do You believe drivers can get, parking facility nearest to all their destination in Arada ?

A. Yes B. No

5. If your answer for the question 4 will be “No” what is the reason? Please explain

6. What are the parking facility effects in traffic flow in Arada ?

road congestion B. Traffic accident C. Air Pollution D. Work time wastage E. fuel consumption F. all

7. What are the main reasons for the traffic accident? Choice level from table

Reasons	Very highly	Highly	Medium	Low
Congestion/jam				
Increment of vehicles				
Shortage of parking spot or lot				
Drivers experience problem				
Low mark or paint on lay bay of parking				
Increasing in-migrants to the town				

Please explain if any other than above reasons

8. Can we minimize traffic congestion and accident?

A. yes B, No

9. If your answer is yes? How? Please explain

10. What are the roles of car parking space to the town?

A. It will bring job opportunity B. to the aesthetic or beautification of the town C. Economic benefit D. all

11.If your answer is different from the above choices ,and if any others please explain briefly_____

12. Is there any private or public parking service by price, in Hossana town?

A. Yes B. No

1. Interview questions for the municipality professionals

Q1.Do you believe that the structural plan of the Hosanna Town includes all the general land uses by standard? Especially to get and design Car parking space sufficiently? If not what will be the solution

Q2.Is there any site that revitalization had done in Hossana Town? Because it would contain all the detailed service design including car parking space

Q3.Do you follow parking standards as the urban planning manual standard and policy? And is there sufficient parking space in the Arada sub city?

Q4.What is the car parking space selection criteria in your Town depending on your profession?

Q5.Do you believe, existing parking space is sufficient for the drivers in Arada? What the cause of the lot shortage?

2. Interview questions for the Road and Transport office professionals

Q1. Do you apply the design standards (building to parking ratio, for example, Office to parking ratio, bedroom number to parking lot ratio?) Especially considering car parking space?

Q2. How the shortage of parking will be improved in Arada Sub City? Please explain it well

Q3. You as the professionals of the Town, what is the role of the parking space to the Sub City

3. Interview for the Road and Transport Office

Q1.What is the car parking space selection criteria in your Town depending on your profession and Road and Transport Department?

Q2.What is the main reasons for the traffic congestion/jam? In Arada Sub City and tell the specific areas where the accident happen most of the time

Q3.Is there any lay bay, Boxes, and traffic symbols, to visualize the car parking lot in the form of (parallel or angle? Parking On-street or Off-street to show parking space clearly for the passengers in Hosanna Town? If you say yes, please what are its uses and how to improve it?

Q4.What is your future program and participation as the stakeholder to improve car parking space provision in Arada Sub City?

Developed and developing countries' Car Parking space selecting criteria of parking space selection criteria

Criteria of parking lot selection consideration	Weight %	A	B	C	D	E	F
Road, bus links	16						
Parking Lease or rent costs	15						
Staff parking	15						
Proximity to market or client	12						
Proximity to labor supply	11						
Customer or visitor parking	11						
Bus links	6						
Proximity to goods or services	5						
Traffic Noise	3						

APPENDICS II

License plate car parking counting format

Date----- time----- Weather----- -----					parking Location----- vehicle type min bus, chino truck, tax,high lux, pic cap						
Time(min)-----up to---- -----											
Ba y no .	30 - 60	60- 90m	90- 120m	120- 150	150-180	180- 210m	210- 240mi	Type of vehicl e	Parking minute	Turnover	

Seven Days car parking duration counting formats

Table 31 Counted 12 hour's arrival data on Monday, aril 5/2021

Duration of time on Monday intervals	Maximum	30minutes intervals	Maximum parked	Occupancy rate%	Parking load
8am._12pm	164	4	96	58.5%	11,520
From 12pm._3pm.	164	3	86	52.4%	7740
From 3 pm. _ 6 pm	164	3	88	54%	7920
6 pm. _ 8 pm	164	2	77	50%	4,620
Total parking load				53.7%	31,800

Table 32 Counted 12 hour's arrival data on Tuesday, aril 6/2021

Duration of time on Monday intervals	Maximum space	Number of hour	Maximum parked	Occupancy rate	Parking load
8am._12pm	164	4	89	54	10,680
From 12pm._3pm.	164	3	73	44.5	6570
From 3 pm. _ 6 pm	164	3	97	59.1	8730
6 pm. _ 8 pm	164	2	78	47.5	4680
Total				51.2%	30,660

Table 33 Counted 12 hour's arrival data on Wednesday, aril 7/2021

Duration	Maximum space	Number of hour	Maximum parked	Occupancy rate	Parking load
8am._12pm	164	4	94	57.3	11,280
From 12pm._3pm.	164	3	74	45.1	6,660
From 3 pm. _ 6 pm	164	3	95	57.9	8,550
6 pm. _ 8 pm	164	2	88	53.6	5,280
Total				40.2%	31,770

Table 34 Counted 12 hour's arrival data on Thursday, aril 8/2021

Duration of time	Maximum	Number of	Maximum	Occupancy rate%	Parking load
8am._12pm	164	4	101	61.6%	12,120
From 12pm._3pm.	164	3	74	45.1	6,660
From 3 pm. _ 6 pm	164	3	103	62.8	9,270

6 pm. _ 8 pm	164	2	77	46.9	4,620
Total				42.5%	32,670

Table 35 Counted 12 hour's arrival data on Friday, aril 9/2021

Duration of time on Monday intervals	Maximum space	Number	Maximum parked	Occupancy rate	Parking load
8am._12pm	164	4	79	48.1	9,480
From 12pm._3pm.	164	3	74	45.12	6,660
From 3 pm. _ 6 pm	164	3	107	65.2	9,630
6 pm. _ 8 pm	164	2	70	42	4,200
Total				39.7%	29,970

Table 36 Counted 12 hours arrival data on Saturday, April 10/2021

Duration	Maximum space	Number	Maximum parked	Occupancy rate	Parking load
8am._12pm	164	4	114	69.5	13,680
From 12pm._3pm.	164	3	98	59.7	8,820
From 3 pm. _ 6 pm	164	3	117	71.3	10,530
6 pm. _ 8 pm	164	2	93	54.2	5,580
Total				63.7	38,610

Table 37 Counted 12 hours' arrival data on Sunday, April 11/2021

Duration	Maximum		Maximum space	Occupancy rate%	Parking load
8am._12pm	164	4	52	31.7%	6,240
From 12pm._3pm.	164	3	45	27.4%	4,050
From 3 pm. _ 6 pm	164	3	63	38.4%	5,670
6 pm. _ 8 pm	164	2	69	42%	4,140
Total				34.8	20,100

APPENDIXC III

Basic equation to calculate the parallel and the angle parking lot designs

Parallel parking lot area = 2.5 x 5.9 m per car P No. $\frac{L}{5.9}$

30° angle parking area = 5 x 2.5 m P No. = $\frac{L - 1.25}{5}$

45° angle parking 5 x 2.5 m P No = $\frac{L - 1.77}{3.54}$

60° angle parking 5 x 2.5 m = P No = $\frac{L - 2.16}{2.89}$

90° angle parking 5 x 2.5 m = P No = $\frac{L}{2.5}$

L = Length of Kerb, P No = Number of parking space