SUSTAINABILITY OF DAR ES SALAAM COMMUTER TRAIN IN REDUCING TRAFFIC CONGESTION: THE CASE OF TANZANIA RAILWAY LIMITED (TRL).

SUSTAINABILITY OF DAR ES SALAAM COMMUTER TRAIN IN REDUCING TRAFFIC CONGESTION: A CASE OF TANZANIA RAILWAY LIMITED (TRL).

By

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A Dissertation Submitted to Mzumbe University, Dar es Salaam Business School in Partial Fulfillment of the Requirements for the Award of Master's of Science Degree in Procurement and Supply Chain Management (PSCM)

2013

CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University, a dissertation entitled the **Sustainability of Dar es Salaam Commuter Train in Reducing Traffic Congestion The Case Of Tanzania Railway Limited (TRL).**In partial fulfillment of the requirement for the award of the Masters of **Procurement and Supply Chain Management (PSCM)** of Mzumbe University.

_____

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Internal Examiner

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DECLARATION

I, Salum Mihayo, declare that this report is the product of my own effort and it has not presented to any institution of higher learning for a Masters Degree or similar award.

Signature…….

Date……

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DEDICATION

This Dissertation paper is dedicated to my lovely wife Habiba Abdallah Seba for being close to our children Rahma(5) and Yasir (2) during my studies and to my lovely mother Zuhura Salum (64)for her love and care to me. ‘‘***May Almighty God rest her soul in peace.’’*** I treasure your love and support**.**

ABBREVIATIONS

APTA	The American Public Transportation Association
BAK	Bakhresa Station/Makburi
CBD	Central Business District
DART	Dar es Salaam Rapid Transit Agency
DCT	Dar Commuter Train
DMU	Diesel Multiple Unit
DSM	Dar es Salaam
FS	Ferrovia Statale –The Italian Train system
IC	Intercity Commuter Train
JICA	Japan International Cooperation Agency
KKO	Kariakoo Station/Kamata
MAT	Matumbi Station
MBB	Mabibo Station
MNY	Manyema Station
MWN	Mwananchi Station
RDC	Rail Diesel Car
RWY	Central Railway Station
TAZARA	Tanzania and Zambia Railway Cooperation
TCRP	Transit Cooperative Research Program
TI	Tier One
TRL	Tanzania Railway Limited
UBG	Ubungo Station
VMT	Vehicle Miles Travelled

ABSTRACT

The number of passengers of Dar es Salaam Commuter Train has been decreased day to day and suspensions of services due to mechanical faults make operation to be hard. In this context, this study examined the factors that would influence good services as well as attracting more riders to commuter train to achieve sustainability in reducing traffic congestion in the city of Dar es Salaam. Since it is the only Commuter Train provider in Tanzania, the sustainability in reducing traffic congestion in the city of Dar es Salaam depends on the number of riderships or passengers and how Dar commuter train can be improved in its service. So a better understanding of train commuter travel behavior will enable the enhancement of commuter rail services to increase ridership and achieve some of the sustainability goals that government and TRL are trying to. Data from respondents in six selected Dar Commuter Train stations were used to assess the sustainability in correctly classifying service status via quality, reliability, comfort, and station facilities. Dependent variable in this study was sustainability in reducing traffic congestion and independent variables considered were quality of service, reliability of the train travel comfort, and station facilities.

Data were collected through primary and secondary data. A random sample of 200 commuters was chosen for this study on board the train and those waiting for the train were interviewed using structured questionnaires and among them 165 were finalized for final analysis This result based on the customer perception and it was found that passenger's perception on comfort (81.6%), and quality of the service 71.5% of the commuters agreed with the service offered by Dar commuter train but very poor conditions of station facilities 28% are available, 51% of commuters said the service is not reliable. All these two among four variables couldn't attract more passengers to use train. Several recommendations have been made to improve the Service of Dar commuter train so as to reduce congestion by attracting more passengers even the user of automobile to shift to this mode, includes the use of modern equipments, government intervention etc and the study shows that the train will be sustainable if some improvement must be done.

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PROBLEM SETTING

1.1 Introduction

This chapter provides background that conceptualizes the research problem. It states the research problem, research questions, the objectives of the study and significant of the study, and it ends with limitations of the study and delimitation

1.2 Background of the Study

Commuter rail is increasingly popular as a means to introduce rail transportation to metropolitan transportation systems. The long-term benefits of commuter rail include the addition of capacity to the transportation system, providing a quality commute alternative, and shifting land use toward transit-oriented development patterns. The success of a commuter rail system depends upon cultivating a ridership base upon which to expand and improve the system. Cultivating this ridership is dependent upon offering a quality transportation option to commuters. (Lownes, 2007). Many metropolitan areas world-wide are investing heavily in building or extending urban rail transit system, (IAPT, 2012) aiming to reduce road congestion and air pollution caused by the wide use of automobiles (Parry and Small, 2009).

In developed country like Japan, almost all commuters in the Tokyo metropolitan area commute to the Central Business District (CBD) by rail rather than by car. They reluctantly commute to the CBD on weekdays at peak hour. Over 60% of commuters spend over two hours and over 20% spend more than three hours commuting on weekdays on congested railways (Yamazaki, 2006). Also In South Africa, the Gautrain service was introduced to relieve the Johannesburg-Pretoria traffic corridor of congestion and offer commuters a viable transport alternative.. Independent estimates indicate the number of cars on the N1 freeway linking the two metropolises has dropped by 20 percent with 100 000 passengers using the trains daily (Sunday Mail Newspaper).

In Tanzania, Dar Commuter Train is the only commuter train service that operated by Tanzania Railway Limited (TRL) and TAZARA. It was first introduced in 2012 to cater especially to commuters in Dar es Salaam and the surrounding suburban areas and it is a popular mode of transport for commuters working in city centre as they can travel to the city without being caught in traffic congestion.

Until very recently, congestion was mainly during 'rush hours' in the mornings and evenings when people were going to work or returning home. However, today, with more than 120,000 private vehicles plying the city's roads daily, jams are even there on weekends and available statistics show that Dar es Salaam has about 6,000 commuter buses that carry only 43 per cent of the city's daily travellers. (The Citizen Newspaper).

Today, the need for an efficient and effective public transportation services is becoming more important in order to overcome problems like traffic congestion especially in Dar es Salaam. It is imperative that Commuter Train needs to become more progressive and aggressive to compete with the competitors because nowadays, customers are becoming more demanding with the quality of the services. They want "value for money" that is they expect the service quality that they received from the service providers equals or exceeds what they had paid for (Lagerstrom, 2002).

Toward improving transport sector and traffic congestion reduction in the city of Dar es Salaam. The government through Tanzania Railway Limited(TRL) and Tanzania and Zambia Railway (TAZARA), launched this commuter trains in the city in October,2012. The services provided by TRL is from City Railway Station to Ubungo Maziwa (12 km) and TAZARA commuter train is from Mwakanga to Kurasini (34.5km) in six days. Average number of passengers or commuters used by TAZARA has reached 9,000 passengers per day after rehabilitations of coaches and one engine. On the other hand the average number of passengers for TRL is 5000 passengers per day (Habari Leo, 17th May,2013).

Burdened with a rapid population growth and city expansion, Dar es Salaam's transport sector depicts a situation where the gap between public transportation needs and provision is continuously widening (Olvera *et al*., 2003).According to Census, (2012). Dar es Salaam takes 10% population of Tanzania Mainland (43,625,354million) which is 4.36 million and has 3,313 km squares comprises of the four major roads emanating from the city center; Nyerere Road, Morogoro Road, Ali Hassan Mwinyi Road and Kilwa Road, but these roads during peak hours and off peak hours seem that fully occupied by vehicles like daladala, private cars, lorries and motorcycles although there is an introduction of commuter trains in the city. The attraction of passengers is much needed to reduce the number of people who use public transport because the city buses have been the most inefficient.

Perceptions of users of public transport are important as these perceptions determine attitude toward the service. Therefore, it can be concluded that the study focuses on sustainability assessment of commuter rail in reducing traffic congestion in the city in terms of service status via quality of service, comfort, station facilities and reliability of the service.

1.3 Statement of the Problem

Transport in the city is characterized by extreme traffic congestion, rapid population growth, environmental deterioration, increased automobile ownership, high accidents rate, inefficient road space allocation, as well as an excessive and obsolete transit fleet (Olvera et al 2003; Nkurunziza et al 2012b).In response to those existing public transport challenges the government introduced Commuter Train aiming at reducing traffic congestion.

However, it has also been observed that the number of ridership (passengers) has been decreased day to day which make the operation to be hard because it was being anticipated that the railway would serve at least 16,000 passengers on the daily basis, but until January, it was only some 5,000 city dwellers that were making use of the services everyday (Citizen Newspaper).

Also frequent stopping of the services of commuter train indicates that there is a technical fault which endangers the life of the train and passengers. On Sunday 23rd, March, 2013 floods destroyed infrastructure in some parts. So City residents, using rail transport between Ubungo Maziwa and Stesheni had resorted to the usual commuter bus mode as TRL officially announced the suspension of train services for 14 days. In addition to that Commuter train stopped again for two days because of technical faults of one of its engines from 8th, July, 2013 until the engine to be repaired. Three days before that commuter train failed to operate after leaving at Kamata due to locomotive faults at 8:30pm.Therefore ,It decided to withdraw passengers and find another commuter buses (Uhuru, 9th, July 2013).

Meanwhile, according to the meeting with management, TRL workers exerted pressures on management to raise their minimum wage (The Guardian, 22nd, Aug. 2013). So Railways workers threaten to strike, that can affect the daily operations of Dar Commuter Train.

Therefore, it is the intention of the researcher to assess the sustainability of the service provided in terms of quality of service, comfort, reliability, and station facilities.

1.4 Research Objectives

1.4.1 General Research Objective

The general objective of the study is to examine the factors that would influence good services as well as attracting more riders to achieve sustainability in reducing traffic congestion in the city of Dar es Salaam.

1.4.2 Specific Objectives

i. To assess the quality and reliability of the services provided by Dar Commuter Train
ii. To understand passenger's perception of comfort provided by Dar Commuter Train
iii. To observe conditions of various stations facilities of Dar Commuter Train

1.5. Research Questions

The study was based on answering the following key research questions:

i. To what extent do quality and reliability of the services provided are perceived by commuters?
ii. To what extent do passengers perceive the comfort from the services provided?
iii. What are the current conditions of various stations of Dar Commuter Train?

1.6. Scope of the Study

The study conducted in Dar-es-salaam region, with focus only on commuter's perceptions, but specifically on the area where there are various stations in which Dar commuter train passes and commuters waiting for the train. The study was not considered management issues such as revenue, operations costs, capital costs etc. It considered the services perspective in terms of quality, reliability, comfort and conditions of various stations with facilities available in those stations. Also the study was not covered commuters of bus transport or daladala. Hence making it a true representative of the population.

1.7 Significance of the Research

The importance of this study will add to the existing literature and also provide a basis for further research because the study has both practical and academic significance. Meanwhile the researcher is convinced that there are limited scholarly works on the subject in the country, if any, although the subject matter is very important. This therefore means that the study will add knowledge and literature on the same.

This study is important for TRL, TAZARA and Dar Commuter Train specifically to improve their services especially trains services. Also, this study will benefit policymakers, community as well as the government at large. The study will explore and recommends potential areas that commuter trains need to put more efforts when delivering their services and overcoming challenges facing them so as to create enabling environment for business so as to reduce congestions.

On the other hand, having the information gathered from this study, they can look for effective ways in overcoming these problems and be more competitive in their services since the respondents for this study are Dar Commuter Train commuter themselves. From the findings of this study, the management can be made aware of the problems that they are facing everyday and the come up with proactive actions to provide better services to the customers. In return, the customers will enjoy a better quality of services in the future.

Finally, this study will be relevant in the award of my Masters degree in Procurement and Supply Chain Management from Mzumbe University, Dar es Salaam Business School.

1.8 Limitation of the Study

The following limitations encountered during the fieldwork;

(i)Inaccessibility of data or information

The researcher faced the limitation on data accessibility because some of the documents are confidential to the management to disclose them. The management officials failed to provide some information on number of passengers boarding in each months as well as revenue up to June which in fear of revealing their weaknesses.

(ii)Budget Constraints

The researcher was sponsored by employer in this study, but the fund was inadequate as per study requirements.

(iii)Time limitation

The time allocated for research work was not enough to cover all aspects in large area more than selected areas and respondents.

1.9 Delimitations

To overcome the above limitations, the researcher tried to put a statement of confidentiality in the questionnaire form and assured the respondents that information will not be exposed to the public. The researcher also met friendly with ticket seller in order to get some data and information.

Sometimes the researcher used his money in order to solve the budget constraints not from sponsor. Time factor has been solved by researcher by reaching various stations one hour before the train to pick commuters and distributed the questionnaires easily. Also the researcher chose the case of TRL only due to time and budget constraints instead of researching together with TAZARA.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed the theoretical and empirical studies as done by different authors on what have been discussed about the assessing the sustainability of commuter rail in reducing congestion. In this Chapter, available literature will be reviewed along subject matter of the research project, which are sustainability, commuter rail and traffic congestion .The review of literature, in addition, aims at providing detailed account of earlier studies in order to identify the gap that exists in the literature, which the research attempted to fill. However, a researcher found a very limited number of scholarly works written on sustainability of commuter rail in reducing traffic congestion

2.2 Conceptual Definitions

Sustainability

Sustainability is a big concept – like “justice” or “freedom” – and like these concepts, it can be easier to understand than to succinctly define.

However hundreds of definitions do exist and most share similar tenets. One oft-quoted definition states that sustainable development “meets the needs of the present without compromising the ability of future generations to meet their own needs.” (United Nations World Commission on Environment and Development (Brundtland Commission) Report – Our Common Future, 1987).

The University of Plymouth Centre for Sustainable Transport provides a widely accepted definition of a sustainable transportation system that states:

A sustainable transportation system is one that:

i. allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations;

ii. is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy;
iii. limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

According to Lund (2007) defines sustainability in four different types. First, Benefit Sustainability refers to whether or not the benefits derived through project are likely to continue once external funding has expired. Second, Organizational Sustainability means whether the organizational structures created through the project are likely to function after the project has ended.

Third, Financial Sustainability means whether finances exist to carry on project activities. Finally, Sustainability as learning considers whether the participants in the intervention have become more capable of learning and managing the structures created once external support comes to a halt. The first definition fit in this study because the researcher wants to assess sustainability in terms of service status via quality of services, travel time, comfort, reliability and station facilities.

Likewise, Transport Canada (2001) (in Jeon and Amekduzi, 2005), a Canadian government agency, has developed a competent set of sustainable transport principles and indicators based on the principles of sustainable development. Those are safety and health, access and choice, and quality of life as social sustainability indicators; efficiency, cost internalization, and affordability as economic sustainability indicators; pollution prevention and protection, and environmental stewardship as environmental sustainability indicators; and leadership and integration, precautionary a subway principle, accountability, and consultation and public participation as managerial competency indicators.

Another author Litman (1999) in conceptualizing sustainable transport as a system that is planned in such a way that it favors economic efficiency, is distributed equitably and causes no or the least environmental harm.

Commuter

According to Macmillan Dictionary, commuter means someone one who travels regularly to and from work. Another definition from the free dictionary define a commuter is one that travels regularly from one place to another, as from suburb to city and back.

Train

A train is a form of rail transport consisting of a series of vehicles propelled along a rail tracks to transport cargo or passengers. Motive power is provided by a separate locomotive or individual motors in self-propelled multiple units. Although historically steam propulsion dominated, the most common modern forms are diesel and electric locomotives, the latter supplied by overhead wires or additional rails (Wikipedia)

Commuter Train

A commuter train also known as commuter rail, is a train which connects a central business district to outlying areas. This allows people to commute into the city from suburbs and neighboring towns and cities. Often, commuter rail connects with city transit, such as or metro system, allowing the passengers to move on to their next destination easily. Many large cities have commuter rail service, which is often sponsored in part by the local or national government.

Commuter rail, also called suburban rail, is a passenger rail transport service that primarily operates between a city center, and the middle to outer suburbs beyond 15 km (10 miles) and commuter towns or other locations that draw large numbers of commuters—people who travel on a daily basis. Trains operate following a schedule, at speeds varying from 50 to 200 km/h (30 to 125 mph).

Non-English names include *Treno suburbano* in Italian, *Cercanías* in Spanish, *Rodalies* in Catalan, *Nahverkehrszug* in German, *Train de banlieue* in French, and *Příměstský vlak* in Czech (Wikipedia).

Commuter train or rail can be distinguished from other train services in several things. The first is that it is designed to accommodate very large numbers of passengers, not always entirely comfortably, because it is not designed to travel very long distances. The second is that a commuter rail runs at regularly scheduled times, unlike many metro and light rail services, which run at specific intervals. Commuter rail is also distinguished from light rail by using heavy rail trains, which can share tracks with freight trains and long distance passenger trains.

There are numerous advantages to installing a commuter rail service. The service encourages people to use public transportation, rather than driving into a city. This, in turn, reduces congestion and parking problems in the city. It is also more energy efficient, since a commuter rail train may use green energy sources. For passengers, a commuter rail is a convenient way to get into the city without having to drive, allowing them to relax, read, or work on work projects on the way in.

Characteristics of Commuter Rail

The term "commuter rail" can be used interchangeably with the term "interurban" rail. Commuter rail has unique characteristics that distinguish it from other forms of passenger rail.

Commuter rail:

i. Primarily serves passengers traveling between home and their place of work.
ii. Runs on existing track which has been upgraded for passenger service, usually shared
iii. Lines range in length, up to about 85 miles from city to terminal
iv. Stations are spaced at intervals of one mile or more and speeds can reach 60 mph between stations and in some cases, up to 79 mph.

v. Service is typically frequent during peak periods to accommodate large numbers of commuters.
vi. Trains consist of one or more cars and may be self-propelled or pushed/pulled by a diesel or electric locomotive. Commuter rail typically uses rail diesel cars (RDC's), new generation diesel multiple units (DMU's), single level locomotive hauled trains or double level locomotive hauled trains. Coaches are high capacity with limited personal space**.**

Traffic

Traffic is a general term can be used in different aspects. It can be defined as vehicles or people in the vehicles, a delay that involves transportation or movement through a designated location. According to yourdictionary traffic means vehicles or pedestrians in transit or the movement or number of automobiles along a street, pedestrians along a sidewalk, ships using a port, etc

Traffic congestion

Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, this results in some congestion. As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam or traffic snarl-up.

Congestion involves queuing, slower speeds and increased travel times, which impose costs on the economy and generate multiple impacts on urban regions and their inhabitants. Congestion also has a range of indirect impacts including the marginal environmental and resource impacts of congestion, impacts on quality of life, stress, safety as well as impacts on non-vehicular road space users such as the users of sidewalks and road frontage properties.

Meyer and Miller (2001) considered features and patterns of urban mobility to consist of work trips, shopping trips, social or recreation trips, business trips and school trips. Depending on how the city has been designed, its population, the available infrastructure, and number of cars on the roads, the situation may or may not lead to traffic serious congestion and air pollution emissions.

Congestion prevents us from moving freely and it slows and otherwise disrupts the conduct of business within urban areas. However, it is important to note that unfettered movement is not the primary benefit we derive from living in urban areas. Cities provide access to a wide range of activities, people, services, goods, markets, opportunities, ideas and networks. These benefits can be delivered either through speed or through greater proximity. Congestion may affect travel speed but in some circumstances, such as dense urban cores, congestion may both be expected and, to some degree, accepted. In these cases, cities have come to accept a degree of congestion and continue to get along relatively well as long as overall accessibility is high (ECMT, 2007).

Traffic congestion in Dar-es-Salaam is felt by everyone. It is a burden to the economy and frustrates efforts to improve the lives of the city's residents. Since Dar es Salaam is the metropolis of Tanzania accounting for more than 60% of national tax revenue of the country as a whole, congestion has a huge impact on the economy. (CEP, 2010). Until very recently, congestion was mainly during 'rush hours' in the mornings and evenings when people were going to work or returning home.

Dar Commuter Train

Dar Commuter Train is the first-ever commuter train service in Tanzania's commercial capital, Dar es Salaam, has been launched on October, 2012 to ease congestion on roads and this new city commuter train service is billed to enable Dar es Salaam residents to reach their workplaces faster. There are two tracks currently running in Dar es Salaam in which one track covers a 25km (15.5 miles) journey between Dar es Salaam's Mwakanga and Tazara railway stations and the second track runs for 20km (12.4 miles) between Ubungo-Maziwa and City railway stations.

Trains operate during the morning and evening – not in the afternoon and late at night. The service operates for six days (from Monday to Saturday) except for Sundays and holidays. TAZARA and TRL offer the service from 06.00am to 10.00am, break and then resume from 3.00pm to 8.00pm.

2.3 Theoretical Literature

One of the great challenges of the transit business is to make every rider feel welcomed. It's easy to do this if you're running a few buses in a small town; there, you have so few riders that you can greet them all by name. But the challenge of big-city transit is to give a welcoming sensation to huge masses of people at once.

Transportation Theory

Burleson, (2009) did some further examination on transportation issues in Northwest Houston and distilled with transportation theory. The inspiration for his theory came from his observation of two well-established transportation ideas:

The first is the suburban transportation hierarchy, which consists of local, collector, and arterial streets. As you move up the scale from local to arterial, the streets get bigger and faster. The idea is that the local streets provide the greatest access, the collectors balance access and speed, and arterials provide less access but high speed. The second is the Ferrovia Statale, the Italian train system.

The FS consists of three main classes of trains. Local trains make every stop along a medium-short route, Intercity trains stop only at medium/large cities along a longer route, and Eurostar trains stop only at major cities and cover very long routes. The local trains are the slowest, the IC trains are in the middle, and the Eurostar is pretty fast. Also, the locals are very cheap, IC’s mid price, and Eurostars are a little pricey. The reason for this is that there are three fundamental tiers of transportation, each with a different function, and each with a different need. The three tiers work something like this:

Tier 1

Travel is long distance travel from one economic area to another. This is not just a long trip, it specifically is a long trip from primary market to another.

For passenger travel, T1 trips are almost always related to special business or recreation trips, such as visiting family in another city or attending a major sporting event. Most freight is Tier 1, moving from a manufacturing center to various other markets where it is to be sold. A T1 trip is likely to involve at least one overnight stay, and is also likely to involve above average daily spending.

The critical indicator for a Tier One trip is SPEED. Above all else, people who are making a Tier 1 trip want to get there as fast as possible

Tier 2

Travel is medium distance travel within a single economic area. This can be a long trip. This includes the majority of business travel, especially daily commutes and business related deliveries. This does not include day to day errands and basic shopping (like grocery shopping), but it can include major shopping trips. These trips are likely to be regular events, but scheduled more flexibly than a T1 trip.

The critical indicator for a Tier Two trip is RELIABILITY. Above all else, people who are making a Tier 2 trip want to know in advance exactly how long a trip will take.

Tier 3

Trips are short trips within a certain travel-time radius of the home. These tend to be frequent, short, daily trips for things that people are less willing to ‘go out of their way’ for. Great examples are trips to the grocery store, or trips to restaurants, parks etc. These are the most frequent and most numerous of all trips. These trips are usually not made in a hurry, though they might be. These also include most social trips, people’s friend networks are usually contained within a certain travel tolerance. These are the most pervasive kind of trip: even little kids make tier three trips when they walk down the street to see a friend.

The critical indicator for a Tier Three trip is CONVENIENCE. Above all else, people making a Tier 3 trip want the trip to be easy.

Higher tiers tend to dominate lower tiers in people's decision making. In the example above, a person would be very unlikely to take a major detour from their Tier 1 trip to accomodate a Tier 2 need because their travel motivation is SPEED. Likewise, when commuting to and from work, people might take a detour that they know will take ten minutes, but they will be much less likely to take a detour if it involves driving in an unfamiliar area (risk of getting lost) or in a highly congested area (risk of getting stuck in traffic) because their primary motivation is RELIABILITY. People want to get to work (or home from work) at a certain time.

Every individual has a travel tolerance, or an amount of time that they are willing to spend in transit. This tends to be highly mode-dependent.

This theory provides a vital lens to examine our transportation policy and design. It is important for us to decide what transportation tier we are attempting to serve when we are building a road, sidewalk commuter rail line etc. From this theory two important principles came out of this theory:

Because each tier of transportation has a different critical factor, conflict between tiers sharing the same space is common**.**

The daily commute is the easiest example to consider. Every morning there are thousands of people driving around CBD and they're doing three very different things. Some are traveling through DSM on their way to another place, a Tier One trip. Many people are traveling to and from work, a Tier Two trip. Most people are running errands, just going about their daily life, a Tier Three trip. The problem is, in places where the street network is not highly connective, these entire people end up competing for the same road and freeway space, and their competing interests cause behavior that can make the congestion worse.

All three tiers must be present in a well connected network for any transportation system to function well**.**

The simplest reason why the automobile is the dominant form of transportation in this country is that it is one of the only travel modes than can operate and reach at various points across all three transportation tiers and their services is very poor. The problem with cars and buses is that they take up a lot of space and function best at low densities, the space requirements of cars (parking and freeway lanes) are increasingly costly to provide as cities get larger and larger. Our nation is now predominantly urban, and the pattern of urbanization shows no sign of reversing. As cities grow larger, population density naturally increases, and an auto-dependent transportation system is less and less effective.

The Disneyland theory of transit

Darrin Nordahl's My Kind of Transit is a book-length explanation of what could be called, in its own terms, the Disneyland theory of transit.The theory states, in its barest form, that to make people ride transit, we must provide an experience that's more like what they get at Disneyland.

Nordahl continue to say that a stronger book would have acknowledged the practical limits of aesthetic thinking and at least noted the role of efficiency in achieving sustainability outcomes through transit. An even stronger book would have explored case studies of how Nordahl's design principles could be applied in a real-world planning problem, where cost and ridership are paramount concerns. Rather than praising systems that are popular because of their rarity, he could have looked at all the ways that his values are already being implemented in affordable and efficient technologies.

Also, he added very important main points in his book and said that transit vehicles are not just transportation, they are civic space, and they must be designed as such. Most of the values that he elucidates and defends -- such as scale, style, transparency, lighting, and connection to place -- should be considered in every decision about the design, procurement, and fitting of transit vehicles. But these experiential values cannot expect to rule on matters such as frequency, speed, and staffing, as Nordahl proposes to do, because those factors are the dominant cost-drivers of transit; they

will always be governed largely by what provides the greatest possible mobility at the least possible cost.

Theory of Demand for Commuter Rail Transport

Transport derives its status as a consumer good primarily from its tied sale i.e. It is usually demanded in conjunction with other goods and services. The rational consumer chooses that mix of items, including transport, which maximizes his satisfaction. If consumer tastes income and expectations and the price of related goods, are held constant, the demand for any transport mode depends on its price. The consumption of transport, however necessities not only an outlay of money but also an expenditure of time. Time will be treated as a component of total cost, and thus introduced directly into the demand (Carol, 1973).

For the congestion mitigation potential of public transport to be realised, travellers must feel that the extent and quality of service provided are sufficient for them to forego using their cars for certain trips – especially those in peak periods. Thus, actions taken to encourage a mode shift to public transport should address the perceived costs by the user, ease and comfort of travelling by public transport as well as its reliability, safety and security.

There are many measures that can improve the attractiveness and performance of public transport systems (e.g. extending services, adapting fee structures, operational improvements, public transport information provision, etc) but these measures come at a cost and, al sufficient congestion management response. Urban areas with high levels of public transport use often also have high levels of road transport.

McDonough (1973) explains variables other than costs and income that may affect rail demand are seasonal factor and auto availability. Rail demand should be greater during the winter months .The relationship between auto availability and rail demand should vary by income range.

Zuidgeest (2005) contributed to this theory that the demand for a good therefore depends on its price, characteristics and the characteristics of the consumer. In case

of transport, the good being demanded is a certain transport service and the price consists of all perceived costs of the traveller, not only the monetary costs of the trip but also the time spent travelling and quality characteristics of the trip. Demand for travel is a derived demand as it is generated by the desire to join activities and due to the derived nature of it, transport demand cannot be analysed without considering the socio-economic characteristics of an area.

2.3.1Investment in commuter rail

Most large cities face the problem of increasing traffic congestion. Traffic congestion is an economic problem because it imposes costs on the auto commuter and on the commuter at large. For the commuter, traffic congestion necessities the expenditure of additional time and money. The entire community must bear the social cost of the resulting air and nose pollution. One solution is increased use of public transport: rail, bus and rapid transit (McDonough, 1973)

According to that many countries in the world adopt the investment of commuter rail or train. In Tokyo, Japan, there is a congestion of commuter trains while in Mumbai, India there are a lot of commuters who need trains and they stand on windows of coaches to reach their final destination. African countries have number of accounted coaches for example in Tanzania there are only 9 coaches used to by Tanzania Railway Limited (TRL) and 9 coaches used by TAZARA to take passengers from suburb areas into the city. The same investment also applied in Zimbabwe, South Africa and Kenya.

Investment in commuter rail transit is a world-wide phenomenon, driven by the belief in its benefits, such as less congestion, less air pollution, improved labor market access for the poor, and higher productivity in industries that make substantial use of vehicles in their production processes (Kain, 1968; Vickrey, 1969, Fernald 1999; Chen and Whalley, 2012). Transit authorities believe that the benefit is large; hence, the investment in rail transit is large (Cervero, 1998). For the same reason, passenger fares for public transportation are usually heavily subsidized (Kenworthy and Laube, 2001; Parry and Small, 2009).

Kakumoto (1999) emphasizes that before investing, it is important to know careful analyze, whether the final benefit justifies the total costs, If analysis shows that a company would loose money on an undertaking, but the social benefits justify the costs. It could be argued that the government should participate in the investiment. However such analysis cannot be definitive, because it would be based partly on assumption about the future. There could be other unforeseen problems too, demand might fall below expectations and costs could balloon for one reason or another.

However, some researchers argue that the cost to build and maintain new transit is higher than the measured benefit, and point out that the optimistic view of the rail transit benefit was based partially on an overestimation of ridership (Gorden and Willson, 1984; Allport and Thomson, 1990; Kain 1991; Kain, 1992; Pickrell, 1992; Kain, 1997a).

Kottenhoff (1999) said that, It is often difficult to operate rail traffic with sufficient profitability. Historically, the railway industry has failed in some respects to choose rolling stock based on the end users' preferences and willingness to pay for using the railways. The reasons for this include the lack of established, practical methods in the railway sector[1] to evaluate the relationship between supply/train properties and travellers' preferences.

2.3.2Passenger Transport and Customers

Cox (1993), explains in his article that passenger transport can increase its market share only by attracting customers. To attract customers, passenger transport must understand what the potential customers of passenger transport -- the automobile drivers -- want.

Proximity: Customers want service that is conveniently close to both their trip origin and destination.

Frequency of Service: Customers want to have the ability to travel whenever they like. That means that service must be frequent, and it must be available virtually all day.

Speed: Customers want to get where they are going as quickly as possible.

It is important to understand that passenger transport can reduce air pollution and traffic congestion only if it entices automobile drivers to switch to passenger transport**.** Mere diversion from automobiles is not enough. Attracting an automobile passenger from a car pool without removing the automobile from the road accomplishes nothing. With respect to reducing air pollution and traffic congestion, the test of passenger transport policy is not how many people are riding passenger transport, it is how many automobiles passenger transport removes from the road.
To serve customers, passenger transport must provide the services that customers want and provide them for no more than the market rate. That requires, at a minimum, incorporating the incentives of the competitive market by which the effectiveness of financial resources are maximized.

Bird (2006) of the European Commission in the World Conference on Rail Reform focused on sustainability as a guiding principle, challenging everybody to go out and do something, not just to listen. "We are here today to talk about the future of rail transport," he said. "And what exactly does the future demand? There has to be a clearly defined strategy to tackle the issues of sustainable development, since rail is seen to be one of the principle solutions. We have to make the effort. Everyone has to be committed to that strategy and rise to the challenge of sustainability. There needs to be excitement, energy and enthusiasm – and the courage to identify and implement developing technologies which will have a solid impact on today's world" (WCRR, 2006).

2.3.3 Customer Perspective

Generally, stakeholders agreed that customers' perspective was the priority and key to the sustainability of the railways. This was due to the fact that under normal circumstances "customers needed transport services and not railway transport services. Therefore if they were not satisfied with railway transport services they would simply turn to other modes of transport".

It was noted that, with customer perspective, customers concerns evolved around four aspects: time, quality, performance and cost. Indeed, common sense dictated

that it was not enough to simply bring down the cost of an item but the delivery time and the manner in which the customer was handled were of paramount importance (Sumatra, 2011)

2.3.4 Commuter Rail and Traffic Congestion

Many authors have been involved in researching ability of commuter rail or train to reduce traffic congestion. Some of them argue that commuter train or rail can reduce traffic congestion but others not argue that it reducing traffic congestion.

Researchers employing empirical approaches include Winston and Langer (2006) and Duranton and Turner (2011). Using metropolitan-area data, these authors regress total congestion or vehicle miles traveled (VMT) on measures of transit capacity. They reach varying conclusions. Winston and Langer estimate that rail lines reduce congestion but that bus lines increase congestion. The net effect of transit systems is thus to increase congestion.

Evidence that a new commuter rail system can immediately reduce highway congestion is not currently reliable. However, The Mobility Report (Schrank and Lomax, 2005) details the amount of delay averted through public transportation, supporting the case for public transportation's long term benefits to a transportation system. The American Public Transportation Association (APTA) lends further evidence to the benefits of public transportation, stating that current public transportation usage reduces U.S. gasoline consumption by 1.4 billion gallons per year, and would provide individual households significant economic benefit (Bailey, 2007).

Lownes (2007) says his contribution to commuter rail that, It is important to note that congestion relief should not be the only goal of a commuter rail system. In the short term, commuter rail provides a safe, reliable, high-quality option for commuters to travel to work. In the long term, commuter rail provides a metropolitan area the means to more effectively manage its growth and character. By establishing commuter rail, the possibility of future rail and transit modes being implemented

improves; future modes that collectively provide relief for a potentially ever-increasingly congested system.

Also Litman (2005) states that commuter rail will impact congestion both directly and indirectly. The direct impacts are realized when a commuter rail trip is substituted for an auto trip, though it is likely that the number of trips diverted from the highway system will be insignificant with respect to the volume of highway traffic in the system in the short term. The indirect impacts are derived from more accessible land use and public transportation gradually changing the travel patterns of a larger number of travelers. Litman further states that while the indirect impacts are difficult to observe, studies do support the hypothesis that these indirect impacts are significant.

The simplest explanation is the possibility of congestion relief – commuters may expect to benefit from reduced congestion even if they rarely use public transit themselves. A large body of transportation and economic research, however, concludes that public transit has effect on reducing congestion, calling into question its heavy subsidy rate (Rubin, Moore, and Lee, 1999; Stopher, 2004; Small, 2005; Winston and Maheshri, 2007).

Nelson et al. (2007) and Parry and Small (2009) develop an analytical model of an urban transportation system and compute the optimal transit operating subsidy. The model takes as inputs average speeds, costs, and price and service elasticities. One input in the model is the effect of transit on relieving traffic congestion. They compute this effect using assumptions about substitution between transportation modes and engineering estimates relating average delays and marginal congestion impacts. In Los Angeles, the congestion relief externality of traveling 1 mile on transit during peak hours is computed at 1.7 person-minutes of reduced traffic delays. Aggregating this figure across all peak-period transit passengers implies that transit reduces average delay by approximately 5% (0.025 minutes per mile).

2.3.5 Reviews on Public transport and conceptualization

In many urban areas or environment, the well performing public transport system is needed in to attract people to come and use that system. But in developing countries the system is very poor in performance although that the importance of public transport is well acknowledged. Assessment and evaluation of the existing system must be done in order to assist in making them effective and efficient public transport system. This study observes the sustainability of commuter train in reducing traffic congestion in terms of the factors which cause the attraction of passengers such as quality of service, comfort, reliability and condition of train stops and terminal.

2.3.6 Travel Demand

The demand for high quality transit service, called for the supply of the transport system. This is a result of travel demand generated by people who desire to participate in activities located in space and time, thus the potential service should be accessible to provide services to the generated demand.

As population continues to increase and as the city continues to sprawl, more people live and work in the city and make more trips within the urban area, often over longer distances. Consequently, the limited capacity of existing transport infrastructure is stretched to the limit and thus, it has become a constraint to cope with the public demand for travel (Kutzbach, 2009). Thus resulting in longer journey times, serious congestion, increased vehicle related accidents, pollution, and reduced mobility opportunities for the disadvantaged. The use of other non-road infrastructure including rail for commuter services in urban centers in Tanzania such as Dar es Salaam has been introduced.

The accessibility of the commuter train will depend on the spatial locations of activities, socio-economic and behavioral characteristics of the commuters and their public transport preferences. Based on this, therefore, the commuter train should be able to provide services accessible for all socio-economic groups to satisfy their

travel needs and preferences in order to achieve its intended objective and sustainability.

Sustainability to the commuter train was measured in service status in terms of quality of service, comfort, reliability and station facilities of Dar commuter train. In this research, accessibility to the commuter train service was assessed by analyzing commuters' perception on those variables in public transport and the results were based on the findings, conclusion on the system effectiveness was drawn.

2.3.7 Quality of Service

Paulley et al., (2006) and Van der Waard (1998) said that quality attributes can partly be influenced by planning authorities and operators and partly depends on the passengers willingness. Service quality is the decisive factor that service organizations can cause to create a difference and obtain competitive advantages. Railway Transport systems plays a crucial role in the economy, making up one of the sources of income generation of Tanzanian economy. Campos and Cantos (1999) have summarized in the Table 2.1 The five most important quality dimensions for the railway industry such as vehicle, route and services, social and dynamic quality, together with a number of standard performance measurement for them. But only three measurement variables are discussed in this study namely quality of service, comfort, stations facilities and reliability.

Table 2.1: **Quality Dimensions of Rail Industry**

Dimensions		**Definition**	**Measurement Variable**
Quality of Service	**Vehicle**	Abroad quality(wagons, locomotive)	-Age of vehicle/no. of years in service. -Vehicle size and load factor. -Availability of seats -Accessibility Travel comfort -noise -vibration -tideness
	Route	Route quality(travel of passengers and cargo	-Distribution and number of stations. -Timetable -peak trains -first-last trains -weekend commuter services -Frequency(number of trains per hour) Punctuality/reliability(waiting at stations) -Cargo services(reliability)
	Service	Pre-transport and transport. Service quality(added value to service)	Ticket sales/reservation -Handling -Staff adequacy and competence -Inquires and general information -Response to complaints
External Quality		Externalities(safety and environment)	-Public obligations -Safety procedures -Liability regimes -Environment protection(noise, pollution) -Congestion

Dynamic Quality		Investment policy	-Fleet and track renewal rates -Track and stations Maintenance -Investigation obligations

***Source**: Campos,J and Cantos,S.P (1999)*

It is interesting to note that passengers do not consider price as such an important factor. It would seem that quality of service is now more important to customers. Quality of service is defined as "the overall measured or perceived performance of transit from the passenger's point of view" (May, 2000). Quality of service measures reflect two important aspect of transit service (1) the degree to which transit service is available to given locations and (2) the comfort and convenience of the service provided to passengers. (Quattro, 2004).

According to American Society for Quality (ASQ), the term quality means ''the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs'' (Haksever et al., 2000:331)

Quality in service operations is usually evaluated by customers as a total experience. In a diverse society, transportation competition is keen, and passengers (or travelers) demand higher services and safety in their transportation choices. There are many empirical evidences exploring the quality-satisfaction-loyalty (QSL) relationship in the service industry (Anderson and Fornell, 2000; Fornell, 2000; Fornell et al., 1996; and Liu and Zhou, 2005).

Some of the earliest studies in public transport industries were undertaken by Allen and DiCesare (1976) who considered that quality of service for this area contained two categories: user and non-user. The user category consists of speed, reliability, comfort, convenience, safety, special services and innovations. The non-user category is comprised of system efficiency, pollution and demand. Silcock (1981) conceptualized service quality for public transport industry as the measures of accessibility, reliability, comfort, convenience and safety. Quality of service is one of

the performance indicators under the effectiveness category. It is comprised of accessibility, reliability, comfort, convenience and safety (Pullen, 1993).

Quality of service measures differ from both traditional highway service quality measures, which are more vehicle-oriented than person-oriented, and from the numerous utilization and economic performance measures routinely collected by the transit industry, which tend to reflect the transit operator's variable (components) of level-of-service concept (Quality of service concept), clearly show the various dimensional approaches of the concept.

TCRP Report 88 (TCRP Report 100, Chapter 2) defines five categories of measures that wholly or partially reflect the passenger's point-of-view in transit services which are availability of transit service, service monitoring, travel time, safety and security, and maintenance and construction activity on passenger trips. In the literature, aspects such as reliability, frequency, travel time and fare level (Hensher et al., 2003; Tyrinopoulos and Aifadopoulou , 2008), comfort and cleanliness (Eboli and Mazzulla, 2007; Swanson et al. 1997), network coverage/distance to stop (Eriksson et al., 2009, Tyrinopoulos and Antoniou 2008), and safety issues (Smith and Clarke, 2000, Fellesson and Friman, 2008) are all known to be important factors in customer evaluations of public transport service quality.

In conceptualizing the basic service quality model, Parasuraman et al., (1985) identified 10 key determinants of service quality as perceived by service providers and consumers, namely, reliability, responsiveness, competency, accessibility, courtesy, communication, credibility, security, understanding/knowing the customer, and tangibility to formulate a service quality framework. Vanniarajan and Stephen (2008) identified the attributes that passengers use to evaluate the service quality of Indian Railways as reliability, assurance, empathy, tangibles, and responsiveness. Agrawal (2008) identified employee behavior as the most important determinant of customers' (passengers) satisfaction with Indian Railway services. In addition to service quality factors, several studies find that quality of service-customers and on-

street service and station and on board safety is more important in attracting riders than changes in fares or the quantity of service (Cervero, 1990)

However, for the purposes of this research, the quality of service indicators of train services provided by commuter trains in the city of Dar es Salaam as perceived by train users by considering these variables (a) quality of service (b) comfort (c) reliability (d) station facilities . These variables were chosen because they help to determine the level-of-service, the train riders enjoy in the city that enhances their intra-urban mobility and accessibility.

2.3.8 Comfort

Zhang's (1996) definition has become the most accepted model as his study showed significant differences between comfort and discomfort: "comfort is associated with feelings of relaxation and well-being…and aesthetic design" and "discomfort is associated with biomechanical factors that produce feelings of pain, soreness, numbness, stiffness, and so on". According to Zhang, researchers must ask individuals to judge their comfort and discomfort separately using a set of questions that describe the sensation of comfort or discomfort.

Helander (2003**)** wrote a paper emphasizing the difference between comfort and discomfort, saying that comfort is primarily a perception, while discomfort is a secondary measure. Comfort is more of an emotional state, while discomfort is more of a physical state of being. He also argued that aesthetics of a seat's appearance would influence the amount of comfort that a user would experience (Helander & Zhang, 1997; Helander, 2003). Also, in this research the comfort of commuter train was assessed according to booking, standing, standing when overcrowded, seating, security in the train, customer care etc.

2.3.9 Reliability of the Train

Reliability is a general term that describes the ability of a service to operate according to its published schedule. The reliability of the service is one of the most important attributes of the service for potential passengers. Commuters will consider

the train as a viable alternative to the automobile only if there is a high confidence of the train meeting its schedule so they can be sure to be at their destination (work) on time. Reliability is an important indicator of level of service in public transport systems. Unreliability causes increase in waiting time, late or early arrivals at destinations and missed connections (Bowman and Turnquist, 1981; Turnquist, 1978; Wilson et al., 1992). User surveys reveal that reliability is implicitly valued by passengers in stated preference surveys (Bates et al., 2001).

Reliability is also seen as a governing factor in selection of transport modes by users (Prioni and Hensher, 2000).

2.3.4 Station/terminal facilities

Typical commuter rail station components include, but are not limited to:

Shelter or building, Seating area, Fare control and vending media, Stairways, ramps, elevators and escalators, if not at-grade with station access points, Route and passenger information displays, Lighting, Trash receptacles, Emergency call boxes, Park-n-ride and kiss-n-ride facilities (Ibi group, 2010). In the report called The "Transit Cooperative Research Program (TCRP) Report 100: Transit Capacity and Quality of Service Manual, 2nd Edition" summarizes some of the advantages and disadvantages of typical passenger amenities, presented below as Table 2.2

Table 2.2 Commuter Rail Station Amenities

Amenity	Advantages	Disadvantages
Shelters	• Provides comfort for waiting passengers • Provides protection from climate (sun, glare, wind, rain, snow) • Help identify the stop/station	•Requires maintenance, trash collection • May be used by graffiti artists
Benches	•Provides comfort for waiting passengers • Help identify the stop/station • Low-cost when compared with installing	• Requires maintenance • May be used by graffiti artists

	a shelter	
Vending Machines	• Provides reading material for waiting passengers	• Increases trash accumulation • May have poor visual appearance • Reduces circulation space • Can be vandalized
Lighting	• Increases visibility • Increases perceptions of comfort and security • Discourages "after hours" use of train stop facilities by indigents	• Requires maintenance • Can be costly
Trash Receptacles	• Provides place to discard trash • Keeps train stop and surroundings clean	• May be costly to maintain • May be used by customers of nearby land uses • May have a bad odor • May be removed for security reasons
Telephone	• Convenient for transit patrons • Provides access to transit information and emergency services	• May encourage loitering at train stop • May encourage illegal activities at train stop

Source: *Ibi group report,2010*

Public Transport Problems

Road is the most dominant mode of transport in urban areas like Dares Salaam. It interconnects production with consumptions and Market centers. Most roads can hardly cope with rapid increase in traffic volumes due to insufficient road capacities. For example Dar es Salaam city roads are connected to the traffic from Bagamoyo, Morogoro, Nyerere and Kilwa roads causing very high road traffic density especially in the Central Bussiness District (CBD) areas (NTP, 2003).

De Casthilo et al. (2005); Orn (2002) explained that in order for the city to function well, there should be efficient public transport system. However El-Geneidy et al., (2005) contended that lack of efficient public transport system will significantly

impact the economy and community well being. Poor public transport performance creates related impacts like congestions, accidents and air pollutions just to mention few. According to the national transport policy on railway transport (NTP, 2003) issued that in order to provide environmentally sound railway transport in urban areas the policy directions to pursue includes: (i) To promote rail transport for the mass movement of passengers in urban areas so as to reduce the rate of pollution and congestion (ii) To continue to liberalize and privatize railway transport operations to make services efficient

2.4 Empirical Literature

2.4.1 Overview

There are several empirical studies on sustainability of commuter rail have been done around the world but a little in Tanzania. This section examines them briefly starting with globally and the return to Tanzania context. Evidence showed that many have failed to sustain in providing the service.

2.4.2 Commuter rail in America

In the study to assess the commuter rail in America that New commuter rail systems, operating over freight rail tracks, have been opened in Los Angeles, Miami-Fort Lauderdale-West Palm Beach, San Diego, Washington, Seattle and San Jose. However, the impact of these systems on traffic congestion has been very small. Based upon the optimistic assumption that all new commuter rail ridership was attracted out of cars, these new systems have, on average, diverted less than 0.15 percent of freeway and principal arterial traffic in their respective urban areas. (www.tppf.com/ read on 20th, May, 2013).

In another study called Regional Transportation Council Commuter Rail Feasibility Study from Vancouver to Portland, 1999 where the purpose was to analyze commuter rail as a transportation alternative between Clark County and Portland's Union Station. It was observed that Qualitative assessment determined that commuter rail over existing BNSF track would not produce benefits in line with the cost to construct and operate the service.

Another study conducted between Vancouver to Portland, 2006 called Columbia River Crossing Alternatives Analysis . Its purpose was to determine whether commuter rail is a reasonable modal option for transportation circulation in the "CRC influence area." The study determined that benefits to costs of commuter rail were not as favorable as other modes. But in this study deals with intangible things like quality of service, comfort, reliability and station facilities.

In another study from America, the report made by Ministry of Transportation and Infrastructure in the Evaluation of the E & N Railway Corridor: Commuter Rail
The factors relating to the quality of the service have been identified through the analysis in that report, and the socioeconomic factors and characteristics of the travel corridor were studied in more detail as part of the report on passenger forecasts (intercity and commuter rail).

Key findings from that evaluation, as they relate to the options being evaluated here, include: The so-called 'direct demand' model which looks at population and employment catchment areas, and relative travel times and service factors of the commuter rail concept, produces estimates of 925 to 1190 passengers per day. This model, described in detail in the Passenger Analysis report, is calibrated against mode shares that other commuter rail services achieve relative to their travel markets with a similar train service on offer. This offers an alternative estimate of the ridership potential of such a system.

Another study conducted in 1995, Investment Study between Manhattan and West of Hudson River by three major local transit agencies—NJT, the Port Authority, and the Metropolitan Transportation Authority to consider ways to improve access between midtown Manhattan and the growing population west of the Hudson River. The study evaluated more than 100 alternatives, including commuter railroad, bus, light rail, subway, automobile, and ferry. The study, completed in 2003, recommended three alternatives for advancement to the federal environment impact process. While these alternatives would have provided more train capacity and were expected to meet projected demand.

The study reviewed that ARC project would have provided a significant increase in rail capacity for moving commuters between New Jersey and New York. And this increase in rail capacity would result in the following:

- The peak hour use of passenger capacity would have decreased from a near-capacity 95 percent to 60 percent at completion, providing additional capacity to accommodate future passenger growth.
- Also with this increase in capacity, projections made as part of the project's environmental study showed an anticipated increase in transit ridership as follows:
- Daily trips between New Jersey and New York Penn Station would have increased from about 174,000 without the project to about 254,000 (a 46 percent increase) with the project by 2030
- Riders travelling between New Jersey and Manhattan would have experienced an average of 23 minutes of travel time savings per trip.
- Better reliability, allowing for faster transit. Average scheduled time from Newark, New Jersey, to Manhattan would decrease by 5 minutes during peak times and 3.5 minutes off-peak.
- Even with the added trans-Hudson commuters, the environmental study found that the new station would have reduced crowding at the adjacent New York Penn Station:
- Average passenger egress time from New York Penn Station would have decreased from 80 to 60 seconds (a 25 percent decrease).

2.4.3 Commuter Rail in Asia

Another study conducted in Malaysia by Waris et al., (2010) titled Customers' Perception towards Electric Commuter Train Services. The study applied the binary logistic regression analysis to analyze the customer perception towards electric commuter train (ECT) services in Malaysia. Data from respondents in twelve selected KTM Komuter stations were used to measure the performance of the model in correctly classifying service status via punctuality, frequency, speed, space, reliability, comfort, safety, and train operation. It was found that, the factors that

most influence the good services were frequency, speed, reliability, comfort, safety, and train operation.

2.4.4 Empirical Studies in Tanzania

In Tanzania, there are few literatures on public transport particularly on rail customer services.

The study conducted by Malisa, (2009) on Rail Customer Services, The case of Tanzania Railway Limited (TRL). In assessing the rail customer services, he looked the quality of rail services rendered by TRL concentrated on five variables mentioned in Serviqual Model namely responsiveness, reliability, empathy, tangible and assurance in three regions Dar es Salaam, Dodoma and Tabora. From the findings of the study showed that the quality of rail services rendered by TRL is poor and customers are not satisfied.

The assurance and reliability dimensions have the lowest average scores of 1.868 and 1.909 respectively. These results imply that customer's expectation of reliability and assurance dimensions of the railway are not met by TRL. The findings also revealed that passengers are not satisfied with the quality of rail services particularly on aspects of security of their goods and themselves, accessibility in coaches, availability of seats and comfortability in the coaches and assurance while they are purchasing tickets, provision of timely service and trustfulness of the railway transport.

Likewise, Lyatuu (2008) conducted a study on the factors affecting the performance of TAZARA. In assessing the performance of TAZARA, he looked mainly on the technical and performance as major performance indicators. Based on those indicators, he also went on to investigate whether TAZARA customers were satisfied with the services offered or not.

In the summary of key findings, he found out that there were shortage of locomotives and wagons which could not meet customer's demand and locomotives were grounded due to lack of spare parts. He also found out that the shortage of spare parts

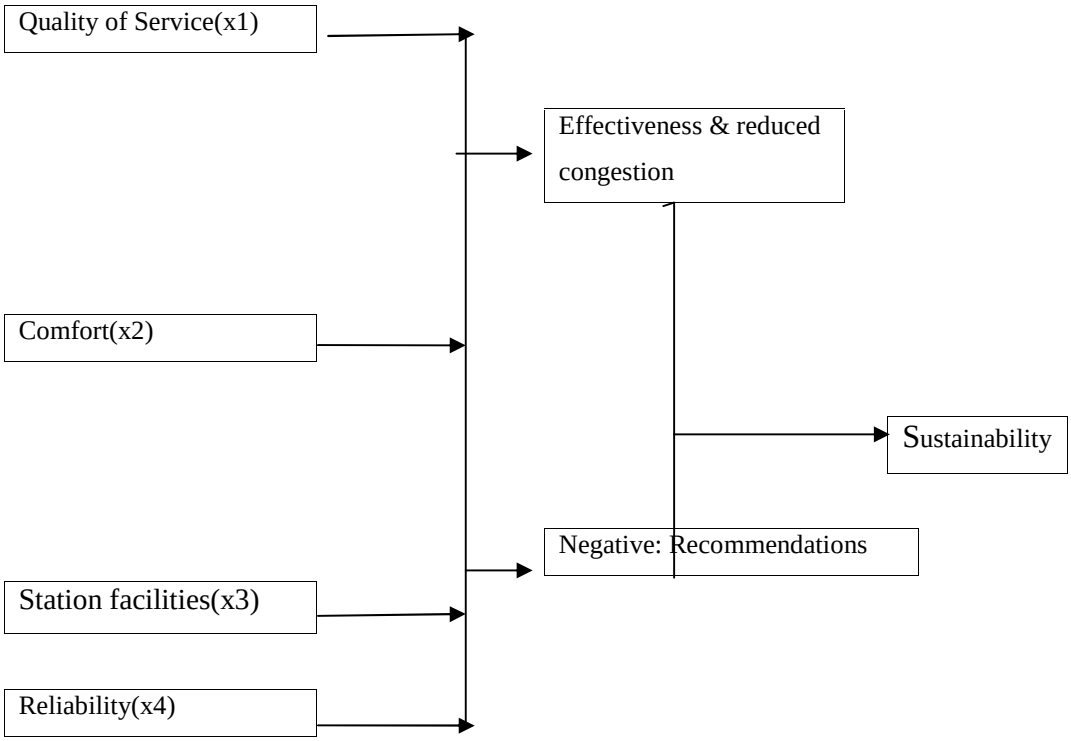
has hindered timely maintenance of the locomotives as such reduced operational efficiency.

2.5 Conceptual Framework

A conceptual framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought. Conceptual framework also called theoretical frameworks are a type of intermediate theory that has the potential to connect to all aspects of inquiry (e.g problem definition, purpose, literature review, methodology, data collection and analysis).Conceptual frameworks act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem (Overbeck et al, 2008)

After the literature review, it is conceptualized that the sustainability is a result of benefits gained from the service and this benefits come from the attraction of passengers to the service. So in order to attract passengers in public transport service the following variables have been conceptualized like quality of service, comfort, station facilities and reliability of the service.

Figure 2.3 Conceptualization of Sustainability of Dar Commuter Train in reducing traffic congestion can be summarized as follows;



Source :*Researcher ,2013*

From the analytical framework, it follows that sustainability is a function of quality of service, comfort, station facilities and reliability etc .This study is going to use only four variables namely quality of service, comfort, station facilities and reliability.

2.5 Description of Variables

2.5.1 Sustainability in reducing traffic congestion means ability to carry out its major activities for a relatively extended time so as to reduce the traffic congestion in the city. If the commuter train will be able to attract many passengers from automobile and other passengers who use daladala service the commuter train will be sustainable. The aim in improving the attractiveness of commuter rail is to encourage users to switch from driving all the way to their destination to using public transit as part of their trip.

2.5.2. Quality of service

Quality of service is very important for any aspect in public transport. The people must satisfy the service provided. The delivery of public goods and services notwithstanding their efficient and responsive delivery is of no value if it does not benefit the individual, t he community and society at large (Mass and Fox, 1997).In this study, cleanliness, service delivery have been considered.

2.5.3 Comfort

Comfort level was put into the research because reports indicated that people value comfort highly (Kanyama et al., 2004).In this research comfort was looked in terms of booking, boarding, seating, normal standing, overcrowded standing, security and customer care. In recent years, researchers have combined subjective and objective measures and tried to draw correlations between the different measures to find meaningful conclusions. Much of the literature from this combined approach shows promise, but there remains a need for solid answers about how to interpret people's perception of comfort and discomfort (Kolich, 2003).

2.5.4 Station facilities

Station facilities can play a major role in attracting riders from different areas to use commuter train. For example attracting riders to use park-and-ride facilities is expected to have a sustainable outcome, although not as much as that from walking to transit. Wulkan and Henry emphasize that residents of outlying areas of cities mostly drive to transit. Park-and-ride facilities can attract commuters to use rail when they otherwise would have driven directly to employment centers.

2.5.5 Reliability

Reliability is a general term that describes the ability of a service to operate according to its published schedule. The reliability of the service is one of the most important attributes of the service for potential passengers. Commuters will consider the train as a viable alternative to the automobile only if there is a high confidence of the train meeting its schedule so they can be sure to be at their destination (work) on time.

2.6 Knowledge Gaps

Since there is no any research conducted to assess the commuter rail in the city the study will fill gap knowledgeably to number of people due to its importance to the life of societies particularly in Dar es Salaam and its outskirts. Knowledge of how people value the quality of a public transit service would benefit transport planners, policy makers, and public transit operators to stipulate strategies of service quality improvement in order this service to be sustainable in our country so as to reduce congestion in the city.

According to recent survey by DART Agency that about Sh4 billion loss was being incurred every day in the city due to the persistent jams. That amounts to about Sh120 billion in a month that adds up to around Sh1.44 trillion, which is about the size of some government ministries. This would help to design service quality interventions that meet customer expectations while eliminating subjectivity in the decision making of urban policies. This paper aims to address this gap in knowledge Also the study will be valuable to further understand issues to consider and models to use when assessing commuter rail projects in the future.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1Introduction

This chapter explains the way the research was conducted in order to collect and analyse data, i.e. the research methodology. It covered research design, area of study and population of the study, sample size and sampling techniques, types of data and sources of data, data collection techniques and data analysis .

3.2 Research Design

This study was a qualitative method according to the view of transport challenges in the city. Also it employed the case study approach as defined by Berg (2001) as a systematic way of collecting information about a particular person, social setting, or group and to understand how it operates. It will be appropriate in this case since it will give an opportunity to the researcher to thoroughly identify and describe the assessment in terms of quality of service, reliability, comfort and station facilities. According to Yin (2003)' a case study – one that illuminates a decision or set of decisions within its real-life context.

Also, Saunders (2004) defines a case study as a strategy for doing research which involves an empirical investigation of particular contemporary phenomenon within its real life context using multiple sources of evidence. Also, it provides a suitable context for certain research questions to be answered (Bryman, 2004).The answers that can be used to produce useful information for other cities with similar contexts.

3.2.1 TRL as a case study

TRL was established on the 21st October,2007 after The TRC system to be concessioned in 2007 to TRL, a joint venture company between Rites of India (51 percent shares – as strategic partner with management responsibility) and Government (49 percent shares). From the outset, the concession was operated in an atmosphere of conflict with very little trust from either side. This led to the withholding of key investment funds and working capital, further exacerbating the

situation, and ultimately to the cancellation of the concession in 2010. The operation of TRL has been transferring to government through RAHCO (Nathan Associates Inc, 2011).

In October 2012, the Minister of Transport, in Tanzania Dr.Harrison Mwakyembe, launched a city commuter train which operates the lines heading to Pugu, Kurasini and Ubungo Maziwa .The train launched was a part of the first phase of a government scheme to improve the city's transport network and to decrease its congested streets. The researcher decided to chose the lines heading to Ubungo Maziwa from City railway station due to limit of time and budget constraints as well as accessibility of the various stations.

3.3 Area of Study

The study was conducted in Dar es Salaam Region but for the purposes of simplifying the collection of data, the study was specifically in the stations area of commuter train like Ubungo Maziwa, Mabibo, Bakhresa and city railway station etc. The City is located between latitudes 6.36 degrees and 7.0 degrees to the south of Equator and longitudes 39.0 and 33.33 to the east of Greenwich. It is bounded by the Indian Ocean on the east and by the Coast Region on the other sides. The Urbanised Area of Dar es Salaam is located on a coastal plain bounded by the Indian Ocean on the east and the Pugu hills to the west. Its location on the coast has a remarkable role on the economic activities of the country. It serves not only as a national port for export and import of commodity in the country but also serves the entire East African region.

Figure 3.1 Map No.1: Map of Dar es Salaam

Source: *Mlambo and Khayesi (2006).*

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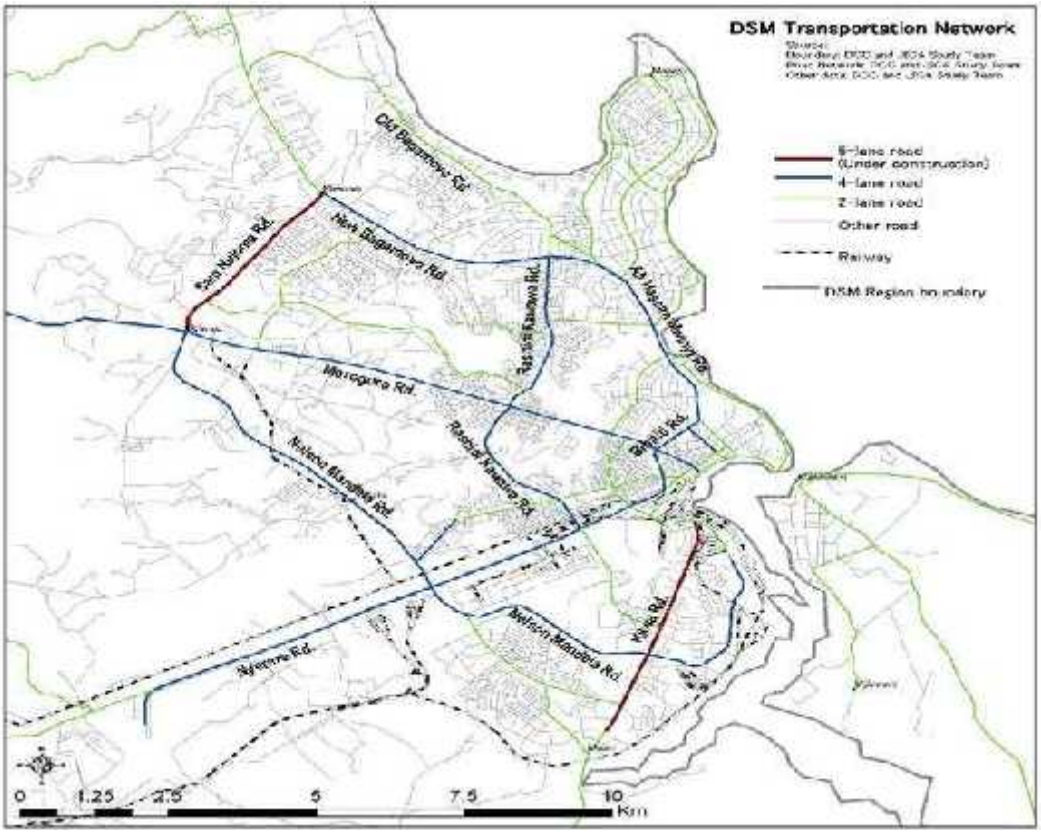
Figure 3.2 Dar es Salaam Transportation Network



Source:JICA,2007

3.4 Population, Sample and Sampling Technique

3.4.1 Target Population and Sample Size

According to Krishnaswami (2002) defined population as the target group to be studied in a particular place while a sample is a part of population. Population is therefore a total collection of elements about which one wishes to get information. In defining sample size Gupta (2002) as cited in Binamu (2006) pointed out, mere size alone does not ensure representativeness thus a small sample, but well selected sample may be superior to a larger but badly sample. Hence, the sample size should neither be too small nor too large. It should be optimum. The optimum size is the one that fulfills the requirements of efficiency representativeness, reliability and flexibility**.** Sample is used in the researches rather than the whole population because of costs in terms of fund, time and materials that can be involved in surveying the whole population.

A sample of 200 respondents was drawn to constitute the study and resulting 165 respondents who were well filled completely the questionnaires, a response rate of 82.5%. These respondents were drawn from 6 stoppage stations where commuter trains passed through or operating in that location. Since there are at least 6 Stoppage stations for TRL line, the researcher selected some main station which carry more passengers. The researcher selected the following stations Ubungo Maziwa, Mabibo, Mwananchi and Bakhresa (Makburi). A total of 200 questionnaires were administered to 200 respondents.

Table 2.3.Samples selected during the field study

TRL STATIONS	**PASSENGERS**
UBUNGO MAZIWA	50
MABIBO	25
MWANANCHI	25
MATUMBI	10
MNYAMANI	15
BAKHRESA	25
RAILWAY ST.	50
TOTAL	**200**

SOURCE: Field data 2013

Ubungo Maziwa

The researcher selected this area because it is a place where commuter train last its trip from city railway station. The people from various area come to take a train in the peak hours for example the around Ubungo, Kimara, Mbezi etc. It is more than one kilometer from Ubungo terminal.

Mabibo

This is also an area located at Mabibo and intersect Kigogo road to Ubungo. Also the people living around used to take a train but the area is nearby Mabibo daladala stand where people used to take the buses to the same destination like Posta, Kariakoo.

Mwananchi

The area situated nearby Mandela road and some daladala are passing here to the city center.

Tabata Matumbi

The area across Tabata road which is also thin area used by people to take a commuter train. It is nearby with the daladala stand to Ubungo and City Centre

Buguruni Mnyamani

Many people live here because it is a squatter area and many houses are very close to the railway line. The researcher combine these stations to interview only 23 passengers (Mnyamani and Matumbi)

Bakhresa

This is the business area where people use to take a train to the city center. Also it is near with various daladala stops Buguruni Sheli, Bakhresa (Azam) and Tazara.

City Railway Station

This is a main station where the people are dispersing into various activities as a final destination.It is used as final destination.

Figure 3.3 Photograph No.2 Dar Commuter Train at City Railway Station

The Dar Commuter train at the Dar central train station

Source: *pesa times.com 23/4/2013*

3.4.2 Characteristics of Sample Size

The sample size based on their socio-economic, demographic and travel characteristics and the researcher checked the collected sample characteristics so as to match with the required population. Also the researcher took the samples in terms of gender to make good representation of male and female respondents in the samples to be collected. Age, and Employment Status, was also included in the sample characteristics.

3.5 Sampling Procedures

Simple randomly sampling technique was employed in the actual selection of these respondents. This procedure offered equal chance for all respondents in the sampling frame to be included n the sample. The researcher was then randomly selected respondents from stoppage stations as above according to gender, age, and employment status and target group were individual commuters who commute

regularly to and from the city centre /CBD.T he sampled populations were only the city residents and not visitors of the city.

3.6 Variables and Measurements

Measurement is a process of determining the depth, width or intensity of physical or abstract phenomenon (Kothari, 2004). The study was concentrated on five variables as mentioned in the literature reviews namely quality of service, travel time, comfort, terminal/stop standard, and reliability.

These variables were measured as Table 2.4 shown below:

Table *2.4* Measurement of Variables from the Conceptual Framework

Variables	Measurement Procedures	Methods
Quality of Service	Service delivery, cleanliness of the train	Questionnaire A.Question no.4
Comfort	Booking, Seating, Standing, Standing when overcrowded, customer care etc	Questionnaire A. Questions no.5
Terminal standards/station facilities	Seating,shedding,lighting,disabled access, parking space,	Quetionnaire B:Observation and Question no.7
Service Reliability	Provision of timely service,consistency,accuracy and dependability of service	Questionnaire A:Question no.6

Source: *Field data, 2013*

3.7 Data Collection Methods and Instruments

3.7.1 Data Collection Method

The study employed different methods of data collection, whereby both primary and secondary data were used. The methods used to consult articles and documents; making observations; and collecting questionnaire responses and conducting interviews, the latter two methods is briefly discussed below:

3.7.1.1Observations

Both non-participant and participant observations were conducted .Non-participant observation was for commuter train only by strolling in different parts of the city and sitting in commuter train ,stops and terminals just noting the public transport conditions and the behavior of the users.

Then for participant observation was conducted for the researcher himself to take different trips from origin to destination in the morning and evening session for the Dar commuter train and commuted in the city. These observations helped the researcher to restructuring some of the research questions besides paving a way for a narrative explanation. Observation methods were employed to assess the terminal stations/stops and the place where commuters like to gather for waiting the train. This helped the researcher to get first hand information and obtain data by seeing.

3.7.1.2 Questionnaires and Interviews:

The researcher prepared questionnaires in English and Swahili language for public transport commuters, for trains in terminals or stops. Researcher, administered the questionnaires through face-to-face contact with the respondents (train commuters) at the terminals during working hours for two weeks in June, 2013. Apart from the written instructions in the questionnaire, the passengers were orally informed about the purpose of the study and received assistance for doubts if any.

They were instructed to read and interpret the questions in Swahili since the questionnaires were in two languages English and Swahili (the local language in Tanzania) The researcher used Swahili Language as a defense in cases where the respondents could not speak English.

3.7.1.3 Documentary Review

This was another method used to collect data in order to pursue literature most of which is presented in Chapter 2 to see what has been done in subject matter, how was it done and what was remained to be done. The researcher used to read critically

some books, publications and articles and electronic media concerning with commuter rail/train in different areas in relation to this study.

3.7.1.4 Photographs

This method was also used to get actual information about Dar Commuter Train in the field. And many photos were taken at various stations to capture a real picture of the stations and passengers in the journey and at the time when waiting for the train. Other pictures were taken by researcher from electronic media to add information on the particular study which is very new in our country. The available pictures are few among of pictures collected by researchers.

3.7.2 Data Collection Strategy

According to Krishnaswami (2002) data are facts, figure and other relevant materials, past and present that serve as basis for the study and analysis. Different sources were used in data collection i.e secondary and primary sources were adopted. Also Krishnaswami (2002) define Primary sources as original sources from which the researcher directly collect data that have not being previously collected and Secondary data are sources that have been collected and complied for another purpose.

The primary data was collected by the use of questionnaires and interviewing the respondents of the selected commuters of train using TRL commuter train. The researcher used primary data to get the raw data from the field. The variables from questionnaires were assigned some values in percentage terms. Under secondary data for this study the Internet, textbooks, documentaries, journals and various newspapers, journals and other relevant document provided the means for secondary source were used to collect information were used. Secondary data was used in circumstances where the researchers needed to supplement the information in research objectives.

3.8 Quality of Data and Measurement

3.8.1 Reliability

The researcher ensured reliability of data. According to Trochim (2005) reliability has to do with the quality of measurement. In its everyday sense, reliability is the 'consistency' or 'repeatability' of your measures. To enhance the reliability of data the triangulated approach was used to get empirical data. This was done to enhance the reliability of the data (Ibid; Yin, 2003).The use of clearance and introductory letter from Mzumbe University helped to build the confidence of the respondents that data will be used for academic purposes.

3.8.2 Validity

Validity refers to a quality of the research as whether it has measured what it was supposed to measure (Trochim, 2005). In ensuring the validity of the study, properly formulated research questions, which were verified and chosen. The choice of the respondents or interviewees was based on the belief that they were having access to the data for the questions. Therefore, the selected sample of the respondents represented others who use the commuter trains.

3.9 Data Processing Analysis

3.9.1 Data Processing

The term ‘data processing’ in research refers to orderliness in research data. This is putting the data into some systematic form (Kombo and Tromp, 2006:111).In this study, data processing were adhered to. The researcher prepared descriptive information and statistics. Also, the researcher prepared some tables and graphs and represent them in pictorial diagrams.

3.9.2 Analytical Technique

The researcher used descriptive statistics and analyze them basing on data and information collected from primary and secondary source on train commuters.

Meanwhile qualitative and quantitative data were analyzed and computed in percentages, represented in tables, graphs and pictorial diagram.

CHAPTER FOUR
PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter deals with the presentation of finding, analysis and discussion of the data collected from the field. The data collected in the field were analyzed in order to assess the sustainability of Dar commuter trains in reducing traffic congestions in Dares Salaam Region. The findings of this study have been derived or extracted from questionnaires, and observations.

Figure 4.1 Minister of TRANSPORT Dr. Mwakyembe during the first day of launching

Source: *www.pesatimes 18/04/2013*

4.2 Analysis of data collected from the field

Analysis of data in this study is aimed at identifying the factors that mostly influencing good services as well as attracting more riders to achieve sustainability in reducing traffic congestion in the city of Dar es salaam basing on performance variables such as, quality of services, comfort level, reliability of train and terminal facilities. The above mentioned reasons are considered as a standard of which if

attained, implies absence of the problem of reduction of passengers who use commuter trains in the city of Dar es Salaam.

4.3 Characteristics of Respondents

About 200 questionnaires were distributed to the passengers who are using commuter trains in Dar es Salaam. 200 questionnaires to TRL commuters and passengers were asked face to face to respond to the questions. But only 165 responded (82.5%) and 35 commuters (17.5%) did not respond for some reasons due to arrival of trains, dropped at a certain station before the final destination and lack of personal interest.

Table 4.1Percentage by respondents and non-respondents

NO.	STATIONS	SAMPLE SIZE	%	RESPONDED	%	NON-RESPONDED	%
1	**UBUNGO**	50	25	42	21	8	4
2	**MABIBO**	25	12.5	20	10	5	2.5
3	**MWANANCHI**	25	12.5	21	10.5	4	2
4	**MNYAMANI/MAT.**	25	12.5	23	11.5	2	1
5	**BAKHRESA**	25	12.5	19	9.5	6	3
6	**RAILWAY ST.**	50	25	40	20	10	5
	TOTAL	200	100	165	82.5	35	17.5

Source: Field data, 2013

4.3.1. Respondents by gender

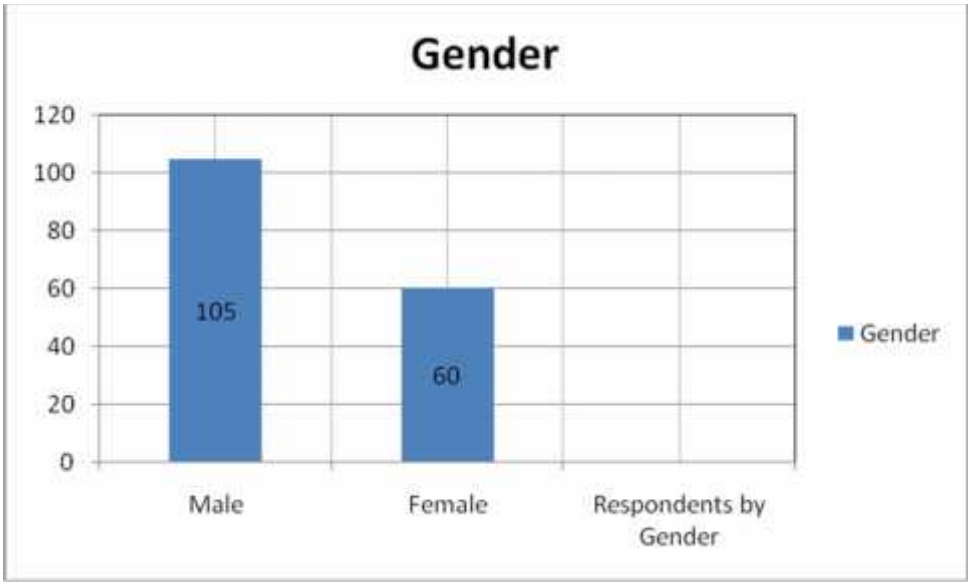
Table 4.2 Number of Respondents by Gender for DAR COMMUTER TRAIN

Sex	Frequency	Percent (%)
Male	105	63.6
Female	60	36.4
Total	165	100

Source: Field data, 2013

The study shows that majority, 105 respondents (63.6%) were male and 60 respondents (36.4%) were female. The results in both shows that men are more than women, this could be due to the reason that most of the African culture men are the head of families, and income earners while women are house wives and taking care of home issues. That's why in any of the public transport mode men exceed the number of women. The same result is illustrated by Figure 4.1

Figure 4.2 Respondents by gender



***Source**:Field data,2013*

4.3.2. Respondents by age

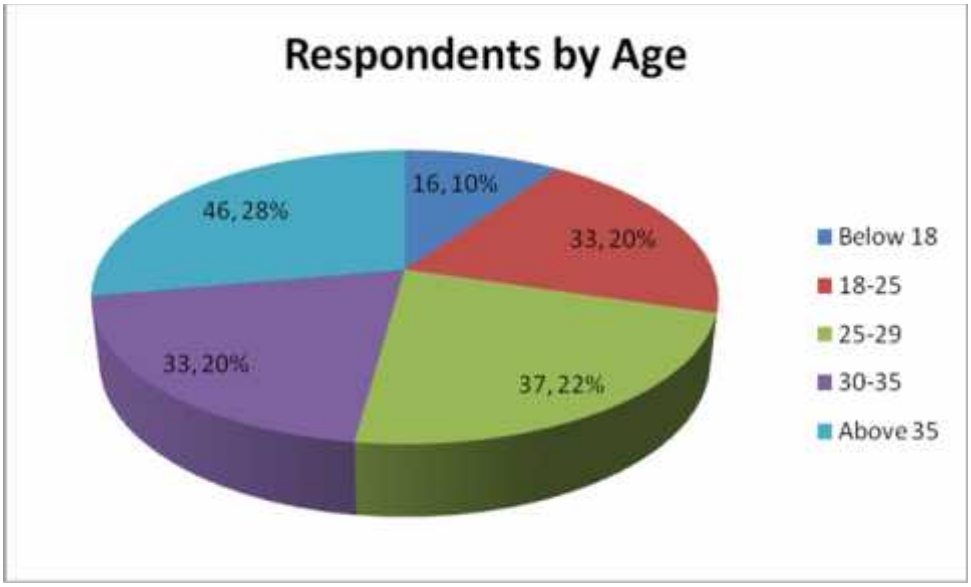
Table 4.3 Percentage of respondents by Age

Age	Frequency	Percent(%)
Below 18	16	10
18-25	33	20
25-29	37	22
30-35	33	20
Above 35	46	28
Total	165	100

***Source**:Field data,2013*

The same results is illustrated in Figure 4.3

Figure 4.3 Percentage of Respondents by Age



Source: Field data, 2013

As regard to total number who responded for TRL commuter train was 165 respondents, Table 4.3 below represent the age of the respondents and their percentage.

From the table and figure .3.4. It can be seen from the majority of the respondents which constitute 28% declared their age range above 35 years old, followed by 22 who were the age between 25-29 years old, while the age between 18-25 and 30-35

took the same 20% of the respondents and below 18 years old took 10% . This data implies that there is an increase of old men above 35 years age that prefer train to bus for Dar commuter train and avoid disturbance of daladala services. Nkurunziza, (2013) in his research on spatial variation of transit service quality preferences in Dar es salaam shows that most of respondents were between 26 and 64 of age as expected since this is the working age group.

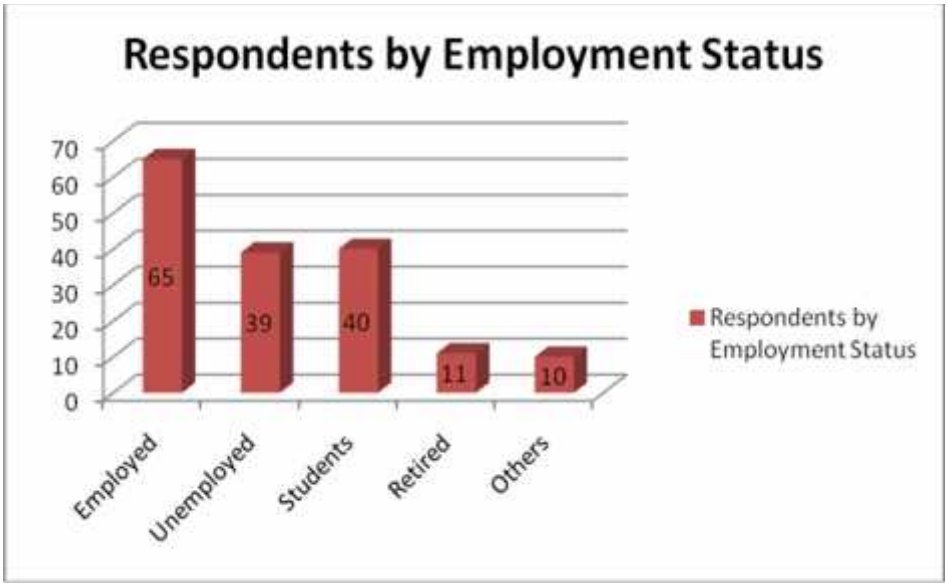
4.3.3Respondents by Employment Status

Table 4.4 Percentage of respondents by Employment Status

Status	Frequency	Percent (%)
Employed	65	39.4
Unemployed	39	23.6
Students	40	24.2
Retired	11	6.7
Others	10	6.1

Source: Field data ,2013

The profile of employment status of commuters using Commuter Train is depicted on Figure 4.4



Source:Field data, 2013

Among 165 passengers who responded at TRL commuter train, 62 were employed, 39 were unemployed, 40 students, 11 retired and others were 10 passengers. This

group of others is 4 petty traders, 6 self employed businessmen. The researcher interview students who show that they are secondary students because of knowledge and understanding in commuter train not primary school students.

This results shows that there is a large number of employed passengers moved from using other means of transport followed by students who want to arrive early in their work and studies respectively.

4.4 Perception of passengers on services of Dar commuter Train

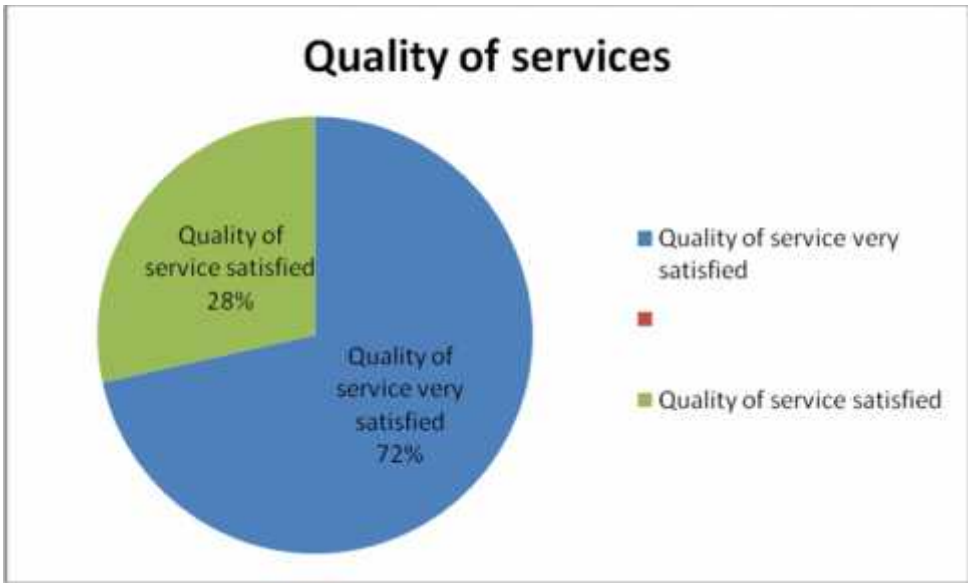
4.4.1 Quality of Service

Table: 4.5 Response on Quality of Service offered by Dar Commuter Train

Question 4	Frequency	Percent (%)
Very satisfied	118	71.5
Satisfied	47	28.5
Neither	0	0
Dissatisfied	0	0
Very dissatisfied	0	0

Source: *Field data,2013*

Figure 4.4 Percentage of respondents on Quality of Services of Dar Commuter Train



According to Pullen (1993) quality of service is one of the performance indicators under the effectiveness category. As discussed in the literature review quality of service is very important for any aspect in public transport. The people must satisfy the service provided. The delivery of public goods and services notwithstanding their efficient and responsive delivery is of no value if it does not benefit the individual, the community and society at large (Mass and Fox, 1997).

In summarizing the table concerning with the quality of services offering by Dar Commuter Train, the results showed that among 165 respondents, 118(71.5%) were very satisfied with the quality of service offered by TRL Commuter train although that other days is missing due to the maintenance of the engines and other infrastructures while 47(28.5%) were satisfied with the service. There are no any passengers among 165 who showed that the commuter train was dissatisfied, very dissatisfied or neither answer.

This indicates that the people have agreed with the service offered by Dar Commuter Train. According to Sumatra, this was due to the fact that under normal circumstances “customers needed transport services and not railway transport

services. Therefore if they were not satisfied with railway transport services they would simply turn to other modes of transport".

Figure:4.5 Photograph No.2, Passengers inside the train

Happy passengers inside the train

Source: *simbadeo.wordpress.com/read on 18/01/2013*

4.4.2 Reliability of the Train

Reliability is a general term that describes the ability of a service to operate according to its published schedule. The reliability of the service is one of the most important attributes of the service for potential passengers. Commuters will consider the train as a viable alternative to the automobile only if there is a high confidence of the train meeting its schedule so they can be sure to be at their destination (work) on time. The intention of explaining the reliability is to show consistency in journey travel times, timetable, and maintaining headway regularity.

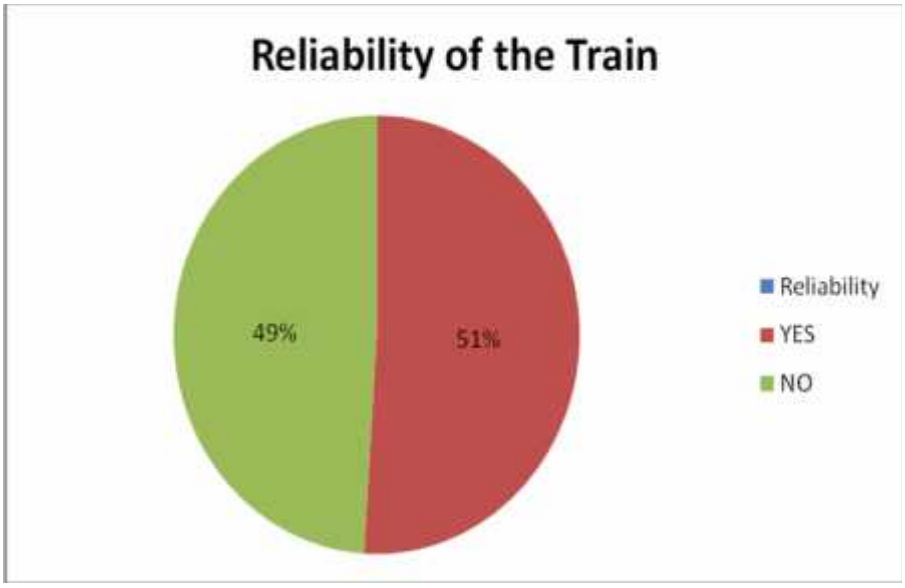
In case of whether Dar Commuter Train is reliable, the commuters have perceived as follows:

Table 4.6 Results on Reliability of the train in different stations

Question 6	Frequency	Percent
YES	81	49
NO	84	51
Total	165	100

Source: *Field Data, 2013*

Figure 4.6 Percentage showing reliability of the train



Source: Field data, 2013

On the question whether the Dar Commuter Train is reliable, 84(51%) respondents commented NO while 81(49%) replied YES. This indicates that currently the train is not reliable, it doesn't follow the schedule as provided by management due to some of inconvenience or problems of locomotive and the researcher observed this when the locomotive fail to move at Bakhresa station for sometime before kicked off by another locomotive. Dzikien et al., (2004) discussed about attributes that negative attributions towards a transit mode usually result in a poor image of this mode. This can be shown with the psychological model of barriers to train use developed by Dziekan et al., (2004). They found that barriers to train use are higher when this mode is loaded with negative attributions. It is of interest to enhance the knowledge about the quality of the attribution in order to investigate their influence on intended

behavior on barriers towards behavior. User surveys reveal that reliability is implicitly valued by passengers in stated preference surveys (Bates et al., 2001). Reliability is also seen as a governing factor in selection of transport modes by users (Prioni and Hensher, 2000).The results shows that there is minor difference in percentage of reliability. Researcher observations showed that during the first peak hours for example in the morning 6:00am and 4:00pm the train was more reliable than in other time waiting some passengers. During this time, the ticket sellers call people to board in his coaches because most of the seats are empty especially from Ubungo to Kariakoo. Inspite of unreliability of Dar Commuter Train most of the respondents had compared commuter trains and daladala services, told the researcher that they will be cool to wait for the train because of congestion, poor services and route scheduled of daladala during in the morning and evening.

The TRL provided their timetable to show departure and arrival of train from Station to Ubungo since 31st, Dec 2012 but sometimes the timetable not applied because of technical faults or mechanical breakdown of locomotives during travel.

Table 4.7 Timetable for Dar Commuter Train from Monday to Friday

Morning Session

From Ubungo	06:30 am	Arrival at Station	07:17 am
From Station	07:30 am	Arrival at Ubungo	08:17 am
From Ubungo	08:30 am	Arrival at Station	09:14 am
From Station	09:30 am	Arrival at Ubungo	10:16 am
From Ubungo	10:30 am	Arrival at Station	11:14 am

Source: *TRL, 2012*

Table 4.8. Timetable for Dar Commuter Train from Monday to Friday Evening Session

From Station	04:00 pm	Arrivat at Ubungo	04:38 pm
From Ubungo	05:00 pm	Arrival at Station	05:44 pm
From Station	06:00 pm	Arrival at Ubungo	06:48 pm
From Ubungo	07:00 pm	Arrival at Station	07:47 pm
From Station	08:00 pm	Arrival at Ubungo	08:48 pm
From Ubungo	09:00 pm	Arrival at Station	09:46 pm

***Source**: TRL, 2012*

Table 4.9 Timetable for Dar Commuter Train for Saturday Morning Session

From Ubungo	08:15 am	Arrival at Station	08 :52 am
From Station	09:15 am	Arrival at Ubungo	10:02 am
From Ubungo	10:15 am	Arrival at Station	11:06 am

***Source**: TRL, 2012*

Table 4.10 Timetable for Dar Commuter Train for Saturday Evening Session

From Station	04:00 pm	Arrival at Ubungo	04:48 pm
From Ubungo	05:00 pm	Arrival at Station	05:45 pm
From Station	06:00 pm	Arrival at Ubungo	06:48 pm
From Ubungo	07:00 pm	Arrival at Station	07:48 pm

***Source**: TRL, 2012*

4.4.3 Comfort level

Commuter rail is unique among the transit modes in that a high priority is placed on passenger comfort as journeys are often long and the main source of competition is the automobile (TCRP, 2010). Railway vehicles provide a range of more comfortable facilities compared to the other means of passenger transportation in respect to the ability of performing sedentary activities like reading, etc (Narayanamoorthy, 2007). Comfort level was put into the research because reports indicated that people value comfort highly (Kanyama et al., 2004). In this research can be looked in terms of booking, boarding, seating, normal standing, overcrowded standing, security and customer care.

In this study, comfort levels were asked from commuters perceptions as follows:

(a)Booking/Ticket Sales

Table 4.11.Percentage Responses on Booking/Ticket sales

Q.5(a)	Frequency	Percent (%)
YES	73	44.2
NO	92	55.8
Total	165	100

***Source**:Field data,2013*

Meanwhile 73(44.2%) said YES to show that they are comfortable with booking process and 92 respondents (55.8%) said NO that they are not comfortable with booking due to the concentration of people in the evening time. The researcher observed that is somehow good but there must be a special arrangement or system. The ticket are sold outside and inside the train and that's why other respondents said NO because sometimes the ticket seller delay to take money from the passenger and didn't issue the ticket when the passengers take off the train.

Speaking on Parliament, (2013) The minister of Transport, Dr.Harison Mwakyembe,said that one of the challenge face Dar Commuter Train is the system of collection of money, lack of engines and locomotives ,and old infrastructures.

(b)Boarding

Table 4.12 Percentage Responses on Boarding

Q5.(b)	Frequency	Percent (%)
YES	120	72.7
NO	45	27.3
Total	165	100

Source: Field data, 2013

From the table 4.12, 120 (72.7%) of the respondents said YES to show that they are comfortable while 45(27.3%) said NO on boarding. This is because of the height of

door to be high which make them to board by using more energy in some of stops excluding Railway Station and Ubungo Maziwa.Sometimes passengers are accompanied with their children so they use more energy to push them into the train. Also this height causes some people who are disabled to get assistance from other people to enter inside excluding the stations where there are platforms like Ubungo Maziwa etc.

Sometimes in the evening the passengers are told to wait for a while which accumulate many people and during the boarding there is a disturbance in entering in the train especially in the evening from town to Ubungo.

(c)Seating

Table 4.13 Percentage Response on Seating

Q5.(c)	Frequency	Percent (%)
YES	165	100
NO	0	0
Total	165	100

Source: Field data, 2013

When we sit in a chair or car seat, we have the sensation of the backrest and seat pan touching our back and thighs. This sensation of touch is due to our nerves receiving signals and sending them to our brain (Coren, Ward, & Enns, 2004). As we sit in the chair, we may have different sensations occurring such as softness, pain, heat, moisture, or pressure adaptation. Our perception of these sensations can determine if we consider ourselves to be in a state of comfort or discomfort. No doubts on seating from passengers because the seats are big enough in which two passengers can seat with enough space.

The size of the seat is quite different from daladala seats if one passenger is fat the other one cannot sit properly, and tried to look for another seat. Arrangement of face to face as a sitting plan increases the relationship with exchanging ideas among passengers.

Figure 4.7, Photograph 3: Commuter Train showing the seating level

Inside the train..in the evening from Ubungo to City Railway Station, no over crowded …very comfortable.

Source :(*simbadeo.wordpress.com/ read on* 18th, Jan 2013)

(d)Normal Standing

Table 4.14 Percentage Response on Normal Standing

Q5.(d)	Frequency	Percent (%)
YES	133	80.6
NO	32	19.4
Total	165	100

Source: Field data,2013

According to table 4.14, It shows that 32(21.2%) respondents said NO on normal standing because of attachment in standing position to be very high, while 43(32.1%) said NO when train have carried many passengers during the evening. When the passengers enter in a certain coach and see that all seats are covered by passengers, they decide to stand by catching the upper attachment. The problems come when the passenger is short enough to touch the upper catchment because it is situated at highly position.

(e) Overcrowded standing

Table 4.15 Percentage Response on Overcrowded standing

Q5.(e)	Frequency	Percent (%)
YES	122	73.9
NO	43	26.1
Total	165	100

Source: Field data,2013

The table 4.15 depicted 122 respondents (73.9%) said YES to show that they are comfortable while 43(26.1%).During the peak hours, the passengers are many but there is a space between them to move forward or backward.

(f) Security in the Train

Table 4.16 Percentage Response on Security in the Train

Q.5(f)	Frequency	Percent (%)
YES	165	100
NO	0	0
Total	165	100

Source: Field data,2013

All respondents said YES to show that the security is enough in the train. It is very important issue in the train**,** two or one policeman are escorting the travel in each coach of the commuter train. TCRP Report 88 (TCRP Report 100, Chapter 2) defines five categories of measures that wholly or partially reflect the passenger's point-of-view in transit services which are availability of transit service, service monitoring, travel time, safety and security, and maintenance and construction activity on passenger trips. So security is also very important aspect in public transport.

Figure 4.8 Security in the train

Source: www.pesatimes.com 18th,April 2013

***(g)*Customer care**

Table 4.17 Percentage Response on Customer care

Q5(g)	Frequency	Percent (%)
YES	165	100
NO	0	0
Total	165	100

Source: Field data, 2013

Overall performance on comfort calculated by average for those people who said YES on all events. (44.2+72.7+100+80.6+73.9+100+100)/7≈(81.6%). So 81.6% of passengers agreed that Dar Commuter Train is more comfortable. This indicates that commuters travelling in comfortable environment. But Migwano (2009) when examining problems of current public bus transport in Dar es Salaam the commuters responded that the comfort level were very poor because of seats to be in smaller sizes, low cabin height, lack of adequate ventilation and no passage ways.

4.4.5 The current condition of Stations/Terminal facilities

Station facilities can play a major role in attracting riders from different areas to use commuter train. For example attracting riders to use park-and-ride facilities is

expected to have a sustainable outcome, although not as much as that from walking to transit. Wulkan and Henry emphasize that residents of outlying areas of cities mostly drive to transit. Park-and-ride facilities can attract commuters to use rail when they otherwise would have driven directly to employment centers.

Facilities at station have been observed by researcher and he observed the following in the stations to see if shelter/building, seating, lighting, passenger's information displays, disabled access, and packing space. The results as indicated below;

In summarizing the results show that City railway station has 4(67%) of facilities, followed by Kariakoo 2(33%) and Ubungo 2(33%) while Bakhresa and Mwananchi have 1(17%) each .B/Mnyamani,and Matumbi have 0(0%).Generally the overall average percentage is 28% of station facilities which is very low for terminal standard.

Table 4.18 Station facilities

S/NO	Stations	RWY	KKO	BAK	MAN	MAT	MWA	MAB	UBG
1.	Shelter /building	√	×	×	×	×	×	×	×
2.	Seating area	√	×	×	×	×	×	×	×
3.	Lighting	√	×	×	×	×	×	×	×
4.	Passengers information display	×	×	×	×	×	×	×	×
5.	Dissabled access	×	√	×	×	×	√	×	√
6.	Parking space	√	√	√	×	×	×	×	√
	Total	**4**	**2**	**1**	**0**	**0**	**1**	**0**	**2**
	Percent	**67**	**33**	**17**	**0**	**0**	**17**	**0**	**33**

Source: Field data, 2013

Seating Area: The seating area is only available at Central railway station, the passengers normally standing at different places or houses until the train pass at the station.

Fig.4.9 Kariakoo Station

Figure4.10 Railway Station Seats

Lighting: There is no light to all stations except at central railway station. And at this station, there are few lights available. Other stations make passenger's life in danger for night travel.

Passenger Information Display: The passenger information in the train is available but there is no passenger information display in the stations .Stanbury and Scott said that in their research towards improving the accessibility of commuter rail to special needs that in keeping with this world, he specific needs of disabilities, the young and elderly were not always considered when commuter rail networks were concentrated in South Africa.

Disabled Access: Disabled persons enter into the train easily to those stations which have platforms like Central railway station, Kariakoo, Mwananchi and Ubungo Maziwa station but other stations there is no accessibility of disabled persons. It is this reason few or no dissabled persons are available in the train.

Parking space: Dar Commuter train has four stations which can help to accommodate vehicle's owner to park and use the train due to space available at those areas. Those stations are Central Railway station (RWY), Kariakoo (KKO),

Mwananchi (MWA) and Ubungo Maziwa (UBG).I f the space will be used for parking they can shift motor vehicle users to rail mode to use a commuter train.

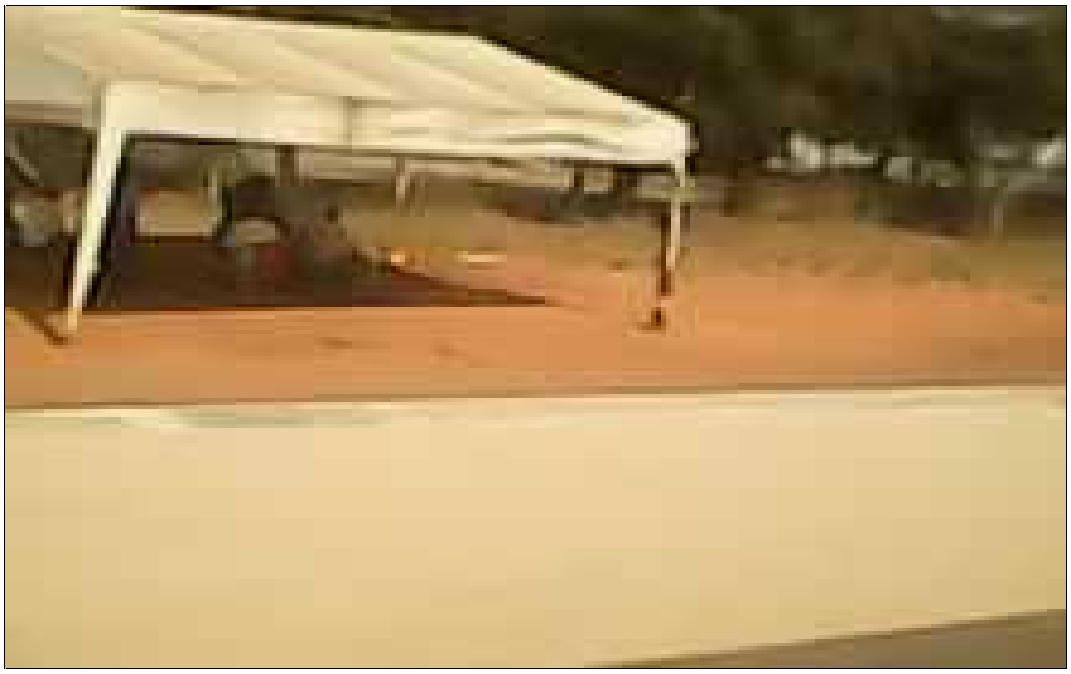
Hamer, (2008) said that ‘‘Providing accessible, cheap and plentiful car parking at commuter railway stations is often advocated as a means of encouraging car drivers to shift to public transport modes for part of their journey’’. A review of park and ride use on London commuter rail lines indicated that each new parking space generates between 0.1 and 0.3 new return rail trips (Niblett & Palmer, 1993). A study of the Wellington commuter rail system in New Zealand found that only 1% - 3% of motor vehicle users would switch to park and ride if additional parking spaces were available or car park improvements were made (Land Transport, New Zealand, 2007).

Figure 4.11 Photograph 4. Ubungo Maziwa Station

Passengers waiting to board at Ubungo Maziwa in the Morning session

Source: *Field data, 2013*

Figure4.12, Photograph5;Ubungo Maziwa Station



Some of food vendor who help passengers from the sun and rain at Ubungo Maziwa.

Source :*Field survey,2013*

Figure 4.13:Photograph 6; Kariakoo/Kamata Station

Figure4.14Area aroundMabiboStation

Area which can fit for Parking at Mabibo

Figure 4.15 Mnyamani Station

Man waiting for the train at Mnyamani

Figure4.16Empty Seats

Commuter train moving with empty seats to Ubungo in the morning.(researcher)

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter draws conclusions on the findings based on the research objective, research specific objectives and questions and, gives recommendations on improving negative aspects of the findings on sustainability of Dar es Salaam Commuter Train in reducing traffic congestion. Further, it gives recommendation on the need for further study. Therefore, the chapter is divided into three sections, i.e. conclusions, recommendations and need for further research.

5.2 Conclusion

The main objective of the research was to examine the factors that would influence good services as well as attracting more riders to achieve sustainability in reducing traffic congestion in the city of Dar es Salaam, while the specific objectives were to assess the quality and reliability of the services provided,to understand passenger's perception on comfort and to observe current condition of the stations used by Dar Commuter Train. Generally, the finding was revealed that Dar commuter train failed to attract passengers due to terminal facilities and reliability of the train. For example in terminal facilities ,there is no park and ride facilities to encourage for those who have cars to park their cars and take train to their work place and when return home to ride their car to home area.

If this could be done, it will reduce the number of cars in the congested areas during the peak hours in the morning and evening. Also for other passengers during the rainy season fail to be attracted because there is no shedding in train stops, people are standing waiting the train even in the hot and rain. Reliability of the train also contributed to a few number of passengers due to failure of locomotives which cause suspension of the services for long period and when it start to resort there is no information for resuming.

Passengers perception indicates that 118(71.5%) of the respondents are very satisfied with quality of service it means that the services should be continued with the improvement in the future time so as to attract more passengers.

Nevertheless, the study found some shortcoming like narrow area used by commuter area. Houses, Food Vendors and businesses are very close to the railway track so that it can endanger the life of people .So the immediate action should be taken to avoid this before the accident of the train to happen.

5.3 Study recommendations

This research provides some recommendations to improve Dar Commuter Train Services in reducing traffic congestion in the city.

5.3.1 Identification of factors that attract riders/passengers

Means of attracting riders/passengers should be considered so as to attract more passengers. This would enable TRL to increase revenue as well as to help the community transport problems in the city. The condition of train stops is very poor you cant know where the train will stop there is no any indication of train stops except at City Railway Station ,Kariakoo and Ubungo Maziwa .An action research needed to be done to identify other attractive ways of passengers.

5.3.2 Improvement of rail infrastructure and modernization of Railway Equipment

The improvement of rail infrastructure should be needed so as to avoid stopping of the train services.TRL should acquire modern equipments since they use old locomotives which have been renovated or rehabilitated in the service. These old engines make the service to be stopped for couples of days and passengers return to use road transport (daladala service) as an alternative means of transport and finally it led to traffic congestion in our road as previous days .To have a modern equipments like locomotives will ensure the service to be provided in efficiency, effective, dependable, reliable and secured rail service.

5.3.3 Passengers Information System

TRL should find a comprehensive and intensive information system which can be placed in each train stops. This will enable the passengers to where the train is and what happened to the train in case of broken on the way. Automatically this will help passengers to use other means of transport because they get information for the train. For the passengers information inside the train TRL should be acknowledged for the information to know which stop are we now and what is the next stop so that the passengers should be prepared to take off the train.

5.3.4 Train Frequencies and Timetables

TRL should increase the frequencies of the train instead of 3 trips in the morning and 3 trips in the evening. By increases the number of trips will cause the timetable to change**.**

5.3.5 Integration between rail and other road based modes.TRL and government should make sure that there must be integration between rail and other modes of transport like road. If there is enough space for vehicles to pass and join the train trip it would be better for the attraction of passengers

5.3.6 Security of passengers at the stations

Security is very important aspect in attracting passengers. During night some stations are in very dark condition so it is hard for the passengers to wait for the train.TRL should make sure that safety are given first priority**.**

5.3.7 Government Intervention

The government should continue to invest more on railway transport sector because rail is a good source of income and mass movement of people**.** Rail passenger transport is generally not financially sustainable without government assistance. Rail transport is, therefore, often viewed as an essential social service and economic enabler that is to the good of society as a whole. This is supported by the lower environmental impact, larger capacities and the spatial form-giving characteristics of an effective and efficient passenger rail transport system. To be among the major

emerging industrial and rapidly developing countries in the world, only government's commitment is needed in building railways which link all parts of the country. We have the potential needed for industrial revolution and this would be a great opportunity for the country to increase foreign investors and kicking away a dependent budget and other social difficulties.

5.3.8 Extension of the service

The train services should be extended to other area like Mbezi, Kimara etc because it has observed that many passengers come from Ubungo area and other neighbouring zone. If the train arrives at Ubungo Maziwa in the evening the passengers arranged in groups to Ubungo area. This implies that people coming Ubungo, Mbezi, Kimara, and Kibaha etc

5.5 Area(s) for Further Research

It is suggested that further research must be done on sustainability of another commuter train at TAZARA toward reducing traffic congestion in city of Dar es Salaam.

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C: Documents Reviews

Reports on/by DART Project
Dar es Salaam Transport Policy and System Development Master Plan
Studies related to Dar es Salaam Transport and Other documents on International Public Transport Practices
National Transport Policy

QUESTIONNAIRE A

To be filled by Train Commuters

Dear Respondent;

I'm a Student of Masters Degree at Mzumbe University Dar es Salaam Business School undertaking a research titled, **Sustainability Assessment of Dar Commuter Train in reducing traffic congestion. The case of TRL.**

Your assistance in filling out this questionnaire will help this study to achieve its objectives.

I would like to assure you most sincerely that whatever any information provided by you through these questions will strictly be confidential and used for research purpose only.

Yours faithfully

Thanks

Salum Mihayo

1. Sex

□Male □ Female

2. What is your age?

□below 18 □18-25 □25-29 □30-35 □Above 35

3. What is your Employment Status?

□Employed

□Unemployed

□Student

□Retired

□Other, specify/ _____

4. Are you satisfied with quality of service offered by Dar commuter train?

□Very satisfied □ Satisfied □Neither □Dissatisfied □Very dissatisfied

5. Write the word YES for comfortable and NO for not comfortable

□Booking…….. □ Boarding…….

□Seating……. □ Normal Standing……

□Security…… □ Customer care …….

□Overcrowded standing……..

6. Is the Dar Commuter train service provided according to its timetable?

□ Yes □ No

7. What is the condition of train terminals?

□ Good, but not attractive

□Good and Attractive

□Poor but no need of improvement

□Very poor but need improvement

□Leave as they are

8. What are your suggestions on Dar commuter train services?

……

……

……

……

……

Thanks in advance.

QUESTIONNAIRE B : STATION FACILITIES

To be filled by Researcher

Facilities	**RWY**	**KKO**	**BAK**	**MNY**	**MAT**	**MWN**	**MBB**	**UBG**	
Shelter									
Seating area									
Lighting									
Passengers Information Display									
Disabled Access									
Parking Area									

Date…… Station…….

QUESTIONNAIRE C: TRANSPORT OPERATOR

Dear Respondent;

I'm a Student of Masters Degree at Mzumbe University Dar es Salaam Business School undertaking a research titled, **Sustainability of Dar Commuter Train in reducing traffic congestion. The case of TRL.**

Your assistance in filling out this questionnaire will help this study to achieve its objectives.

I would like to assure you most sincerely that whatever any information provided by you through these questions will strictly be confidential and used for research purpose only.

Yours faithfully

Thanks

Salum Mihayo

Questions.

1. How many coaches and locomotives used in the operation?
2. What are the impacts of technical performance shortcomings on quality of service offerd by TRL
3. What measures or strategies, if any, being taken by the TRL management to overcome those shortcomings.
4. Is there any claims concerning with timetable, comfort , and station facilities? (if any please specify).
5. What measures have you taken to attract more passengers?
6. What are your suggestion to improve the service?

Thanks in Advance

Transport Minister Dr. Harrison Mwakyembe boarded a train, along with passengers, for the maiden journey.