



ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICs

SCHOOL OF COMMERCE

**ASSESSMENT OF QUALITY OF ROAD INFRASTRUCTURE:  
THE CASE OF DESSIE AND KOMBOLCHA CITIES**

By

LISANU DIBETA DILLA

**A Project Work submitted to Addis Ababa University College of Business and  
Economics School of Commerce in partial fulfillment of the requirement for  
the Degree of Master of Arts in Project Management**

June 2023

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY

FACULTY OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

DEPARTMENT OF PROJECT MANAGEMENT

**ASSESSMENT OF QUALITY OF ROAD INFRASTRUCTURE:  
THE CASE OF DESSIE AND KOMBOLCHA CITIES**

By

LISANU DIBETA DILLA (GSD/3432/11)

**A Project Work submitted to Addis Ababa University College of Business and  
Economics School of Commerce in partial fulfillment of the requirement for  
the Degree of Master of Arts in Project Management**

Advisor: Fesseha Afework (A/Professor)

June 2023

ADDIS ABABA, ETHIOPIA

**ADDIS ABABA UNIVERSITY**  
**SCHOOL OF COMMERCE**  
**DEPARTMENT OF PROJECT MANAGEMENT**


**APPROVAL SHEET**

SUBMITTED BY: LISANU DIBETA DILLA

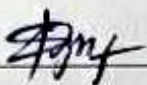
GSD/3432/11

APPROVED BY THE EXAMINING COMMITTEE

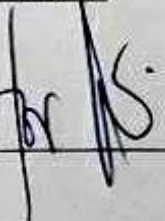
ADVISOR

Name: Fesseha A. (A.P) Signature:  Date: 25/07/23

INTERNAL EXAMINER

Name: Berhanu Beza (Ph.D) Signature:  Date: 25/07/2023

EXTERNAL EXAMINER

Name: Lakew Alemu (Ph.D) Signature:  Date: 25/07/2023

## DECLARATION

I declare that this research project entitled “Assessment of Quality of Road Infrastructure: A case of Dessie and Kombolcha Cities”, is my original work. This Project Work has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the Project Work have been duly acknowledged.

Candidate:

Name: Lisanu Dibeta Dilla

Signature:

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke extending to the right.

Date: 19 July, 2023

## LETTER OF CERTIFICATION

As Masters Research project advisors, I hereby certify that I have read and evaluated this research project prepared under my guidance, by Lisanu Dibeta Dilla entitled “Assessment of the Quality of Road infrastructure: A case of Dessie and Kombolcha Cities. I recommend that it can be submitted as fulfilling requirement of Masters of Art Degree in Project Management.

Fesseha Afework (A/ Professor)  
Advisor

Signature



Date

25/07/23

## **ACKNOWLEDGEMENTS**

I would like to express my deepest gratitude to those who made orientation in my life's journey much easier so far.

My special gratitude is expressed to my advisor Ato Fisseha Afework for his sincere guidance, support and advice during this research. It is not only his contributions towards the academic achievements but also for pointing out my weakness and enabling me to use my potential and for giving me different documents relevant to this research and any resource available in good will without reservation. In doing so he brought out the best in me.

Special thanks go to all the staff in School of Commerce of Addis Ababa University.

Finally, my appreciations are to my family specially my wife and children who sacrificed their time and for being beside me through all these challenging time to accomplish this work without any preconditions.

## **Abstract**

The objective of the research is assessment of the quality of road infrastructure in general and identifying the current condition of road infrastructure, the effects of poor quality road infrastructure on the functional performance of the road and identifying the challenges of quality road infrastructure construction at Dessie and Kombolcha cities in particular. Both quantitative and qualitative research approaches were used. The research methodology used is descriptive research as it aims to find out the effects of quality on the functional performance of road infrastructure. To put this methodology in to practice, desk review was carried out to identify the effects of the road quality on the functional performance of road infrastructure. Survey questionnaire and in depth interview of decision makers, experts and engineers of the cities was administered to accomplish the research objective. The researcher used stratified purposive sampling technique to identify and select proper sample respondents from each city for filling up questionnaire on quality issues associated with poor infrastructure performance. Data was analyzed on both quantitative and qualitative methods to answer research question and attain the research objective. Data collected using questionnaires was coded, entered, clean and analyzed by using Statistical Package for Social Science (IBM SPSS Statistical version 22). The collected data was presented used descriptive statistical analysis to analysing various characteristics of respondents. The main findings include the road infrastructures at Dessie and Kombolcha cities currently are mainly asphalt roads, cobblestone roads and gravel roads. The quality of these roads was found to be satisfactory. These roads satisfy the dwellers of the cities about 74.23 %. The effects of quality of these roads on functional performance of the roads were viewed from three corners namely effectiveness, reliability and cost. The challenges of quality road construction were found to be as heavy traffic load, quality of construction material, nature of the subgrade soil, thickness of road layers, environmental effect, poor drainage, workmanship, technology used in construction, poor mix design, use of inexperienced site staff and flaws in specification. In the recommendation, road infrastructure asset inventory with pavement serviceability index, identification and questioning of accountable bodies for poor performance of the roads, strict follow up and putting into effect of quality controlling means, use of appropriate technology, experienced designers and supervisory staff is compulsory for maintaining quality road infrastructure.

Key words: challenges, infrastructure, performance, quality

# Contents

Abstract.....	vii
Chapter One .....	1
Assessment of Quality of Road Infrastructure: The Case of Dessie and Kombolcha Cities .....	1
1. Introduction.....	1
1.1 Back Ground .....	1
Background of the Case.....	3
1.2 Statement of the Problem .....	4
1.3 Research Question .....	5
1.4 Objectives.....	6
1.4.1 General Objective .....	6
1.4.2 Specific Objectives .....	6
1.5 Significance of the Study .....	6
1.6 Scope of the study.....	6
1.7 Limitation of the Study.....	6
1.8 Structure of the Study .....	7
Chapter Two.....	8
Literature Review .....	8
2.1 Introduction.....	8
2.2 Theoretical Review.....	8
2.3 Empirical Review .....	17
2.4 Conceptual Framework.....	21
Chapter Three .....	23
Research Methodology .....	23
3.1 Research Area .....	23
3.2 Research Design .....	23
3.3 Population, Sampling, Data Sources and Techniques .....	23
3.4 Research Instrument .....	26
3.5 Method of Data Analysis .....	26
3.6 Unit of Analysis .....	26
3.7 Dependent and Independent Variables.....	27
3.7.1 The Independent Variable.....	27
3.7.2 The Dependent Variable.....	27

3.8 Reliability and Validity.....	27
3.8.1 Content Validity.....	27
3.8.2 Construct Validity.....	28
3.9 Ethical and Confidentiality .....	28
Chapter 4 .....	29
Results and Discussion.....	29
4.1 Data Presentation, Analysis and Results.....	29
4.1.1. Demographic characteristics of respondents.....	29
4.1.2 The Current Condition of the Road Infrastructure on the Ground.....	31
4.2 The effect of quality on the functional performance of the road infrastructure.....	34
4.3 Challenges in Construction of Quality Road Infrastructure .....	37
Chapter Five.....	42
Conclusion and Recommendations.....	42
5.1 Summary of Findings .....	42
5.1.1 Current Situation .....	42
5.1.2 Effect of Quality on Functional Performance of the Road Infrastructure .....	42
5.1.3 Challenges in Construction of Quality Road Infrastructure .....	43
5.2 Conclusion .....	43
5.3 Recommendations .....	44
References.....	45
Annex 1: Questionnaire for Drivers and Office Workers.....	50
Annex 2: In-depth interview Questionnaire for Decision Makers.....	54

## List of Tables

Table 2.1: Ranking of countries as per Road Quality Index.....	21
Table 2.2: Conceptual Framework.....	22
Table 3. 1: Drivers number and proportion to population size. ....	25
Table 3.2: Reliability of Survey Questionnaire .....	27
Table 4.1: Respondents reply in number .....	29
Table 4. 2: Demographic Character of the respondents.....	30
Table 4.3: Data for Current Condition of Roads in Dessie and Kombolcha .....	33
Table 4.4 : Car Accidents due to Poor Road Condition.....	33
Table 4.5: Recently Build Roads in Dessie and Kombolcha.....	33
Table 4.6: Likert scale of Performance of the road infrastructure. ....	35
Table 4.7: Likert scale of Challenges in Construction of Quality Road Infrastructure. ....	38

## **List of Acronyms**

AASHTO	American Association of State Highway and Transport Officials
AMP	Asset Management Plan
APCI	Airfield Pavement Condition Index
CSA	Central Statistical Agency
CSIS	Center for Strategic and international Studies
ERA	Ethiopian Road Authority
IRI	International Roughness Index
PCI	Pavement Condition Index
PSI	Present Serviceability Index
QI	Quality Infrastructure
QIS	Quality Infrastructure System
RSDP	Road Sector Development Program
SPSS	Statistical Package for Social Sciences
UIIDP	Urban Institutional and Infrastructure Development Program
UNIDO	United Nations Industrial Development Organization
USD	United States Dollars
WHO	World Health Organization

## **Chapter One**

### **Assessment of Quality of Road Infrastructure: The Case of Dessie and Kombolcha Cities**

#### **1. Introduction**

##### **1.1 Back Ground**

Infrastructure is the backbone of the economy in any country. Investopedia defines Infrastructure as the basic physical systems of a business, continent, or country and often includes the production of mass oriented goods or services. The word infrastructure first came into function in the late 1880s, originated from French, with infra implying below and structure implying building. Infrastructure can be considered as the foundation upon which the structure of an economy is based. Examples of infrastructure include roads, railways, airways, waterways, communication networks, sewers, and school systems. The most developed countries in the world are those who could afford quality infrastructure for their nations ([www.investopedia](http://www.investopedia)).

The term incorporated a number of systems and structures where physical components are required such as the water supply networks throughout a town, region, or country. Whereas the constructed facilities, machinery, or suchlike physical assets such as bridges and roads are necessary to the system, infrastructure also helps nationalities to take part in the social and economic community and supplies them with needs like food and water.

The World Bank has long focused on quality growth. Its report “The Quality of Growth,” published in 2000, elaborates on the three principles for development necessary for quality of growth: (1) focus on all assets: physical, human, and natural capital, (2) attend to the distributive aspects over time, and (3) emphasize the institutional framework for good governance. Infrastructure investment is related to the first principle—it is primarily a form of physical capital. However, according to the principle of development for quality growth, infrastructure investment should contribute to the formation of human and natural capital under good governance and focus on equity in the long run. The Principles for Quality Infrastructure Investment, agreed to at the G20 Osaka Summit in 2019 chaired by Japan, support precisely the infrastructure investment necessary to achieve this objective. World Bank (2000)

The principles call for quality infrastructure investments to be inclusive and resilient to positively impact the economy, environment, society, and development. The quality of infrastructure investment is also enhanced by promoting investment in infrastructure through good governance, including eradicating corruption through more transparent infrastructure procurement and ensuring financial sustainability both at the project and macro levels. Helping to build human capital through the transfer of technology and know-how to the people of developing countries through infrastructure investment also enhances quality.

Majority of African countries remain behind from the other world in supply of main infrastructure types, encompassing energy, road and rail transportation, and water infrastructure. Electric power supply is the exemplary shortage in African Infrastructure. More than two-thirds of the global population without access to electricity is based in sub-Saharan Africa. Sealing the gap in infrastructure coverage is a big deal for the continent's transformation, for the change of life of its people, and for the development of its business sector. The positive aspect is that infrastructure investment in Africa has been progressing continuously over the past 15 years, and that worldwide investors have both the willingness and the funds to spend much more across the land. Nevertheless, the difficulty is that Africa's back history in completion of projects financially is poor: only 20 percent of infrastructure projects pass at the feasibility and business-plan stage. (World Bank, 2009)

In 2019, Namibia had the highest road quality infrastructure in Africa, according to business executives' perceptions. The country reached an index rating of 5.3 on a scale from 1 (lowest) to 7 (highest) in terms of road condition and extensiveness. Egypt and Rwanda followed with a score of 5.1 and 4.8, respectively (Statista Research Department, 2023).

The current government focused Ethiopian infrastructures include road, railway, electricity, water supply, drainages, bridges, airports, landfills and abattoirs which are heavily invested by the government and donors up on. Ethiopia does not undertake post-completion reviews for infrastructure projects. The implementation of post-completion reviews could help determine whether projects have achieved their objectives efficiently, and better identify are

improvement (Global Infrastructure hub, 2017). Effects of the quality problems of these infrastructures directly affect the economy of the country thereby raising good governance, safety and health issues.

In Ethiopia the network of roads and highways has a total length of 120,171 km. With an average of 28,826 traffic fatalities per year (2013 - 2019), road traffic in Ethiopia is considered quite dangerous. This corresponds to 26.7 accident fatalities per 100,000 inhabitants per year. By comparison, this figure is 12.3 in the USA and 17.0 worldwide. ([www.worlddata.info](http://www.worlddata.info))

History of Road construction in Ethiopia takes us to the early 17th century. The first Asphalt road was constructed in 1903 from Addis Alem to Addis Ababa. Since establishment of ERA in 1951, well organized and planned programs have been taking place to expand and preserve the road network in the country. According to the detail study conducted in the late 1990's; roads were constructed in important urban areas and to some rural areas. Majority of the country were secluded from business centers, market and basic social services. The majority of the current road is deteriorated and in poor condition. The leaders of Ethiopia understood that the little road network coverage and deteriorated road network has been a tackle to economic comeback and economic development. Based on the 24th year Road Sector Development Program (RSDP) report, the total road network has expanded from about 26,550 km in 1997 to 155,830.1 km in 2021 including district and municipality roads (ERA 2013).

### **Background of the Case**

Kombolcha Town and Dessie City are found in South Wollo Zone, along the eastern margin of Amhara Regional State in the north central part of Ethiopia, away from 375km and 400km from Addis Ababa, which is a capital city of Ethiopia, respectively. Kombolcha is located 505 km from the regional capital Bahir Dar, 23 km from the zonal city Dessie and 533 km from port Djibouti. Dessie is 482 km southeast of the regional capital (Bahir Dar), and 23 km north of Kombolcha. Dessie is categorized under moist/humid highland Climatic Zone favored by its overall physical feature (the location and topography) and possesses highland climate. It has favorable climate (suitable temperature with an average minimum temperature of around 7°C and average maximum temperature of around 27°C and sufficient rainfall that mostly reaches in between 866 and 1100mm per annum) which provides comfortable living and working environment. (Dessie City Administration, 2023)

According to the 2007 population and housing census projection, Dessie had a total population of 212,436. (CSA's projection for 2007).The 2022 population projection of Kombolcha is 204,318 among which 103,210 male and 101,138 female (CSA's projection for 2022).Kombolcha City is one of prehistoric City founded during the Italian occupation from 1935-1945. It is one of the reforms city in the region and has a city administration Status. Its temperature ranges from moderate to high. The minimum average temperature being about 2.95<sup>0</sup>c, which mostly occurs from November to January and the maximum average temperature is about 33.07<sup>0</sup>c which mostly occurs from May to July. Generally, the average temperature of the town falls within the range of comfortable temperature for habituation, i.e.20.1<sup>0</sup>c. (Kombolcha City Administration, 2023)

Dessie and Kombolcha are cities situated in East Amhara region and incorporated in Urban Institutional and Infrastructure Development Program (UIIDP). Currently Kombolcha has 246.81 km road of with details of 7.15km asphalt, 29.07 km cobblestone, 119.52 km gravel, 1.9 km large stone and 65.47 km compacted earth and 23.7 km federal asphalt road.

Dessie has 52.10 km asphalt, 108.86 km cobblestone,150.05 km gravel, 3.19 km large stone and 114.38 km compacted earth and 42.79 km federal asphalt road with a total of 428.59 km.

## **1.2 Statement of the Problem**

However, the infrastructure of these cities are suffering from quality problems and this has also effected in draw backs which negatively affect the economy, good governance and health and social interaction of the society dwelling in these cities. The causes of these quality problems of the roads are lack of technical knowledge and capacity in designing the roads, environmental variation and expansive subgrade soil. Lack of technical knowledge and capacity caused lack of traffic data and bad design and construction quality thereby causing heavy traffic loading, poor material quality, poor drainage, poor workmanship and method of construction which eventually caused poor road infrastructure quality (Asnake, 2015). This research was done on the assessment of the quality of road projects of the cities of Dessie and Kombolcha. Although these cities have been constructing these infrastructures from the funds from UIIDP and from their own source revenue which they generate annually, the projects are suffering from quality problems. Theses quality problems have effects on the infrastructure functional performance of the cities. The economic, social, environmental, political and health effects of the poor quality of infrastructures of these cities was dealt in the study. Poor quality of road projects in these cities resulted in

maintenance demand which resulted in the replacement of the existing road with a new one which requires a huge amount of budget before the end of its desired service life. Moreover, poor quality of road infrastructure results in halt of movement of goods, products and people. It also leads to halt of emergency response activities such as movement of ambulance, fire brigade and military movement. The taxi drivers, three wheelers and heavy truck drivers complain about the poor quality of the main and arterial roads within these cities. Currently, these complains are accompanied by public grievances which led to poor governance of the government which eventually end up in the political instability of the cities. Quality problem of drainage projects lead to flooding of the road, flooding of individual's residences and damage of the road infrastructure which has economic, health and environmental effects which leads to public grievance thereby resulting in poor governance and political instability. In addition to these, Dessie has infrastructure maintenance backlog of about ETB 169,638,540.64 in general and ETB 41,190,732 in road infrastructure in particular whereas Kombolcha has infrastructure maintenance backlog of about ETB 111,937,209 in general and ETB 92,996,961.33 in road infrastructure in particular (Dessie, Kombolcha AMP, 2022). Therefore, this effects need to be identified and addressed before it result in huge budget consumption in a developing country like Ethiopia. Identifying the major effects of the quality problems leads to long-lasting infrastructure performance. This research is aimed at filling the gap in identifying the quality problems of the road infrastructure which eventually results in public grievance and poor governance resulting in political instability and finding out the remedial measures to bring quality road infrastructure which brings speedy transportation of commodities and quick movements, saves time significantly in all of the day to day performances. Roads serves as feeder line for other types of movements and, therefore, the other way improves their progress, helps for the effective protection of the nation at the time of wars, roads support the growth of trade and other economic activities all over the country and bring overall economic development of the country.

### **1.3 Research Question**

The research questions are:

1. What is the current condition of the road infrastructure on the ground at Dessie and Kombolcha?
2. What is the quality and functional performance of the road infrastructure in Dessie and Kombolcha cities?

3. What are the challenges in construction of quality road infrastructure in Dessie and Kombolcha cities?

## **1.4 Objectives**

### **1.4.1 General Objective**

The general objective of this research is to assess the quality of the road infrastructures of Dessie and Kombolcha cities.

### **1.4.2 Specific Objectives**

The specific objectives of the research is:

- To identify the current condition of public road infrastructures of Dessie and Kombolcha cities.
- To identify the quality and the functional performance of the road infrastructure of Dessie and Kombolcha cities.
- To identify the challenges of quality road infrastructure construction in Dessie and Kombolcha cities.

## **1.5 Significance of the Study**

The study assesses the quality problems and the functional performance of road infrastructure and suggests remedial measure to make life easier to the society that uses the road infrastructures. In addition to this, the study has practical significance to the cities, regional and federal authorities for design, maintenance and rehabilitation of the road infrastructures particularly the municipality, for its asset management, fund allocation and prioritization and for securing long-lasting road infrastructure.

## **1.6 Scope of the study**

The scope of the study is limited to the assessment of the Quality and the functional performance of road infrastructure of Dessie and Kombolcha cities. Quality problems of other projects like water supply, telecommunication, airports, landfills, abattoirs, factory buildings were not incorporated in the study.

## **1.7 Limitation of the Study**

Data was limited to the functional performance of the infrastructures. Structural performance was not addressed in this research. Pavement serviceability index data was not yet made available for

each span of road. Respondents of the questionnaire were limited to only drivers, decision makers and engineers of the two cities.

### **1.8 Structure of the Study**

This study is organized in five consequent chapters. The first chapter introduces the back ground of the study, statement of the problem, basic research questions, and objectives, significance, scope and limitation of the study. The second chapter discusses on review of literatures with descriptions of different researchers related to the topics. The third chapter deals with the research methodology, design, sources of data, target population, sampling technique and sample size, validity and reliability of instrument and research ethics throughout the data collection and analysis. The fourth chapter presents the data analysis, presentation and discussion through tables, by frequency and occurrences. The fifth chapter, which is the final chapter of the study, is about the summary of major findings, conclusion and recommendations.

## **Chapter Two**

### **Literature Review**

#### **2.1 Introduction**

The literature review encompasses similar researches conducted and papers published which deal with the infrastructure need, coverage and performance in general and road infrastructure in particular. The review identifies knowledge gaps and areas that need further study. The research is on infrastructure particularly road infrastructure. The relevant literature pertaining to the definition of infrastructure, challenges, theoretical and empirical studies and conceptual framework are presented in this chapter.

#### **2.2 Theoretical Review**

The World Bank (1994) reported that there is no nonambiguous meaning of infrastructure, but there is still a transparent agreement on the meaning of infrastructure. As stated by the Macmillan Dictionary of Modern Economics (1996), “infrastructure is a structural element of the economy that facilitates the flow of goods between buyers and sellers.” In view of that, and as stated by the Routledge Dictionary of Economics (1995), “infrastructure is the main service of a country allowing the realization of economic and social activities through the provision of means of transportation, public health services, educational services and buildings for community activities.”

There is no undeviating meaning of urban infrastructure. Some meanings concentrate on the ‘physical’ structures and the material grids that carry their supply (Estache and Fay 2009). “Other definitions include the people, practices, discourses and imaginaries that shape urban services,” (Amin and Thrift 2017). Despite everything, there is a common understanding that urban infrastructure is a mechanism through which urban services, of different types, are supplied (Cirolia and Rode, 2018).

Cirolia and Rode put four basic infrastructural ideas that have come at various periods historically and which continue to direct our understandings, views and political stands currently. These incorporate: universal networked access, connecting competitive space, ecological modernization and new self-sufficiency.

The idea of universal access lays foundation to a major part of the worldwide development discussion. Part of the growth dialogue of universal access rests on societal economics. The idea of universal access is attached to a special emphasis that is viewed to possess a public cost that is externality. For example, inability to provide roadway could end up in expansion of diseases, high mortality, poor health and the risk of social instability (Boyer 1986). “Wider concerns about societal well-being, a healthy labour force and economic productivity further strengthened the case for universal access,” (Revi and Rosenzweig 2013). These can be considered as ‘public benefit’ or ‘public good’ opportunity. Clarke and Wallsten (2002) dispute that provision of infrastructure facilities are viewed as rights that every member of the society should enjoy. Consequently, albeit supplying with infrastructure facility is a must or a means of progress (or both), the ideal of universal access demands fixing a delineation of ‘access’ and benchmark to compare progress against demand. “Majority of the nation put forward particular infrastructure provision demands as public policy targets,” (Clarke and Wallsten 2002).

Generalizing arguments around the scaled provision of social interests, (Paget-Seekins and Tironi 2016), the Keynesian development model (Graham and Marvin 2001) and monopolistic (public and private) services (Clarke and Wallsten 2002), universal access was the authorized contemporary infrastructure view, universal establishment of goals and the mid-20th century period of communal function dominates in the West (Coutard 2002). Unlikely, universal access was knowingly rejected as parcel of the progress of colonial cities, like in African cities, where urban access were only supplied in chosen areas (Graham and Marvin 2001). “Nevertheless, it is worth mentioning that the idea of universal access to cross connected urban infrastructure is not mandatory to cope up with a particular political view states. In accordance with history at least, different countries differing from the advanced to the developing nations have all progressed as well as labored with dealing universal access and providing wide range infrastructure projects to incorporate it,” (Clarke and Wallsten 2002).

‘Connecting competitive space’ is an infrastructural idea that is necessarily dealt with economic advancement, fruitfulness and the efficient utilization of limited man power, time and money. It pursues the idea of ‘strengthening strengths’, standing for prioritizing infrastructure provision where they can bring major influence on progress and resource advancement (that is to say, where there is already accumulated capacity). This need mobilizing together massive investment;

virtually it implies investment in limited urban areas with massive power for upgrading financially and effectiveness of investments.

“The notion of expanding competitive spaces entertains an unequal coverage of infrastructural advancements.”(Jessop 1998). As the World Bank (2009) implied it in its World Development Report, “‘the world is not flat’, not only admitting that economic works are becoming denser but also certainly entertaining conforming infrastructure rules and regulations. Contrary to universal access, connecting competitive space is aiming at infrastructural alignment tuned to result in economic capacity. Connecting competitive space is about farsighted investments that influence the domination of urban concentration (specifically, its wide and unequal form). The notion of connecting competitive space aligns with the idea of urbanization that reinforces and prioritizes massive expansion points, enhancing economic development and public safety in locally much condensed places (Collier 2016).

In the new report of Africa, exposing itself to the World (2017) is a strong evidence of this dialogue concerning urban Africa. Based on this fact the World Bank challenges that the internal and external value cities significantly have is being neither organized nor arranged for successful urban advancement in urban Africa. They call for areal, state wise and worldwide connectivity.

“Ecological modernization is a significantly special infrastructural idea from the above two, both eventually pointing to public safety, this takes into account the worldwide ecological disorders as its origin of difference. A core belief of this idea is the restructuring of the surrounding as a human property and wealth rather than a free supply, necessarily withstanding the externalization of prices to the surrounding resulted by the current infrastructural and service providing leaders.” (Hajer 1995). Referring to infrastructure advancement, environmental modernization shows a to infrastructure provision, beyond power and movement, supporting the construction of a green economy. In the power line, this minimizes replaceable power production, intelligent expansion mechanism and power storehouse. In movement, social and vital movement infrastructures are the major appropriate ones, more supported by electrification and telecommunication infrastructure influencing the entire transport ecosystem. An important consideration of environmental modernization is organizational changes that bring about the conducive structure for environmental/infrastructural transformations, in turn not only taking into account the existing

challenges of our environmental damages but also the public disagreements that substantiate it (Hajer 1995).

“The last infrastructural idea marked for this summary deals with the renewed thinking to local self-sufficiency and a post-interconnected urban infrastructure”, (Coutard and Rutherford 2015). Contemporary self-sufficiency points out that substituting the extended goal of access to interconnected facilities with long-lasting rather than provisional types of not interconnected, little detail and at times ordinary options. Modern self-sufficiency forecasts a re-fixing of areas of collective, local service delivery, to personal and group-wise infrastructural actions. “It may therefore indicate a significant extent of sharing area wise service access points”, (Banerjee, Sudeshna, Quentin Wodon, Amadou Diallo, Taras Pushak, Elal Uddin, Clarence Tsimpo and Vivien Foster 2008) (water, electricity, toilets), hyper-individualized not interconnected means and the introduction of area wise, small networks that are not interlinked to a wider area.

In conclusion, all these infrastructural ideas share is the demand for much and modified infrastructure; they differ in based on their major priorities (for example, access vs growth), with sub indication for the kind of infrastructure that is argued for. All four infrastructural ideals agree that infrastructure and services are decisive means for directing cities. Decisions about investments are not only technical – but they go beyond and direct social and political domains as well. These options also decide how infrastructure is taken into consideration, as a right, goods or an investment. In this way, the ideals imply the decisive outcome of infrastructure

The World Bank (2014) hints out that contemporary tax revenues in Nigeria, Ethiopia and Congo are less than infrastructure investment demands by a factor of 12, 20 and 26 respectively, making sure the little scope for the distribution of infrastructure services within the existing financial model(World Bank, 2014).

Social and political readings got fame as a reply to the shortcomings of technical views of infrastructure. “The ‘Infrastructure Turn’ implies to the developing need that scholars in the social science and humanities have interested in the study of infrastructure,” (Amin 2014).

“Scholars taking part in the Infrastructure Turn have in common an intense feeling with the instrumentalist, non-political and supposedly objective reading of infrastructure shared within the technical and policy arguments”, (Ferguson 2012). These authors debate that infrastructure is

simultaneously political, built and possibility. In this regard, infrastructure's expansion is directed by enclosed, unforeseen, seemingly temporal and complex power dynamics (Law 2009). The argument is not that infrastructure is both technical and political, but that 'the technical' itself is political.

Urban scholars have come to the Infrastructure Turn. These scholars interested in the social and political nature of urban infrastructure and provisions. Two major scholarly classes within the urban Infrastructure Turn are identified: the 'structural' and the 'relational' urban infrastructure groups.

### **Urban Infrastructure Structural Accounts**

“Structural accounts of urban infrastructure identify the methods where manners of capitalist collection can be revealed, and our knowledge of their current importance pinpointed, through investigation of infrastructure,” (Ferguson 2012). These authors have in common an intense feeling that the emanating manners of infrastructure supply are leading to biasedness, fragmentation and intense unfairness in cities. Of special consideration are the methods in which urban infrastructure has been owned and financed, ending up in enclosed access and connectivity. Structural scholars view the privatization and financialisation of urban infrastructure as a reply to the deficiency in capitalist systems – or what might be referred to a continuing process of 'creative destruction' caused by the eternal deficiencies of conservative economics (Peck, Theodore et al. 2009).

Structural accounts of urban infrastructure have severe claim. They seize international approaches and position national experiences within distinct international processes. Contemporary ideas of neoliberal and financialised models of infrastructure supply, the typical and solid administrations of risk and return and the destructive effects of these models were made accountable by them. Nonetheless, structural accounts of urban infrastructure are criticized for not taking into consideration complexity, supplying with 'crisis' and 'techno-pessimist' visions and – in their strict criticism of capitalism – not addressing propositionality and options.

### **Urban Infrastructure Relational Approaches**

Relational approaches tend to use infrastructure to reflect on social and political topics. Post-structural reviews discard universalizing and reductionist writings such as neoliberalism, and fake

twofolds, for example between the technical/social or human/environment (McFarlane 2011, Anand 2012). Thus relational approaches to the study of urban infrastructure are clearly post-structural (Guy and Karvonen 2012).

Relational approaches emphasize the necessity of viewing urban infrastructure by its interconnections. Hypothesizing on the 'poetics of infrastructure', Larkin (2013) explains on the 'peculiar ontology' of infrastructure as both 'things' and interconnection between things. Since interconnections are invariably being created, infrastructure can be viewed as 'invariably coming into being', and not as a stable matter. These interconnections are considered as complicated. By mentioning and assessing the complication of interconnections, relational approaches encompass chaos. This action does not need to levy onto infrastructure a dominating system sequence. Subsequently, the 'blame' that relational scholars put on technocratic views of infrastructure is not aimed at revealing the disagreements of capitalism (as the structural account does). Contrary to it, relational activity on urban infrastructure needs to 'trace effects', bringing out the built form of infrastructure and the chances for relevant buildings and methods (Mol 2010). Relational accounts carry a number of dangers; infinite particularism and basic withstanding to norms are mostly criticized (Pieterse 2011). Whatever, laying down the long duration structural view on all over interconnected functions truly gives options to reconstruct and renew our grasp of what could be done and necessary from the beneficial view of unique cities and contextualized urban traditions.

In general, the already existing interconnections between different disciplines are not sufficient to resolve the complex currently prevailing urban problems. Truly speaking, there are a number of methods to grasp and understand urban infrastructure. Importantly, there are a number of methods to do researches of urban structure to show conceptual enquiry in connection to cities, development, politics and society. Necessarily, infrastructure ideas have directed the investment priorities infrastructure systems in nations. In a number of progressing nations, these have been directed by ideas that are driven within international policy dialogue. In the same way, the intellectual exploration of infrastructure was, till the near past, influenced by the technocratic departments. Recently, many are interested from the social studies. This is more than considering the basic matters like the social influences of infrastructure. It incorporates the using infrastructure for analysis of social and political views and their dissemination in some areas. There is important difference among the ideas as well as among the technical and social views of urban infrastructure.

They have basic disagreements around approaches of origination, which interpret into different level in terms of both understand and intervention. (Cirolia and Rode, 2018).

Social and political views of urban infrastructure direct our views to the influential mode of infrastructure; influential both in the way it directs areas and in the way in which authority is framed into its system. Very necessarily, social and political views broaden the aspect for understanding optional methods. They let us to view infrastructure as ‘equivocal’, mentioned as a method of progress oscillating between different choices.’

Infrastructure is the backbone of the economy in every nation. It is the physical undergirding of any society, and a country’s infrastructure plays a large role in determining its long-term economic and social trajectory. A Quality Infrastructure (QI) is an arrangement leading to statewide policy goals in areas incorporating growth of industry, commercial competitiveness in worldwide markets, successful usage of natural resources and manpower, food safety, health, the surrounding and changing weather. It gives a full package considering the needs of the people, of suppliers and users, and of institutions and other organizations that give those produces and functions. The QIS includes important areas such as strategy, organizations, suppliers, and the value-adding use of worldwide requirements and fulfilment analysis processes (UNDO).

“Quality” describes making sure that that goods and supplies fulfil the standards of the consumers.” The other method of grasping this idea to quality is that goods and supplies should be fulfil the function for which they are needed. Knowledge of quality as being fit for purpose and fulfilling consumer standards lets Quality Infrastructure System to be used for producing successful outputs in fulfilling a wide area of difficulties, in addition to goods or supply quality. Illustrations of specific need to progressing nations are food safety, health, the environment, addressing climate change, social responsibility and gender issues. There is no off-the-shelf Quality Infrastructure System prototype that will fit all nations, a reconstructed model is important. The Quality Infrastructure System makes adjustment to fulfill the national and regional standards that have been found by rigorous analysis on necessities. (UNIDO, 2018).

Quality Infrastructure System gives uses to all in the supply and demand interconnections. This incorporates the user, producer and the provider. User gain advantage because the QIS assures that the produces and functions they buy are fit for functionality. Producers and providers gain advantage because the QIS advertises their function of worldwide standards to confirm that their commodities and functions

satisfy state-of-the-art standards, and that their commercial methods are structured on administrative approach requirements acceptable internationally.

The economy needs reliable infrastructure to connect supply chains and efficiently move goods and services across borders. Infrastructure connects households across metropolitan areas to higher quality opportunities for employment, healthcare and education. Clean energy and public transit can reduce greenhouse gases (www.brookings.edu, Robert Puentes, 2015).

High-quality infrastructure provides direct positive impacts, including higher efficiency, increased safety, decreased environmental impact, and more effective delivery of public goods and services (Daniel F. Runde, 2017).

While the arrangements, machinery, or similar physical assets like bridges and roads are important to development, infrastructure also helps people to take part in the social and economic community and supplies them with needs such as food and water. (Investopedia Team, 2023)

However, in a developing country like Ethiopia, focus was given to new infrastructure quantity and volume than on quality; and quality is compromised due to lack of technical knowledge and capacity and insufficient infrastructure maintenance. One of the public infrastructures playing the decisive role in the mobility of goods, products and people is the road infrastructure. Best quality roads infrastructures facilitate the mobility of raw materials, products and people thereby giving standard service and saving time. Whereas poor quality road infrastructures render services below the expected standards, bring adverse effect on the environment, cause short life span of the infrastructure and sometimes even remain non-functional. Road infrastructures rendering services below the expected standards result in loss of economy (Value for many) and hazard on life and economy of beneficiaries. Loss of economy results in public grievance which leads to poor governance eventually resulting into political instability. Hazard on life and property of beneficiaries lead to loss of property, life and injury which result in pressure on emergency response institutions and high cost of maintenance on hard currency leading to public grievance. Road infrastructures rendering services below the expected standards also result in delayed functionality after completion of the project which leads to loss of public asset which resulting in public grievance thereby ending up into poor governance and political instability. Poor quality of public road infrastructure also has negative effect on the environment which results in high maintenance cost leading to public grievance. Poor quality of road infrastructure leads to short life

span of the public road infrastructure resulting in loss of public asset/ money which leads to public grievance resulting in poor governance and political instability. Non-functional road infrastructures result in loss of public asset/ money which in turn leads to loss of opportunity cost /economy resulting in public grievance. All the road infrastructure negative effects which result in public grievance lead to poor governance resulting in political instability.

<https://www.theconversation.com> puts uses from advanced road networks point wise in the following:

- Due to paved roads, people who suffered at home or died in travel to hospital would now be saved and get latest treatment.
- It gives women better access to health before and after berth. Other opportunities like educational facility will advance the women life status.
- A number of pregnant women feel like going to the hospital to give birth;
- 100% immunization rate in many villages would be achieved by health workers using modern roads.
- The ambulances can reach the villages easily and save the lives, unlike there was no road in the past;
- The advanced pavements help the society, especially women, to find jobs, go to work and schools, and visit clinics and hospitals more quickly and safely;
- It also supports producers to cultivate cash crops, and makes transportation of their produce faster, keeping it fresh and in good condition;
- It gives farmers the opportunity to visit the market frequently due to the new road facility;
- Agricultural extension workers frequently visit the villages and support the farmers in bringing good products.
- Employments will be increased and much job opportunity will be created.
- On farm job creation will also be increased due to shift from grains to cash crops and also multiple cropping;
- A number of people would be moving to the neighboring villages for little income generating jobs which in turn will generate employment opportunities;
- Agro and small scale industry will increase due to road facility.

- Better road network will let children to go to schools without any fear of danger and the number of boys and girls going to school would increase, parents will feel safe about their children.
- Energy supply for the purpose of cooking will increase and visit to cultural and religious places would increase.
- People will have broad opportunity in purchasing and supplying their products;
- Business men in small villages may get the opportunity to access the bigger markets, transport the agricultural products quickly and entertain better profits rather than confining the local markets.
- Better road network not only connects the village communities to better markets, but also brings broad job opportunities far away;
- Advanced road network will lead to development of tourism;
- Better road network will maximize sources of revenue and maximized revenue will support in reducing debts and would maximize the purchasing power of the people, thus would advance over all life status;
- Good road network will get a life status options in terms of hiked in land price, progress in business transactions, change in people's life style, advancing of job from agriculture to commercial, advancement in transportation, better movement and transport facilities, better inter connection, alleviation in poverty, illiteracy and ignorance. Eventually, it is concluded that the success and influence of the road construction projects that link, underdeveloped, prone and detached society to schools, services and markets is basic to socioeconomic advancement. Also, road construction and maintaining roads make a massive influence on people's lives in the nonurban places. It is critical to bear in mind that infrastructure such as better roads carry absolute role towards minimizing poverty.

### **2.3 Empirical Review**

In 2018, there were a total of 64,285,009 km of any kind of roads in the world. These were shared between 411,853 km of expressways and 63,873,156 km of normal roads (paved and not paved) (Nicolas de Loisy, 2019).

Countries with the worst quality of roads in the world today are Chad with a quality score of 1.9 out of 7 followed by Mauritania with a road quality score of 2.0, Madagascar with that of 2.0 ranking 141<sup>st</sup>, 140<sup>th</sup> and 139<sup>th</sup> respectively. Whereas countries with the best quality of roads in the world today are Singapore with a quality score of 6.5 out of 7 followed by Netherlands with a road quality score of 6.4, Switzerland with that of 6.3 ranking 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> respectively. (World Economic Forum, 2018-2019)

Singapore's road network connects all corners of the island with more than 9,500 lane-km of roads and expressways. The roads cover 12% of the total land area. (<https://www.lta.gov.sg>)

The Netherlands has one of the world's most dense road networks with 139,000 kilometers of public roads, including at least 3,530 kilometers of motorways and expressways. Switzerland's roads had a total length of 71,558 kilometers. Of these, the secondary or regional roads made up the largest share, at nearly 25 percent. By comparison, motorways had a combined length of 1,462 kilometers. (European Road Safety Observatory National Road Safety Profile – Switzerland, 2021)

As of the year, 2020 India constitutes a total of 5,897,671 km worth of road networks. The rapid increase in the construction of expressways and highways has added up to an increase in the road networks of the country India. The United States of America has the largest road network in the world which constitutes up to 6.58 million kilometers. India now has the second largest road network in the world next to USA. (Vedantu Group, 2023)

Moreover, challenges encountered by the roads are; worse riding facility, bad geometrics and pavement depth which is not sufficient. Having bad road network results in much difficulty for children to go to school and costly for farmers to bring their products to the market. Roads which are no good seriously harm people in a number of different ways and thus it leads people to be poorer. Constructing and maintaining roads make a massive influence on day to day lives of people in villages. A number of small towns are poor, and youth are directed for migrating to large cities to secure jobs. (Worldhighways, 2023)

Total Area of Africa is 30.365 million square kilometer ([www.Britannica.com](http://www.Britannica.com)). Africa has a paved road distribution of 31 kilo meters every 100 kilometer square of land in comparison to 134 kilometer in other low income countries. The total paved road of Africa comes to be 9,413,150 kilometers (Holtz and Heitzig, 2021).

According to the Global Status Report on Road Safety released in 2018 by the World Health Organization (WHO), “Road traffic injuries claim more than 1.35 million lives each year and have an enormous impact on health and development.” (Maria Segui-Gomez, Tawia Addo-Ashong, Veronica I. Raffo, Pieter Venter, 2021)

In 1997, the total road network in Ethiopia was 26,550 kilometers. By 2014 it reached 99,522 km. For the country to reach its ambitious growth targets it’s aiming to double this to over 200,000 km by 2020. (Nathanial Matthews, 2018)

Currently, in the world, an estimated 900 million nonurban people are lacking facilities of road and transport infrastructure. Worldwide invested economy on roads is closer to USD\$1.6 trillion every year for the coming 40 years as roads built will be increasing, particularly in the progressing countries. (Nathanial Matthews and Frank van Steenberg, 2018)

Unless and otherwise local ideas and local needs are taken into consideration, solutions for better roads won’t be applicable. Cooperation and participation among local partners – from engineers to technicians, farmers, labourers and governments departments – very important. Bringing together the ministries responsible for roads and water designing a solution for the challenges could be a simple direction.

South Africa has the total road network of 750,000 kilometers out of which 158,124km are paved and 591,776 kilometers are gravel. South African National Road Agency is currently managing about 21,403 km, of which 84 percent are non-tolled and only 16 percent are tolled. Provinces manage about 47,348 km's whereas 51,682km's is managed by municipalities. (South Africa Transport Department, 2023)

A new report by business consulting firm Frost & Sullivan shows that more than half (54%) of the country’s unpaved road network is in poor to very poor condition, while about a third (30%) of the paved network is in poor to very poor condition. (<https://businesstech.co.za>). This leads to conclusion that 47.43 kilo meter of the paved road is in poor condition and 319,559 kilometer of the unpaved road is in poor condition which needs due maintenance to give service.

Currently, the total road network in Nigeria is estimated to be 194,000 kilometers. About 19% of Nigerian roads are paved as per the assessment. **13%** of unpaved roads are bad roads. The impacts of bad road networks in Nigeria are assessed. In Nigeria, the impacts of bad road are found to be damage of vehicles, delay in movements, robbery, air pollution and accidents. Both the paved and the unpaved

roads in Nigeria were deteriorating by the day and has become a source of worry to all vehicle users. Annual losses (from vehicle maintenance), due to bad roads was valued at over USD 2.1 billion (Okechukwu Nnodim, 2019)

According to the Kenya Roads Board, Kenya has 160,886 kilometers of roads among which 12,950 were paved and 147,916 are unpaved ones. (Kenyan Board of Roads, 2019)

In Ethiopia, according to the 24th year Road Sector Development Program (RSDP) report, the total road network has expanded from about 26,550 km in 1997 to 155,830.1 km in 2021 including Wereda and municipality roads. Table 2.1 shows Ranking of countries as per Road Quality Index.

Country	Road Quality Index	Continental Rank	Global Rank
Namibia	5.3	1	22
Egypt	5.1	2	29
Rwanda	4.8	3	39
Mauritius	4.7	4	42
Morocco	4.7	5	43
South Africa	4.5	6	51
Kenya	4.1	7	64
Senegal	4.1	8	65
Tanzania	4.1	9	66
Algeria	4	10	67
Cape Verde	4	11	68
Seychelles	4	12	71
Swaziland	4	13	73
Burundi	3.9	14	75
Botswana	3.9	15	81
Gambia	3.7	16	83
Guinea	3.7	17	84
Uganda	3.7	18	89
Ivory Coast	3.6	19	94
Tunisia	3.6	20	97
21. Zambia	3.4	21	105
22. Benin	3.2	22	109
23. Mali	3.2	23	110
24. Ethiopia	3	24	116
25. Ghana	3	25	117
26. Burkina Faso	2.8	26	122
27. Malawi	2.8	27	123
28. Zimbabwe	2.8	28	124
29. Lesotho	2.7	29	125
30. Gabon	2.5	30	130
31. Nigeria	2.5	31	131

Country	Road Quality Index	Continental Rank	Global Rank
32. Cameroon	2.4	32	132
33. Mozambique	2.4	33	134
34. Angola	2.2	34	135
35. DR Congo	2.1	35	136
36. Madagascar	2	36	139
37. Mauritania	2	37	140
38. Chad	1.9	38	141

Sources: World Economic Forum competitive report: Road quality index 2018– 2019

Table 2.1: Ranking of countries as per Road Quality Index

### Present Serviceability Index (PSI)

The present serviceability index (PSI) is a pavement performance measure. Introduced by the American Association of State Highway and Transportation Officials (AASHTO), the PSI is one of the most widely used pavement performance indicators after pavement condition index (PCI) and international roughness index (IRI). This performance indicator ranges between 0 and 5, 0 representing a failed pavement and 5 an excellent one. (Wesolowski, 2022)

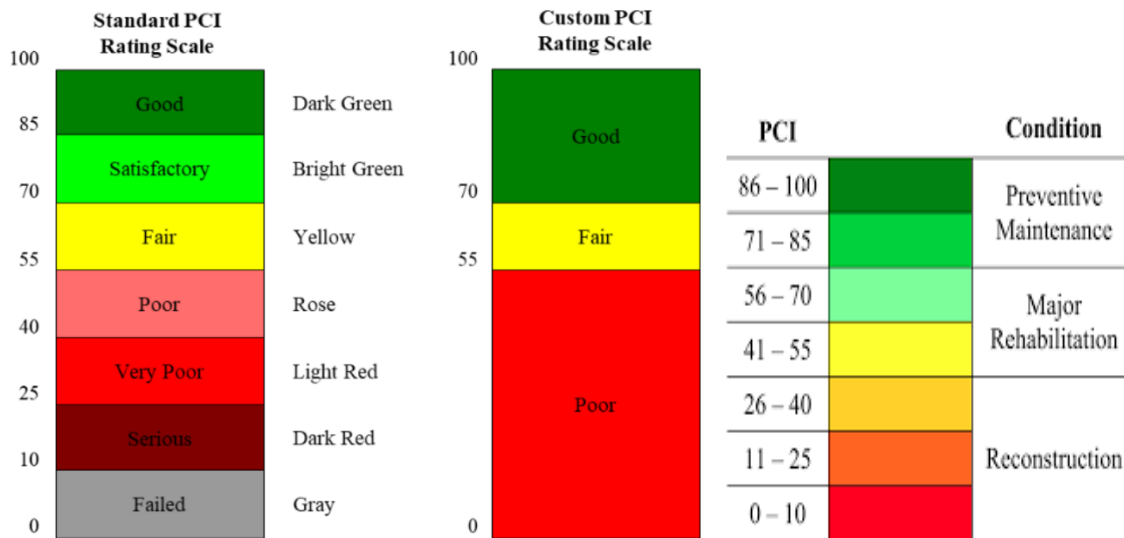


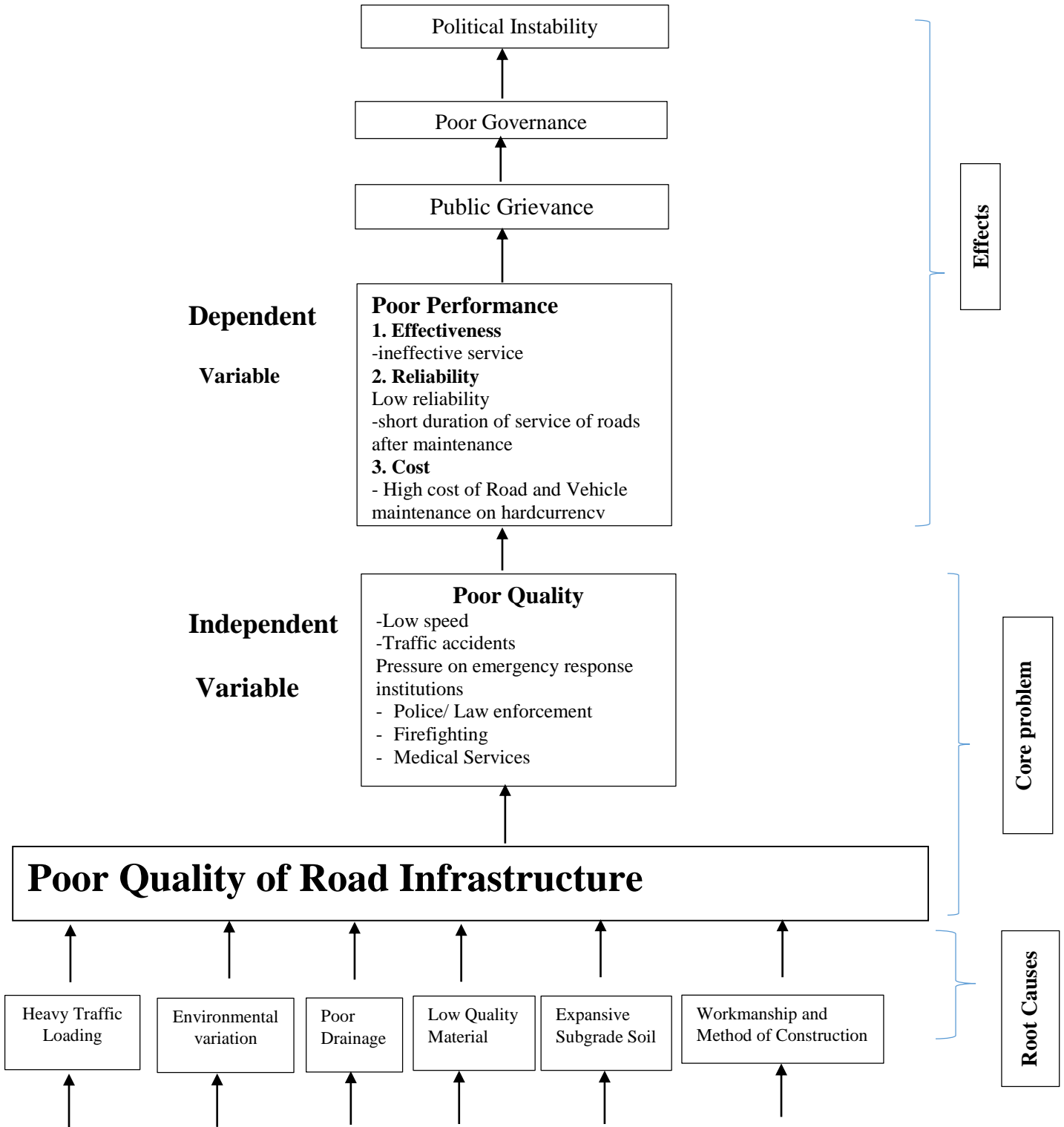
Figure 1: Pavement Condition Index Scaling

Source: Wesolowski, Complex Method of Airfield Pavement Condition Evaluation Based on APCI Index, 2022

## 2.4 Conceptual Framework

The Conceptual framework of the research is shown in the next page. It shows the causes and effects of the poor quality infrastructure.

**Table 2.2: Conceptual Framework**



**Source:** Author's Own Collection, 2023

## **Chapter Three**

### **Research Methodology**

#### **3.1 Research Area**

The geographical area of the research is in East Amhara region at cities of Dessie and Kombolcha where identification of effects of pavement quality on the functional performance of road infrastructures carried out. Kombolcha is located 375 km north of Addis Ababa, the capital of Ethiopia. Dessie is 400 km to the north of the capital Addis. Kombolcha is a town and district in north-central Ethiopia. Located in the Debub Wollo Zone of the Amhara Region, it has a latitude and longitude of 11°5'N 39°44'E with an elevation between 1842 and 1915 meters above sea level. (Google Group, February 8, 2005).

The conceptual area of the research is on urban road infrastructure particularly on effects of quality on functional performance of road infrastructure.

#### **3.2 Research Design**

The methodology used is descriptive research as it aims to find out the effects of quality on the functional performance of road infrastructure of Dessie and Kombolcha cities. Based on the purpose, the research is descriptive, i.e. looking for the effects of the quality problems on the functional performance of the infrastructures. It is also one time research which was carried out in the past four months.

To achieve the research objective and answer the research question descriptive research methods was to collect both qualitative and quantitative types of data. The descriptive study was designed to analyze the collected data using an interpretive means of data analysis. This research generates results in qualitative and quantitative form or in the form which are not subject to rigorous quantitative analysis. Therefore, the research approach of this study is mixed approach. To put this methodology in to practice, desk review of the infrastructure Asset Management Plan (AMP) was carried out to identify the effects of the quality on the functional performance of these infrastructure. Questionnaire and in depth interview were used.

#### **3.3 Population, Sampling, Data Sources and Techniques**

The population of research is 428.59 km of roads at Dessie and 240.83km of roads at Kombolcha. It is finite population of 669.41km of roads in total. The researcher used stratified purposive sampling technique in identifying and selecting appropriate sample respondents from each cities of Dessie and

Kombolcha for filling up questionnaire on the current condition of the road, effect of quality associated with good governance issues associated with poor infrastructure functional performance. Here, the sample respondents are the drivers of taxi, three wheelers, cars, heavy trucks, buses and motorcycles who regularly drive on the road infrastructures for their daily activities. The stratified sampling will be for drivers of vehicles such as taxi, buses, light trucks, heavy trucks, three wheelers and motorcycle. Municipality engineers and decision makers also filled up the questionnaire. The number of vehicles in Kombolcha per type were 118 taxi, 2494 three wheelers, 250 motorbikes, 120 cars, 80 medium trucks, 60 heavy trucks, 40 buses. And that of Dessie were 520 taxi, 1260 three wheelers, 140 motorbikes, 70 medium trucks 130 cars, 100 heavy trucks and 35 buses. The total sum of the vehicles of the two cities is 5,417. The number of drivers is expected to be equal to the number of vehicles in the cities. As shown in table 3.1 below, among 638 taxi drivers 23, 3754 drivers of the three wheelers 136, 390 drivers of motorbikes 14, 190 drivers of cars 7, 210 drivers of medium trucks 7, 160 drivers of heavy truck 6 and 75 drivers of buses 3 were selected randomly.

The **population** frame of these drivers from the two cities is **5,417**. The sample size for the study was determined by using Kothari, (2004), formula which is the most familiar, simple as well as precise in enabling the research to represent the target population. The way how the sample size is determined by the given formula is shown as follows:

$$n = \frac{z^2 * p * q * N}{e^2 * (N-1) + z^2 * p * q}$$

Where:

z- Value of standard score at a desired confidence limit (in this case 95% i.e. 1.96)

p- Intended proportion of the population to be included in the sample (0.05 in this case)

q = 1-p (0.95 in this case)

N- Size of total population 5,417

e- Error margin (0.03 in this case)

3.8416 * 0.05 * 0.95 * 5417	=	988.472492	=	988.472492	=	195.47097
0.0009 * 5416 + 3.842 * 0.05 * 0.95		4.8744 + 0.182476		5.056876		

According to Kothari (2004), Sample size using the above formula, the sample size from the total population of 5,417 members in the frame is approximately 196. The sample size selected was as follows.

$$\begin{aligned}
 n1 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{638}{5417} = \frac{125048}{5417} = 23.08 \\
 n2 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{3754}{5417} = \frac{735784}{5417} = 135.83 \\
 n3 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{390}{5417} = \frac{76440}{5417} = 14.11 \\
 n4 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{190}{5417} = \frac{37240}{5417} = 6.87 \\
 n5 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{210}{5417} = \frac{41160}{5417} = 7.59 \\
 n6 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{160}{5417} = \frac{31360}{5417} = 5.79 \\
 n7 &= \frac{nxN1}{N} = \frac{196}{5417} * \frac{75}{5417} = \frac{14700}{5417} = 2.71
 \end{aligned}$$

Total = 196

No	Type of Vehicle	Total Driver population in in both cities	Proportionate to population size
1	Taxi	638	23
2	Three wheeler	3754	136
3	Motorbike	390	14
4	cars	190	7
5	Medium Trucks	210	7
6	Heavy trucks	160	6
7	buses	75	3
Total		5417	196

Source: Kombolcha, Dessie city Administration Transport office, 2023

Table 3.1 Drivers number and proportion to population size.

Furthermore, key informants from city council and cabinet members was selected using purposive sampling technique. This instrument is vital to collect data that can't be obtained using questionnaire. Moreover, it provides a chance to respondents in order to express their views. In order to obtain information about effects of poor quality roads, ten key informants were selected from each city purposively. Ten from Dessie and ten from Kombolcha in total 20 were selected for in depth interview. Primary data was gathered from citizens of the sub-city, individuals working in the sub city and city administration, line government offices and other different administrative organs of the cities. Questionnaire, key informant interview and document review were method of data collections.

### **3.4 Research Instrument**

The research instrument which was used were questionnaire and in depth interview guideline. Questionnaire was used to gather data from taxi drivers, three-wheelers and motorized vehicle drives and office workers. In depth interview was for the engineers, city administration decision makers and experts within the government offices of the city administrations.

### **3.5 Method of Data Analysis**

Data was analyzed on both quantitative and qualitative methods to answer research question and attain the research objective. Data collected using questionnaires was coded, entered, clean and analyzed by using Statistical Package for Social Science (**IBM SPSS Statistical version 22**). The collected data was presented used descriptive statistical analysis such as frequency and percentage was used to analysis various characteristics of respondent. In this study, questionnaire was employed as the primary tool for collecting data from vehicle drivers. The questionnaire contained many close ended and some open ended items. Likert scale was applied in the construction of questionnaires Excellent (5), Very good (4), good (3), Poor (2) and very poor (1).Such type of questionnaire was selected on the fact that it provides a great uniformity of responses.

On the other hand data gathered from interview and was first categorized thematically, written in to narrative and then it was followed by analysis and interpretation. Moreover, comparisons of facts and views was made in order to make the findings more reliable and complete.

### **3.6 Unit of Analysis**

The unit of analysis is the quality of the road infrastructure of Dessie and Kombolcha cities. It is what the researcher is interested in analyzing.

### 3.7 Dependent and Independent Variables

#### 3.7.1 The Independent Variable

The independent variables is the quality of the road infrastructure.

#### 3.7.2 The Dependent Variable

The dependent variable is the functional performance of the road infrastructure which depends on the quality of the road infrastructure.

### 3.8 Reliability and Validity

Reliability check is the extent to which the dimension of a construct is uniform or trustworthy. A number of methods are there to calculate reliability one of which is used in this research is internal consistency reliability. It is a measure of consistency among unlike items of the same construct. Reliability can be estimated in terms of cronbach's alpha Bhattacharjee (2012) and George and Mallery (2003), states that a reliability score of greater than 0.9 is excellent, greater than 0.8 is good, greater than 0.7 is acceptable, greater than 0.6 is questionable, greater than 0.5 is poor and less than 0.5 is unacceptable. In this research Cronbach's alpha model was used and the reliability was found to be 0.936 which is excellent level according to a principle set by (George and Mallery 2003). Table below depict reliability of the survey questionnaires using cronbach's alpha.

Independent and dependent variable	Cronbach's Alpha	Number of Items	Level as to George and Mallery
Functional Performance of road infrastructure	0.936	12	Excellent
Challenges of quality road construction	0.837	15	Good
Over all reliability	0.97	27	Excellent

Source: survey questionnaire, 2023

*Table 3.2: Reliability of Survey Questionnaire*

#### 3.8.1 Content Validity

Content validity determines whether the measuring instrument truly measures what it was intended to measure or how truthful the research results are. There are three dimensions of functional performance of the road infrastructure. These are effectiveness, reliability and cost. Scale

measuring the performance contain questions regarding effectiveness, reliability and cost. Data triangulation and analysis triangulation was used to measure the validity of the research findings.

### **3.8.2 Construct Validity**

It is the extent to which a measurement tool is truly assessing what it has been designed to assess. In this research convergent construct validity testing method was used. Quality and performance were used to measure road infrastructure service delivery. The higher the quality the higher the functional performance of the road infrastructure.

### **3.9 Ethical and Confidentiality**

The researcher informed the participants about the aim of the study and they participated based on their own willingness. Privacy and confidentiality was maintained. Data collected in the research will not be used for any other purpose. In the beginning all legal permissions were secured, as per the work plan and schedule procedures were followed by effectively undertaking the research process.

## Chapter 4

### Results and Discussion

#### 4.1 Data Presentation, Analysis and Results

In this chapter of the study, the data collected from Dessie and Kombolcha cities through open and closed ended questions were analyzed. The main purpose of the study was to find out the effect of quality on the functional performance of the road infrastructure of Dessie and Kombolcha cities. To achieve the objective of the research 196 sample respondents, of drivers, engineers and decision makers were selected using Kothari's (2004) sample size determination formula.

Questionnaire	Respondents	Percentage
Returned	195	99.49
Not returned	1	0.51
Total distributed	196	100

**Source:** Survey Questionnaire, 2023

*Table 4.1: Respondents reply in number*

As shown in table 4 above, Out of 196 questionnaire that were distributed 195 (99.49 %) returned and 1(0.51%) of questionnaires was not returned. The return rate indicates that there was a high response rate from the respondents.

##### 4.1.1. Demographic characteristics of respondents

The data in table 4.2 below shows sex, age, marital status, and occupation and education level of respondents of Dessie and Kombolcha.

<b>Sex of respondent</b>	Frequency (N=195)	Percent (%)
Male	151	77.44
Female	44	22.56
<b>Age of respondents</b>	Frequency	Percent
20 and under	3	1.54
21-30	100	51.28
31-40	71	36.41
41-50	20	10.26

Above 50	1	0.51
<b>Marital status</b>	Frequency	Percent
Unmarried	73	37.45
Married	114	58.46
Divorced	8	4.1
Widow/er	-	-
Separated	-	-
<b>Educational status</b>	Frequency	Percent
Primary 1-8	5	2.56
Secondary 9-12	83	42.56
Diploma	28	14.36
Degree, Master and above	79	40.51

<b>Occupational background</b>	Frequency (N=195)	Percent (%)
Government employee	71	36.41
Private employee	115	58.97
Merchant	1	0.51
NGO	-	-
No occupation	7	3.59
Pension	1	0.51

**Source:** Survey Questionnaire, 2023

*Table 4. 2: Demographic Character of the respondents*

The data in table 4.2 above indicates that 151 (77.44%) were male and 44(22.46%) were female. The majority of the respondents were male. This was because most of the drivers and office workers are men.

Regarding the age composition of respondents, the majority (51.28%) were in the age group between 21 to 30, while 36.41% were in the age of 31to 40, followed by 41-50 years old (10.26%) and below 20 years old was 1.54%. Above 51years old was 0.51%. The result indicates that the majority (51.28%) of respondents were in age group 21 to 30 years old,

As shown in table 4.2 above, the majority (58.46 %) of the respondents are married. The rest 37.45% are unmarried, 4.1% are divorced. The result shows that most of the respondents were married men and women.

As indicated in table 4.2 above, the educational statuses of the respondents range from beginner to higher education. The majority, 42.56% of the respondents are from grade 9 to 12. About 40.51% have degree, master and above levels of education. 14.36% hold diploma while 2.56 % of the respondents have primary (1-8 grade) schooling. This shows that more than 45.12% of the respondents have education status below diploma and 54.87% have diploma, degree, master and above levels of education.

As indicated in the above table 4.2 occupational backgrounds of the respondent, 115 (58.97%) are private employee, 71(36.41%) government employee, 7 (3.59%) have no occupation, 1 (0.51%) merchant, 1 (0.51%) pension. As the result indicates, majority of respondent are private employees followed by government employee.

#### **4.1.2 The Current Condition of the Road Infrastructure on the Ground**

The current condition of the road infrastructure on the ground at Dessie and Kombolcha in table 4.5 below show that there are asphalt roads, Cobblestone roads, gravel roads, and earthen roads administered by the city administrations at these cities. As per table 4.3 concerning the existing condition of roads 95.89 % of the respondents believe that there are roads projects that has design or quality problem. 95.38% of the respondents implied that there are road infrastructures that are difficult for ambulance, fire truck and police forces to cross due to quality problem in your cities. 95.38 % of the respondents pointed out that there are road infrastructure that has failed and difficult to drive on it. 76.92% of the respondents pointed out that there are road infrastructure that has caused car accident due to its poor quality. 91.28 % of the respondents revealed that there is public grievance on the mal-performance of the road infrastructure. 81.03% of the respondents showed that there is no any identified responsible body for poor performance of the road infrastructure that was subject to accountability. Moreover, 93.85% of the respondents pointed out that there was no measure taken fair and educative for other persons not to commit the same mistake. Data also show that there were car accidents frequently occurring in the cities due to poor design and maintenance of the road infrastructure. There were overturning and crushing accidents of vehicles at Piazza

asphalt, Wollo University Junction, from Municipality to Institute and from Institute to Boubuawula segments of the road at Dessie and in front of Mintiwab Hall, Road Authority in Kombolcha as per table 4.4 below.

<b>Is there any road project that has design or quality problem in your city</b>	Frequency (N=195)	Percent (%)
Yes	187	95.89
No	8	4.1
<b>Is there any road infrastructure that is difficult for ambulance, fire truck and police forces to cross due to quality problem in your city</b>	Frequency	Percent
Yes	186	95.38
No	9	4.62
<b>Is there a road infrastructure that has failed and difficult to drive on it?</b>	Frequency	Percent
Yes	186	95.38
No	9	4.62
<b>Is there any road infrastructure that has caused car accident due to its poor quality?</b>	Frequency	Percent
Yes	150	76.92
No	45	23.08
<b>Is there any public grievance on the mal-performance of the road infrastructure?</b>	Frequency	Percent
Yes	178	91.28
No	17	8.72
<b>Is there any identified responsible body for poor performance of the road infrastructure that was subject to accountability?</b>	Frequency(N=195)	Percent
Yes	37	18.97
No	158	81.03

<b>Is the measure taken fair and educative for other persons not to commit the same mistake</b>	Frequency(N=195)	Percent (%)
No	183	93.85
Yes	12	6.15
<b>Source:</b> Survey Questionnaire, 2023		

Table 4.3: Data for Current Condition of Roads in Dessie and Kombolcha

Year	Type of car accident incidence	The road infrastructure that caused the incidence	Causality on human life	Causality on property
2023	Vehicle overturning	Wollo University Junction	3 injured People	Pole damaged
2022	Crush with each other	Piazza Asphalt	1 Dead	2 vehicles damaged
2022	Crush with each other	Municipality to Institute	-	2 cars damaged
2021	Overturning	Institute to Boumbuawuha	1 person injured	1 car damaged
2020	Passerby with vehicle	Mintiwab Hall road Kombolcha	1 Dead	1 car damage
<b>Source:</b> Survey Questionnaire, 2023				

Table 4.4 : Car Accidents due to Poor Road Condition

#### Recently Build Roads in Dessie and Kombolcha

City	Road Type	Year of Construction	Road Length	Condition
Dessie	Asphalt	2018 - 2022	1.2	Good
	Cobblestone	2018 - 2022	2.8	Moderately fair
	Gravel	2018 - 2022	2.5	Poor
Kombolcha	Asphalt	2018 - 2022	2.1	Good
	Cobblestone	2018 - 2022	3.5	Fair
	Gravel	2018 - 2022	2.6	Poor
<b>Source:</b> Asset Management Plan 2018 - 2022, Dessie and Kombolcha City Administration				

Table 4.5: Recently Build Roads in Dessie and Kombolcha

## 4.2 The effect of quality on the functional performance of the road infrastructure

The descriptive data in this section was collected from survey questionnaire. The descriptive statistics was organized on the key point of the research question “The effect of quality on the functional performance of the road infrastructure.” The data in this section are summarized from Likert like scale of 5 points. The scale points were designed to observe the performance of the road infrastructure from three key parameters namely effectiveness, reliability and cost. The results are shown in table below (from table 4- 6 below). Concerning the rating of the design of the public road infrastructure to suit the local condition and available resource, 54.36 % of the respondents replied very good, 26.67 % of the respondents pointed out it as good, 12.82% of the respondents marked it as poor and 6.15% of the respondents marked it as very poor. The result indicates that more than 81.03% of respondents pointed out that the design of the public road infrastructure to suit the local condition and available resource is good.

Concerning the rating of the ride-ability of the surface of the road infrastructure 1.54 % of the respondents replied excellent, 35.38 % of the respondents replied very good, 44.62 % of the respondents pointed out it as good, 14.36 % of the respondents marked it as poor and 4.1 % of the respondents marked it as very poor. The result indicates that more than 81.54% of respondents pointed out that the ride-ability of the surface of the road infrastructure is good

No	Variables of explanation rated out of 5	NO OF RESPOND	5 Excellent (%)	4 Very Good (%)	3 Good (%)	2 poor (%)	1 Very Poor (%)	TOTAL%
1	Design of the public road infrastructure to suit the local condition and available resource	(N=195)	0	54.36	26.67	12.82	6.15	100
2	The ride-ability of the surface of the road infrastructure	(N=195)	1.54	35.38	44.62	14.36	4.1	100
3	The roughness of the surface of the road infrastructure	(N=195)	3.59	33.85	34.87	22.05	5.64	100
4	Level of satisfaction on the performance of public road infrastructure against the expected service planned to be provided	(N=195)	3.59	24.1	47.18	21.54	3.59	100

5	effectiveness of the road infrastructure provided in fulfilling the demand by the community	(N=195)	0.51	23.59	48.72	20.51	6.15	100
6	the performance of the road infrastructure	(N=195)	1.03	28.21	43.07	24.10	3.59	100
7	durability of the road infrastructure as per the planned year of service life	(N=195)	2.05	24.62	45.13	24.1	4.62	100
8	Level of satisfaction on the suitability of the road project to the environment that it doesn't cause any adverse effect on the environment	(N=195)	1.54	24.1	50.77	21.03	2.56	100
9	The balance between the cost incurred and the road infrastructure constructed (value for money)	(N=195)	1.54	29.74	39.49	23.08	6.15	100
10	Capacity and delivery of services provided by the road infrastructure	(N=195)	1.03	29.23	44.1	22.56	3.59	100
11	The quality of services delivered by the road infrastructure	(N=195)	2.05	23.08	45.12	25.12	4.63	100
12	The extent to which the community exercise their right to question about the maintenance of the roads	(N=195)	2.56	25.64	44.10	23.08	4.62	100
<b>Source:</b> Survey Questionnaire, 2023								

*Table 4.6: Likert scale of Performance of the road infrastructure.*

Concerning the roughness of the surface of the road infrastructure 3.59 % of the respondents replied excellent, 33.85% of the respondents replied very good, 34.87% of the respondents pointed out it as good, 22.05% of the respondents marked it as poor and 5.64% of the respondents marked it as very poor. The result indicates that more than 72.31% of respondents pointed out that the roughness of the surface of the road infrastructure is good.

Regarding Level of satisfaction on the performance of public road infrastructure against the expected service planned to be provided 3.59 % of the respondents replied excellent, 24.1% of the respondents replied very good, 47.18% of the respondents pointed out it as good, 21.54% of the respondents marked it as poor and 3.59% of the respondents marked it as very poor. The result indicates that more than 74.87% of respondents pointed out that Level of satisfaction on the

performance of public road infrastructure against the expected service planned to be provided is good.

Regarding effectiveness of the road infrastructure provided in fulfilling the demand by the community 0.51% of the respondents replied excellent, 23.59% of the respondents replied very good, 48.72% of the respondents pointed out it as good, 20.51% of the respondents marked it as poor and 6.15% of the respondents marked it as very poor. The result indicates that more than 72.82% of respondents pointed out that effectiveness of the road infrastructure provided in fulfilling the demand by the community is good.

Regarding the performance of the road infrastructure 1.03% of the respondents replied excellent, 28.21% of the respondents replied very good, 43.07% of the respondents pointed out it as good, 24.10% of the respondents marked it as poor and 3.59% of the respondents marked it as very poor. The result indicates that more than 72.31% of respondents pointed out that the performance of the road infrastructure is good.

Concerning the durability of the road infrastructure as per the planned year of service life 2.05% of the respondents replied excellent, 24.62% of the respondents replied very good, 45.13% of the respondents pointed out it as good, 24.1% of the respondents marked it as poor and 4.62% of the respondents marked it as very poor. The result indicates that more than 71.8% of respondents pointed out that the durability of the road infrastructure as per the planned year of service life is good.

Concerning the Level of satisfaction on the suitability of the road project to the environment that it doesn't cause any adverse effect on the environment 1.54% of the respondents replied excellent, 24.1% of the respondents replied very good, 50.77% of the respondents pointed out it as good, 21.03% of the respondents marked it as poor and 2.56% of the respondents marked it as very poor. The result indicates that more than 76.41% of respondents pointed out that the Level of satisfaction on the suitability of the road project to the environment that it doesn't cause any adverse effect on the environment is good.

Concerning the balance between the cost incurred and the road infrastructure constructed (value for money) 1.54% of the respondents replied excellent, 29.74% of the respondents replied very good, 39.49% of the respondents pointed out it as good, 23.08% of the respondents marked it as

poor and 6.15% of the respondents marked it as very poor. The result indicates that more than 70.77% of respondents pointed out that the balance between the cost incurred and the road infrastructure constructed (value for money) is good.

Concerning the capacity and delivery of services provided by the road infrastructure 1.03% of the respondents replied excellent, 29.23% of the respondents replied very good, 44.1% of the respondents pointed out it as good, 22.56% of the respondents marked it as poor and 3.59% of the respondents marked it as very poor. The result indicates that more than 74.36% of respondents pointed out that the capacity and delivery of services provided by the road infrastructure is good.

Concerning the quality of services delivered by the road infrastructure 2.05% of the respondents replied excellent, 23.08% of the respondents replied very good, 45.12% of the respondents pointed out it as good, 25.12% of the respondents marked it as poor and 4.63% of the respondents marked it as very poor. The result indicates that more than 70.25% of respondents pointed out that the quality of services delivered by the road infrastructure is good.

Regarding the extent to which the community exercise their right to question about the maintenance of the roads 2.56% of the respondents replied excellent, 25.64% of the respondents replied very good, 44.10% of the respondents pointed out it as good, 23.08% of the respondents marked it as poor and 4.62% of the respondents marked it as very poor. The result indicates that more than 72.3% of respondents pointed out that the extent to which the community exercise their right to question about the maintenance of the roads is good. Although the quality of infrastructure obtained from the research data is good, when it is triangulated to international standard the result is satisfactory which is a little higher than poor.

### **4.3 Challenges in Construction of Quality Road Infrastructure**

The descriptive data in this section was collected from survey questionnaire. The descriptive statistics was organized on the key point of the research question “Challenges in Construction of Quality Road Infrastructure.” The data in this section are summarized from Likert like scale of 5 points. The scale points were designed to observe the Challenges in Construction of Quality Road Infrastructure from key parameters namely heavy traffic load, quality of construction material, nature of the subgrade soil, thickness of road layers, environmental effect, poor drainage, workmanship, technology used in construction, poor mix design, and flaws in specification. The results are shown in table below (from table 4- 7 below).

No	Variables of explanation rated out of 5	NO OF RESPOND	5 Strongly agree (%)	4 Agree (%)	3 Neutral (%)	2 Disagree (%)	1 Strongly Disagree (%)	TOTAL%
1	Heavy traffic is a challenge for quality of road infrastructure.	(N=195)	17.45	74.86	7.18	0	0.51	100
2	Low quality material is a challenge for quality of road infrastructure.	(N=195)	28.72	49.74	20.0	1.54	0.0	100
3	Environmental variation is a challenge for quality of road infrastructure.	(N=195)	25.64	53.84	18.46	1.03	1.03	100
4	Expansive subgrade soil is a challenge for quality of road infrastructure.	(N=195)	27.18	51.28	21.03	0.51	0	100
5	Poor side drainage is a challenge for quality of road infrastructure.	(N=195)	28.72	47.18	23.59	0.51	0	100
6	Thickness of sub grade material is a challenge for quality of road infrastructure.	(N=195)	17.96	51.79	27.69	2.56	0	100
7	Thickness of sub base material is a challenge for quality of road infrastructure.	(N=195)	12.82	56.41	28.72	2.05	0	100
8	Thickness of base course material is a challenge for quality of road infrastructure	(N=195)	15.89	54.36	28.72	1.03	0	100
9	Workmanship and technology are challenges for quality of road infrastructure.	(N=195)	19.49	47.18	30.77	2.56	0	100
10	Method of construction is a challenge for quality of road infrastructure.	(N=195)	15.38	52.31	28.72	3.59	0	100
11	Poor Mix design is a challenge for quality of road infrastructure.	(N=195)	16.93	47.18	33.33	2.56	0	100
12	Flaws in specification is a challenge for quality of road infrastructure.	(N=195)	15.38	51.28	30.77	2.06	0.51	100
13	Use of inexperienced site staff is a challenge for quality of road infrastructure.	(N=195)	16.92	48.72	32.31	2.05	0	100
14	Implementation of quality assurance is a challenge for quality of road infrastructure.	(N=195)	12.32	51.28	30.77	3.58	2.05	100
15	Use of Good labour supervision is a challenge for quality of road infrastructure.	(N=195)	13.85	38.97	37.95	6.15	3.08	100

**Source:** Survey Questionnaire, 2023

*Table 4.7: Likert scale of Challenges in Construction of Quality Road Infrastructure.*

Regarding heavy traffic is a challenge for quality of road infrastructure 17.45% of the respondents strongly agree, 74.86% of the respondents agree to this idea, 7.18% of the respondents remained neutral, 0% of the respondents disagree and 0.51% of the respondents strongly disagree. The result indicates that more than 92.31% of respondents agree that heavy traffic is a challenge for quality of road infrastructure.

Regarding the idea that low quality material is a challenge for quality of road infrastructure 28.72% of the respondents strongly agree, 49.74% of the respondents agree to this idea, 20.0% of the respondents remained neutral, 1.54% of the respondents disagree The result indicates that more than 78.46% of respondents agree that Low quality material is a challenge for quality of road infrastructure.

Regarding environmental variation is a challenge for quality of road infrastructure. 25.64% of the respondents strongly agree, 53.84% of the respondents agree to this idea, 18.46% of the respondents remained neutral, 1.03% of the respondents disagree and 1.03% of the respondents strongly disagree. The result indicates that more than 79.48% of respondents agree that environmental variation is a challenge for quality of road infrastructure.

Regarding the idea that expansive subgrade soil is a challenge for quality of road infrastructure. 27.18% of the respondents strongly agree, 51.28% of the respondents agree to this idea, 21.03% of the respondents remained neutral, 0.51% of the respondents disagree. The result indicates that more than 78.46% of respondents agree that expansive subgrade soil is a challenge for quality of road infrastructure.

Concerning the idea that Poor side drainage is a challenge for quality of road infrastructure, 28.72% of the respondents strongly agree, 47.18% of the respondents agree to this idea, 23.59% of the respondents remained neutral, 0.51% of the respondents disagree. The result indicates that more than 75.9% of respondents agree that Poor side drainage is a challenge for quality of road infrastructure.

Concerning the idea that thickness of sub grade material is a challenge for quality of road infrastructure, 51.79% of the respondents strongly agree, 47.18% of the respondents agree to this idea, 27.69% of the respondents remained neutral, 2.56% of the respondents disagree. The result

indicates that more than 69.75% of respondents agree that thickness of sub grade material is a challenge for quality of road infrastructure.

Concerning the idea that thickness of sub base material is a challenge for quality of road infrastructure, 17.96% of the respondents strongly agree, 51.79% of the respondents agree to this idea, 27.69% of the respondents remained neutral, 2.56% of the respondents disagree. The result indicates that more than 69.23% of respondents agree that thickness of sub base material is a challenge for quality of road infrastructure.

Concerning the idea that thickness of base course material is a challenge for quality of road infrastructure, 15.89% of the respondents strongly agree, 54.36% of the respondents agree to this idea, 28.72% of the respondents remained neutral, 1.03% of the respondents disagree. The result indicates that more than 70.25% of respondents agree that thickness of base course material is a challenge for quality of road infrastructure.

Regarding the idea that workmanship and technology are challenges for quality of road infrastructure, 19.49% of the respondents strongly agree, 47.18% of the respondents agree to this idea, 30.77% of the respondents remained neutral, 2.56% of the respondents disagree. The result indicates that more than 66.67% of respondents agree that workmanship and technology are challenges for quality of road infrastructure.

Regarding the idea that method of construction is a challenge for quality of road infrastructure, 15.38% of the respondents strongly agree, 52.31% of the respondents agree to this idea, 28.72% of the respondents remained neutral, 3.59% of the respondents disagree. The result indicates that more than 67.69% of respondents agree that method of construction is a challenge for quality of road infrastructure.

Concerning the idea that Poor Mix design is a challenge for quality of road infrastructure, 16.93% of the respondents strongly agree, 47.18% of the respondents agree to this idea, 33.33% of the respondents remained neutral, 2.56% of the respondents disagree. The result indicates that more than 64.11% of respondents agree that Poor Mix design is a challenge for quality of road infrastructure.

Concerning the idea that flaws in specification is a challenge for quality of road infrastructure, 15.38% of the respondents strongly agree, 51.28% of the respondents agree to this idea, 30.77%

of the respondents remained neutral, 2.06% of the respondents disagree and 0.51% of the respondents strongly disagree to this idea. The result indicates that more than 66.66% of respondents agree that flaws in specification is a challenge for quality of road infrastructure.

Regarding the idea that Use of inexperienced site staff is a challenge for quality of road infrastructure, 16.92% of the respondents strongly agree, 48.72% of the respondents agree to this idea, 32.31% of the respondents remained neutral, 2.05% of the respondents disagree. The result indicates that more than 65.64% of respondents agree that Use of inexperienced site staff is a challenge for quality of road infrastructure.

Concerning the idea that implementation of quality assurance is a challenge for quality of road infrastructure, 15.38% of the respondents strongly agree, 51.28% of the respondents agree to this idea, 30.77% of the respondents remained neutral, 2.06% of the respondents disagree and 0.51% of the respondents strongly disagree to this idea. The result indicates that more than 63.6% of respondents agree that implementation of quality assurance is a challenge for quality of road infrastructure.

Concerning the idea that use of Good labour supervision is a challenge for quality of road infrastructure. 13.85% of the respondents strongly agree, 38.97% of the respondents agree to this idea, 37.95% of the respondents remained neutral, 6.15% of the respondents disagree and 3.08% of the respondents strongly disagree to this idea. The result indicates that more than 52.82% of respondents agree that use of Good labour supervision is a challenge for quality of road infrastructure.

## Chapter Five

### Conclusion and Recommendations

#### 5.1 Summary of Findings

##### 5.1.1 Current Situation

The road infrastructures at Dessie and Kombolcha cities currently are mainly asphalt roads, cobblestone roads, gravel roads. The quality of these roads is not too bad. As per the data collected from the respondents, these roads satisfy the dwellers of the cities about 74.23 %.

Concerning the existing condition of roads, there are roads projects that have design or quality problem. Moreover, there are road infrastructures that are difficult for ambulance, fire truck and police forces to cross due to quality problem in the cities. There are road infrastructure that had failed and difficult to drive on it. Due to undulations, there are road infrastructure that has caused car accident due to its poor quality. The quality problems of these roads are accompanied by public grievance on the mal-performance of the road infrastructure. In addition to these, there was no any identified responsible body for poor performance of the road infrastructure that was subject to accountability. And no fair and educative measures were taken for other persons not to commit the same mistake. These are indicators for poor governance which eventually result in political instability of the cities. Data also show that there were car accidents frequently occurring in the cities due to poor design and maintenance of the road infrastructure. There were overturning and crushing accidents of vehicles at both cities.

##### 5.1.2 Effect of Quality on Functional Performance of the Road Infrastructure

The effect of quality on the Functional Performance of the Road Infrastructure of Dessie and Kombolcha cities were viewed from the three main parameters of road performance, namely, Effectiveness, reliability and cost.

**Effectiveness:** this is to what extent the road infrastructures meet or satisfy the need of quality road of the dwellers. The ride-ability of the surface of the road infrastructure, the roughness of the surface of the road infrastructure, level of satisfaction on the performance of public road infrastructure against the expected service planned to be provided, effectiveness of the road infrastructure provided in fulfilling the demand by the community, durability of the road infrastructure as per the planned year of service life, Level of satisfaction on the suitability of the road infrastructure to the environment that it doesn't cause any

adverse effect on the environment, the quality of services delivered by the road infrastructure are all the measures of the effectiveness of the road infrastructure. The results of these parameters are 81.54%, 81.03, 72.31, 74.87, 72.82, 72.31, 71.8, 76.41, 70.77, 74.36, 70.25 and 72.3. The total of these comes to be 890.77 and the average is 74.23. It is, therefore, the road infrastructure of Dessie and Kombolcha are 74.23 % effective. In the western world, the pavement serviceability index (PSI) is measured out of 5. The New roads have PSI close to 5. When the roads deteriorate, the PSI comes down. When the PSI reaches 2.7, roads stop functioning and go for serviceability (AASHTO 2014). When 74.23% satisfaction of Dessie and Kombolcha roads is converted to 5 point scale, it comes to be 3.7 which is in acceptable range.

**Reliability:** is the ability of the road infrastructures to give effective and efficient service after maintenance. As per the city administration data, maintenance is carried out based on the asset management plan (AMP) of the cities and for road conditions which are moderately damaged. Roads of urgent need are prioritized for maintenance every year.

**Cost:** The cost of construction of the roads is compared against the quality the roads have and the service these roads are providing. The balance between the cost incurred and the road infrastructure constructed (value for money) was found to be 70.77% acceptable. As the cost of construction materials is unpredictable in the market currently, this figure is more about the road infrastructures constructed in the past.

### **5.1.3 Challenges in Construction of Quality Road Infrastructure**

The research data show the challenges of construction of quality road infrastructure were: heavy traffic load, quality of construction material, nature of the subgrade soil, thickness of road layers, environmental effect, poor drainage, workmanship, and technology used in construction, poor mix design, use of inexperienced site staff and flaws in specification. The main challenges from this research were heavy traffic load (92.31%) followed by environmental condition (79.48%) and quality of construction material (78.46%) and expansive subgrade soil (78.46%).

## **5.2 Conclusion**

1. Currently, there are mainly asphalt roads, gravel roads and cobblestone road infrastructures in Dessie and Kombolcha. These roads have quality problems. The quality of these roads is satisfactory. Quality of road infrastructure has a direct relationship with the functional performance of the road infrastructure.

2. The effects of quality of these roads on the functional performance of the roads is found to be satisfactory. The functional performance of the roads is 74.24%. When triangulated to the international standard of measuring the pavement serviceability Index, the roads of Dessie and Kombolcha fall to be 3.7 out of 5. The better the quality of the road infrastructure, the better is the functional performance of the road infrastructure.

3. Heavy traffic load, quality of construction material, nature of the subgrade soil, thickness of road layers, environmental effect, poor drainage, workmanship, technology used in construction, poor mix design, use of inexperienced site staff and flaws in specification are the challenges in construction of quality road infrastructure.

### **5.3 Recommendations**

- Road Infrastructure asset inventory should be carried out with pavement condition survey of each segment.
- The accountable body for the poor performance of the road infrastructure should be identified and questioned.
- Timely maintenance of road infrastructure needs due attention since most roads infrastructure of Dessie and Kombolcha have quality problems.
- Strict follow up and putting in to effect of quality controlling means and measures is compulsory to get quality road infrastructure
- Laboratory test for materials ahead of using them in road construction

## References

1. American Association of State Highway and Transportation Officials (AASHTO), 2014
2. Africa's roads are badly built, and there aren't enough  
(<https://www.theconversation.com>, Accessed on 6 March, 2023)
3. Amin, Ash and Nigel Thrift (2017). *Seeing like a city*, John Wiley & Sons.
4. Amin, Ash (2014). "Lively infrastructure." *Theory, Culture & Society* 31(7-8): 137-161.
5. Anand, Nikhil (2012). "Municipal disconnect: on abject water and its urban infrastructures." *Ethnography* 13(4): 487-509.
6. Asnake Abate, *Assessment of Road Pavement Failure along Addis Ababa-Modjo Trunk Road*, 2015
7. Banerjee, Sudeshna, Quentin Wodon, Amadou Diallo, Taras Pushak, Elal Uddin, Clarence Tsimpo and Vivien Foster (2008). "Access, affordability, and alternatives: Modern infrastructure services in Africa."
8. Bhattacharjee A, *Social science research: principles, methods, and practices*, (2012). University of south Florida: scholar commons.475–489
9. Boyer, M Christine (1986). *Dreaming the rational city: The myth of American city planning*, Mit Press.
10. *Challenges of Quality Infrastructure Reform*, [www.worldbank.org](http://www.worldbank.org), 6 March, 2023
11. Cirolia, L., Rode, P. 2019: *Urban Infrastructure & Development*
12. Clarke, George and Scott Wallsten (2002). "Universal (ly bad) Service: Providing infrastructure services to rural and poor urban consumers."
13. Collier, P. (2016). *African Urbanization: An Analytic Policy Guide* International Growth Centre (IGC).
14. *Countries in Africa with the highest quality of roads in 2019*, Statista Research Department, 2023
15. Coutard, Olivier (2002). "'Premium network spaces': a comment." *International journal of urban and regional research* 26(1): 166-174.
16. Coutard, Oliver and Jonathan Rutherford (2015). *Beyond the Networked City: Infrastructure Reconfigurations and Urban Change in the North and South*, Taylor & Francis

17. C.R. Kothari, *Research Methodology, Methods and Techniques*, New Age International (P) Ltd., Publishers, 2004
18. Daniel F. Runde, January, 2017, *Quality Infrastructure: Ensuring Sustainable Economic Growth*, Center for Strategic and international Studies (CSIS), Project on Prosperity and Development
19. Desalegn Ambaw and Solomon Niguse, *Infrastructure inequities and its effect on poverty reduction across regional states in Ethiopia*, *Journal of Mega Infrastructure & Sustainable Development*, 2022
20. Dessie City Administration, *Infrastructure Asset Management Plan*, 2023
21. Estache, Antonio and Marianne Fay (2009). *Current debates on infrastructure policy*. Commission on Growth and Development, the International Bank for Reconstruction and Development and the World Bank.
22. Ethiopian Road Administration, *Federal Road and Bridge Annual Book*, 2022
23. European Road Safety Observatory, *National Road Safety Profile – Netherlands*, 2021
24. European Road Safety Observatory *National Road Safety Profile – Switzerland*, 2021
25. Ferguson, James (2012). "Structures of responsibility." *Ethnography* 13(4): 558-562.
26. G.C. Enwerem and G.A. Ali, *Economic Effects of Bad Roads on Vehicle Maintenance in Nigeria*, *International Journal of Scientific and Research Publications*, June 2016
27. Graham, Stephen and Simon Marvin (2001). *Splintering urbanism: networked infrastructures, technological mobilities and the urban condition*, Routledge.
28. *Green Resilient, Inclusive Development*, The World Bank Group, 2021
29. Guy, Simon and Andrew Karvonen (2012). "Using Sociotechnical Methods." *Understanding social research: Thinking creatively about method*.
30. Hajer, Maarten A. (1995). *The politics of environmental discourse: ecological modernization and the policy process*. Wotton-under-edge, UK, Clarendon Press
31. *Infracompass Country Profile, Ethiopia*, Global Infrastructure hub, 2017
32. *Infrastructure Maintenance in the Pacific, Challenging the Build-Neglect-Rebuild*
33. Investopedia Team, February 07, 2023, *Infrastructure: Definition, Meaning and Examples*

34. Jessop, Bob (1998). The narrative of enterprise and the enterprise of narrative: place marketing and the entrepreneurial city. *The entrepreneurial city: Geographies of politics, regime and representation*. T. Hall and P. Hubbard: 77-99.
35. Kenya: Over 90% of Roads Are Not Tarmacked, Report Shows, 2018, <https://allafrica.com/>, Accessed on 6 March, 2023
36. Kombolcha City Administration, Infrastructure Asset Management Plan, 2023
37. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*. Sonderheft 50: 253- 269.
38. Larkin, Brian (2013). "The politics and poetics of infrastructure." *Annual review of anthropology* 42: 327- 343.
39. Law, John (2009). "The materials of STS." *The Oxford handbook of material culture studies*: 173-188.
40. Leo Holtz and Chris Heitzig, Figures of the week: Africa's spatial distribution of road infrastructure, *Africa in Focus*, Wednesday, March 17, 2021
41. Liza Cirolia and Philipp Rode, *Urban infrastructure and development*, 2018
42. *Macmillan Dictionary of Modern Economics* (1996)
43. Mariusz Wesolowski, *Complex Method of Airfield Pavement Condition Evaluation Based on APCI Index*, June 2022
44. McFarlane, Colin (2011). "On context." *City* 15(3-4): 375- 388
45. Mol, Annemarie (2010). "Actor-network theory: sensitive terms and enduring tensions."
46. Nathaniel Matthews, Published October 31, 2018, King's College London and Frank van Steenberg, Utrecht University
47. Nicolas de Loisy (2019), *Transportation and the Belt and Road Initiative: A Paradigm Shift*, SCMO Research, June 15, 2019
48. Nida Hussein Abid Aown<sup>1</sup> and Hala Ali Meer (2018), *New Urbanism and the City Planning (Implications of the Application of the New Urbanism Principles on the Land Uses in Al-Karkh in Baghdad City)*, Knowledge E,
49. New data shows how broken South Africa's roads are, <https://businesstech.co.za>, 2021, accessed on 06 March, 2023
50. Okechukwu Nnodim, *Nigeria losing N1 trillion annually to bad roads*, 2019 <https://punchng.com/>, Accessed 07 March, 2023

51. Paget-Seekins, Laurel and Manuel Tironi (2016). "The publicness of public transport: The changing nature of public transport in Latin American cities." *Transport Policy* 49: 176-183
52. Paradigm, Pacific Region Infrastructure Facility (PRIF), 2013.
53. Peck, J., N. Theodore and N. Brenner (2009). "Neoliberal Urbanism: Models, Moments, Mutations." *SAIS Review*.
54. Pieterse, Edgar (2011). "Grasping the unknowable: coming to grips with African urbanisms." *Social Dynamics* 37(1): 5-23
55. Quality Infrastructure, Building Trust for Trade, United Nations Industrial Development organization (UNIDO), [www.unido.org](http://www.unido.org), Accessed 07 March, 2023
56. Revi, Aromar and Cynthia Rosenzweig (2013). "The urban opportunity: Enabling transformative and sustainable development."
57. Roads, Land Transport Agency Singapore, (<https://www.lta.gov.sg>), 2022, 6 March, 2023
58. Robert Puentes, January 20, 2015, why Infrastructure matters, Rotten Roads, Bum Economy, Commentary, [www.brookings.edu](http://www.brookings.edu), accessed 06 March, 2023
59. Solving Africa's infrastructure paradox, [www.mckinsey.com](http://www.mckinsey.com), 2022, 6 March, 2023
60. South Africa Transport Department, 2023, Roads, <https://www.transport.gov.za/roads>, accessed, 06 March, 2023
61. Tawia Addo-Ashong, Maria Segui-Gomez, Veronica I. Raffo Pieter Venter, Africa Transport Policy Program Road Safety Data in Africa, 2018
62. The Importance of QI Reform and Demand Assessment, [www.worldbank.org](http://www.worldbank.org), Accessed on 6 March, 2023
63. The quality infrastructure (QI) as a flexible public-private partnership (PPP) system, [www.worldbank.org](http://www.worldbank.org), Accessed 6 March, 2023
64. Tilman Graff, Spatial Inefficiencies In Africa's Trade Network, National Bureau of Economic Research Working Paper Series, 2019
65. Transport and Infrastructure in Ethiopia, [www.worlddat.info](http://www.worlddat.info), Accessed on 6 march, 2023
66. Why Infrastructure Matters: Rotten Roads, Bum Economy, ([www.brookings.edu](http://www.brookings.edu)), Accessed on 6 March, 2023
67. World Economic Forum competitive report: Road quality index 2018 – 2019 <https://sarf.org.za/>, Accessed on 6 March, 2023

68. Worldhighways, [www.worldhighways.com](http://www.worldhighways.com), July 17, 2019, Bad roads make people poorer, Route One Publishing Limited. Accessed on 6 march, 2023
69. [www.vedantu.com](http://www.vedantu.com), 11 July, 2023, Questions and Answers
70. Nathaniel Matthews and Frank van Steenberg, Africa's roads are badly built, and there aren't enough. This can be fixed, Published: October 30, 2018 2.14pm GMT  
<https://www.theconversation.com>, 2018, accessed 06 March, 2023

## Annex 1: Questionnaire for Drivers and Office Workers



### Questionnaire

**Addis Ababa University, College of Business and Economics, School of Commerce,  
Department of Project Management**

Dear Respondents, I would like to inform you that the Purpose of this questionnaire is only for academic research in partial fulfillment of Master of Art Degree in Project Management. The title of the research is "Effects of Quality on the Performance of Infrastructure: The Case of Dessie and Kombolcha Cities". For the realization of this research your genuine response to the following questionnaires is highly appreciated and the researcher would like to confirm you that the information you provide will be kept confidential and be put in use only for academic purposes. Your answer should reflect only your perception and experience in the area of the subject. I kindly request you in responding to the questionnaires as promptly as possible. This Questionnaire is to be filled by the vehicle drivers at Dessie and Kombolcha.

Please use (√) mark

#### 1. Back ground information

1. Gender    a. Male     b. Female
2. Age        a) 20 and under     b) 21-30     c) 31- 40     d) 41- 50
- e) 51 and above
3. Marital status    a) Unmarried.     b) Married.     C) Divorced.
- d). Widower     e). Separated

4. Educational status a) Primary 1-8  b) Secondary 9-12  c) Diploma   
 d) Degree, Master and above

5. Occupational back ground of respondent. a) Government employee   
 b) Private employee  c) Merchant  d) NGO  e) No occupation   
 f) other specify -Pension

6. What are the types of public road infrastructure projects constructed in the last 5 years in your city?

Asphalt Road, Cobblestone road, Gravel Road, Earthen Road

7. Is there any road project that has design or quality problem in your city? a) Yes   
 b) no

8. If your answer to question No 7 is yes, specify the projects. Listed in the Questionnaire.

9. Is there any road infrastructure that is difficult for ambulance, fire truck and police forces to cross due to quality problem in your city? a) Yes  b) no

10. Is there a road infrastructure that has failed and difficult to drive on it? a) Yes  b) no

11. Is the any road infrastructure that has caused car accident due to its poor quality?

a) Yes  b) no

12. If your answer to question 11 is yes, specify the incidents and casualties in the table below

Year	Type of car accident incidence	The road infrastructure that caused the incidence	Causality on human life	Causality on property
2023	Vehicle overturning	Wollo University Junction	3 injured People	Pole damaged
2022	Crush with each other	Piazza Asphalt	1 Dead	2 vehicles damaged
2022	Crush with each other	Municipality to Institute	-	2 cars damaged
2021	Overturning	Institute to Boumbuawuha	1 person injured	1 car damaged
2020	Passerby with vehicle	Mintiwab Hall road Kombolcha	1 Dead	1 car damage

**Source:** Survey Questionnaire, 2023

13. Is there any public grievance on the mal-performance of the road infrastructure?

a) Yes  b) no

14. If your answer to question no 7 is yes, what measures have been taken to rectify the situation?

No measure was taken

15. Is there any identified responsible body for poor performance of the road infrastructure that was subject to accountability? A) Yes  b) no

16. What measures have been taken on the responsible body?

No measure was taken

17. Is the measure taken fair and educative for other persons not to commit the same mistake?

a) Yes  b) no

Answer the following questions by putting a  $\sqrt{\quad}$  mark on the corresponding number as follows.

5 = excellent  
 4 = very good,  
 3 = good  
 2 = poor  
 1 = very poor

No	Question	5	4	3	2	1
1	How do you rate the design of the public road infrastructure to suit the local condition and available resource?	0	106	52	25	12
2	How do you rate the ride-ability of the surface of the road infrastructure?	3	69	87	28	8
3	How do you rate the roughness of the surface of the road infrastructure?	7	66	68	43	11
4	What is your level of satisfaction on the performance of public road infrastructure against the expected service planned to be provided?	7	47	92	42	7
5	How do you rate the effectiveness of the road infrastructure provided in fulfilling the demand by the community?	1	46	95	40	12
6	How do you rate the performance of the road infrastructure?	2	55	84	47	7
7	How do you rate the durability of the road infrastructure as per the planned year of service life?	4	48	88	47	9

8	How do you rate your level of satisfaction on the suitability of the road project to the environment that it doesn't cause any adverse effect on the environment?	3	47	99	41	5
9	How do you rate the balance between the cost incurred and the road infrastructure constructed (value for money)?	3	58	77	45	12
10	How do you rate capacity and delivery of services provided by the road infrastructure?	2	57	86	44	7
11	How do you rate the quality of services delivered by the road infrastructure?	4	45	88	49	9
12	How do rate the extent to which the community exercise their right to question about the maintenance of the roads?	5	50	86	45	9

Answer the following questions by putting a  $\sqrt{\quad}$  mark on the corresponding number as follows.

- 5 = strongly agree
- 4 = agree
- 3 = neutral
- 2 = disagree
- 1 = strongly disagree

No	Question	5	4	3	2	1
1	Heavy traffic is a challenge for quality of road infrastructure.	34	146	14	0	1
2	Low quality material is a challenge for quality of road infrastructure.	56	97	39	3	0
3	Environmental variation is a challenge for quality of road infrastructure.	50	105	36	2	2
4	Expansive subgrade soil is a challenge for quality of road infrastructure.	53	100	41	1	0
5	Poor side drainage is a challenge for quality of road infrastructure.	56	92	46	1	0
6	Thickness of sub grade material is a challenge for quality of road infrastructure.	35	101	54	5	0
7	Thickness of sub base material is a challenge for quality of road infrastructure.	25	110	56	4	0
8	Thickness of base course material is a challenge for quality of road infrastructure	31	106	56	2	0
9	Workmanship and technology are challenges for quality of road infrastructure.	38	92	60	5	0
10	Method of construction is a challenge for quality of road infrastructure.	30	102	56	7	0
11	Poor Mix design is a challenge for quality of road infrastructure.	33	92	65	5	0
12	Flaws in specification is a challenge for quality of road infrastructure.	30	100	60	4	1
13	Use of inexperienced site staff is a challenge for quality of road infrastructure.	33	95	63	4	0
14	Implementation of quality assurance is a challenge for quality of road infrastructure.	24	100	60	7	4
15	Use of Good labour supervision is a challenge for quality of road infrastructure.	27	76	74	12	6

## **Annex 2: In-depth interview Questionnaire for Decision Makers**



### **Questionnaire**

**Addis Ababa University, College of Business and Economics, School of Commerce,  
Department of Project Management**

Dear Respondents, I would like to inform you that the Purpose of this interview Guideline questionnaire is only for academic research in partial fulfillment of Master of Art Degree in Project Management. The title of the research is "Effects of Quality on the Performance of Infrastructure: The Case of Dessie and Kombolcha Cities". For the realization of this research your genuine response to the following questionnaires is highly appreciated and the researcher would like to confirm you that the information you provide will be kept confidential and be put in use only for academic purposes. Your answer should reflect only your perception and experience in the area of the subject. I kindly request you in responding to the questionnaires as promptly as possible. This Questionnaire is to be filled by the decision makers and engineers at Dessie and Kombolcha.

I kindly request you to respond to the key informant interview as promptly as possible.

Thank you

1. What type of road infrastructures are there in the city?
2. How often are these roads maintained?
3. How do you feel about the cost and quality of the roads?
4. How often do people complain about the quality and service delivery of these roads?

5. Do you think that the construction cost of the roads is equivalent to service delivery of the roads?
6. Do you think that the community is satisfied with the current performance of the roads?  
To What extent?
7. Who is responsible for public grievances due to poor quality road infrastructures in the city?
8. What are the challenges to construct and supply quality road infrastructures?
9. What do you think the causes of challenges of road infrastructures in the city?
10. What are the mitigation measures for poor quality road infrastructures?

## 2. Data collected from city Administration

City	Road Type	Year of Construction	Road Length	Condition
Dessie	Asphalt	2018 - 2022	1.2	Good
	Cobblestone	2018 - 2022	2.8	Moderately fair
	Gravel	2018 - 2022	2.5	Poor
Kombolcha	Asphalt	2018 - 2022	2.1	Good
	Cobblestone	2018 - 2022	3.5	Fair
	Gravel	2018 - 2022	2.6	Poor
<b>Source:</b> Asset Management Plan 2018 - 2022, Dessie and Kombolcha City Administration				