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Weak Links in the City Logistics System of Addis Ababa

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Abstract

Addis Ababa City is geographically positioned at the center and is the economic, political, and social hub of Ethiopia. This has created significant traffic congestion and environmental pollution, and put Addis Ababa's livability, mobility, and sustainability in question for most residents. Logistics system in Addis Ababa is as good as its weakest link. The study presents factors attributed to the weak links in the city logistics of Addis Ababa, Ethiopia, that considers issues of mobility, livability, and sustainability as requirements for a metropolitan city such as Addis Ababa. Delphi technique that comprises 22 experts from logistics profession, practitioners, and academia was selected to rate their perception of the current bottlenecks (weak links) in the city logistics of Addis Ababa. In addition to empirical literature, observation of traffic congestion at roundabouts, participant observation, five key informants, and secondary data sources were further used to draw conclusions and forward recommendations. Inadequacy of pedestrian roads design, substandard roundabout design, inadequate parking facilities, the prevalence of old vehicles due to lack of green transport policy, lack of scheduled logistics service providers among public transport, and freight logistics at different time made city of Addis Ababa below standard in terms of livability, mobility, and sustainability.

Keywords: City Logistics, Pedestrians, Roads Design, Weak Link, Green Transport Policy

Introduction

As of December 2019, the total number of vehicles in Ethiopia is 1,151,893 of which 613,638 vehicles are located in Addis Ababa City.[1] These vehicles are used for passenger transport, freight logistics, and construction logistics in the city. By any standard, this implies that there is a small number of vehicles per capita for Ethiopian population for over 110 million. Optimal city logistics has to make a trade-off among three goals, i.e., mobility, sustainability, and livability. Logistics system in Addis Ababa is as good as its weakest link among interaction of three multifaceted factors: regulation, operation, and infrastructure. Any bottleneck in any of the three factors will constrain logistics system optimization. Each factor has its own complex elements that will contribute to the overall effectiveness of logistics system in the case analysis of Addis Ababa City. Addis Ababa City, in multidimensional thinking, is geographically positioned at the center, and is the economic, political, and social hub of Ethiopia. It is also a political headquarters of African Union with 54 member states and hosts the headquarters of the United Nations Economic Commission for Africa (ECA), as well as various other continental and international organizations. Accordingly, there is regular high volume of freight and public transport services with exponential increase in and out of the city. This in turn has created significant traffic congestion and environmental pollution, and put Addis Ababa's livability, mobility, and sustainability in question for most residents.

Based on anecdotal sources and empirical observations, weak links in the city logistics of Addis Ababa are attributed to multi-dimensional factors. These are mainly related to:

- lack of synchronized city logistics,
- lack of adequate pedestrian roads,
- lack of standard roads design,
- driver's competence issues in terms of behavior and skill,
- age of vehicles,
- lack of adequate parking facilities and services,
- traffic accident,
- cross roads design problem,
- roundabout design problem,
- absence of carbon tax and toll roads,

[1] Ethiopian Federal Transport Authority, 2019.

- absence of legal infrastructure for sharing transport,
- and lack of devolution of logistics services from the city such as warehouse, coffee hauling machines, and manufacturing factories.

Therefore, there is a need to analyze whether these factors have attributed to the city logistics weak links of Addis Ababa City.

Literature Review

Supply chain, in general, and city logistics, in particular, have been facing increasingly complex challenges posed by transitions in economic structures, urbanization, city design and transport systems, as well as by the external factors related to logistics activities in cities (Cardenas et al., 2017). (Diziain et al., 2012) stated that logistics is becoming an important source of employment and a generator of wealth in cities, but constrained by the negative externalities of freight transport which is explained by increasing via pollution, congestion, and inefficient use of resources, for example, poor performance in load factors. Since most negative effects related to urban freight transportation is visible at traffic market, other markets (i.e. transport, trade, etc.) have received far less attention from researchers in city logistics research (Anand et al., 2012). City logistics, which focuses on the efficient and effective transportation of goods in urban areas while taking into account the negative effects on congestion, safety, and environment, is critical to ensuring continued quality of work life in cities (Savelsbergh & Woensel, 2016). City logistics is aimed to optimize urban transportation systems that is an interaction of several factors (Crainic, 2008). On the other hand, the World Bank report (2018) on logistics performance index (LPI) puts the overall logistics performance of Ethiopia as "low," ranking the country at the lower end of the surveyed countries, even below the Sub-Saharan average in most of the indicators. In reality, the logistics system of the nation is deteriorating when compared with other countries.[2] A study done by (Yetnayet, 2012) shows that there are inadequate levels of infrastructure in parts of the current road network of Addis Ababa, particularly the peripheral areas suffer from lack of roads. On the other hand, roads in the central areas of the city of Addis Ababa have capacity limitation. Ethiopian logistics system is characterized by poor logistics management system and lack of coordination of goods transport, low level of development of logistics infrastructure, and inadequate fleets of freight vehicles in number and age, damage, and quality deterioration of goods while handling, transporting, and in storage. This coupled with lack of seaport resulted in poor linkage of producers (farmers) to the consumers (market) and noncompetitiveness of Ethiopian goods in global market, which compromised livelihood of the people and economy of the country (Fekadu, 2013). There is very high rate of traffic accident (first in the world) and congestion in cities and at city inlets/outlets to which freight vehicles contribute significantly (Fekadu, 2013). Similar study made on Addis Ababa Transport Policy revealed that there is no compatible urban transport supply and effective management to meet the increasing trip frequency and mobility needs of the people and goods, which resulted in the seriousness of the issue. The challenges of the urban transport include poor access to workplace, education, health and other services, due to lack of public transport service, continuous increases in transport fair especially for low-income groups, lack of smooth traffic flow, lack of infrastructure for nonmotorized transport (NMT) (for walking and bicycle), high rate of traffic accidents, and increasing air and noise pollutions (Ministry of Transport, 2011). A study made by Melkamu (2016) also found that foreign currency shortages, higher taxes, lack of integrated system, and long lead time in ports are found to be the critical challenges of logistics for selected firms in Ethiopia. On the one hand, study done by Mulu (2015) on public transport system of Addis Ababa revealed that increasingly heavier reliance on vehicles with small passenger-carrying capacity commonly called mini buses is resulting in congested junctions, with heavy traffic. According to Gebretsadik (2019), lack of physical facilities (IT infrastructure especially in the private sector); poor coordination among the sect oral agencies, reliance on paper documents, fax, and emails in the exchange of official information between government agencies and the private sectors are the major challenges identified in the multi modal transport system of Ethiopia.

Even though, there are empirical studies related to logistics system challenges in terms of operations performance in Ethiopia, in general, and transport problem in Addis Ababa, in particular, there is no comprehensive study made to address the city logistics systemic problem in Addis Ababa. Factors attributed to the weak links that constrained the optimal flow of goods and mobility of people in the city that accommodates mobility, livability, and sustainability were not fully explored by prior researchers. Therefore, this study will assess weak links in the city logistics of Addis Ababa by considering factors related to freight and people

[2] (http://ethiopianbusinessreview.net, access date, June, 2019).

component of logistics to provide evidence based on experts' opinion to enable understanding optimal city logistics in Addis Ababa.

Research Methods

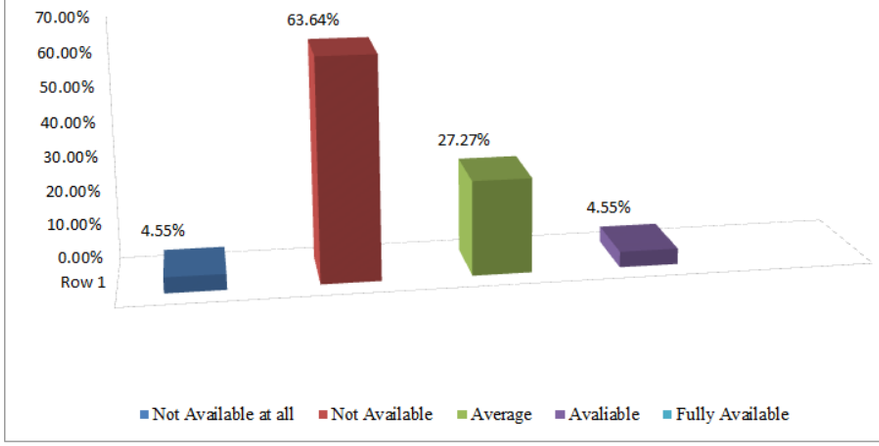
Addis Ababa City logistics weak links were identified from literature and analyzed based on empirical observation and perception survey using online survey monkey from different logistics practitioners, professionals, and regulators who have knowledge on the city logistics of Addis Ababa purposely selected using the Delphi technique approach. Based on access to the networks of logistics professionals, practitioners, academicians, and various stakeholders, key informants with a sample size of 22 were considered as sources of calling population for such kind of observation is assumed to be large (infinite). The data collection was made in the months of September and November 2019. Expert's opinion was measured in Likert scale of one to five. In addition, focus group discussion was made with five experienced managers in the field of logistics related to weak links in the city logistics of Addis Ababa City. Participant observation was made across all directions of Addis Ababa City on all identified weak link factors over the past 5 years, as the researcher is the resident of Addis Ababa.

Data Analysis

Based on the data obtained from the opinion of 22 experts and five key informant interviews on city logistics weak links in Addis Ababa, the accompanying analysis is made followed by a discussion and a conclusion. The analysis covers factors related to pedestrian roads and traffic accident, parking services, green logistics in the city, drivers' competence in terms of skill and behavior, legal infrastructure for sharing economy, design issues, devolution of logistics function from the city, and synchronized city logistics schedule for different transport system as presented below.

Weak Links Related to Pedestrian Roads and Traffic Accident in Addis Ababa

Rate pedestrian roads as: 1 = not available at all to, 5 = fully available



	NOT AVAILABLE AT ALL	NOT AVAILABLE	AVERAGE	AVAILABLE	FULLY AVAILABLE	TOTAL
ROW 1	4.55%	63.64%	27.27%	4.55%	0.00%	
	1	14	6	1	0	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	1.00	4.00	2.00	2.32	0.63

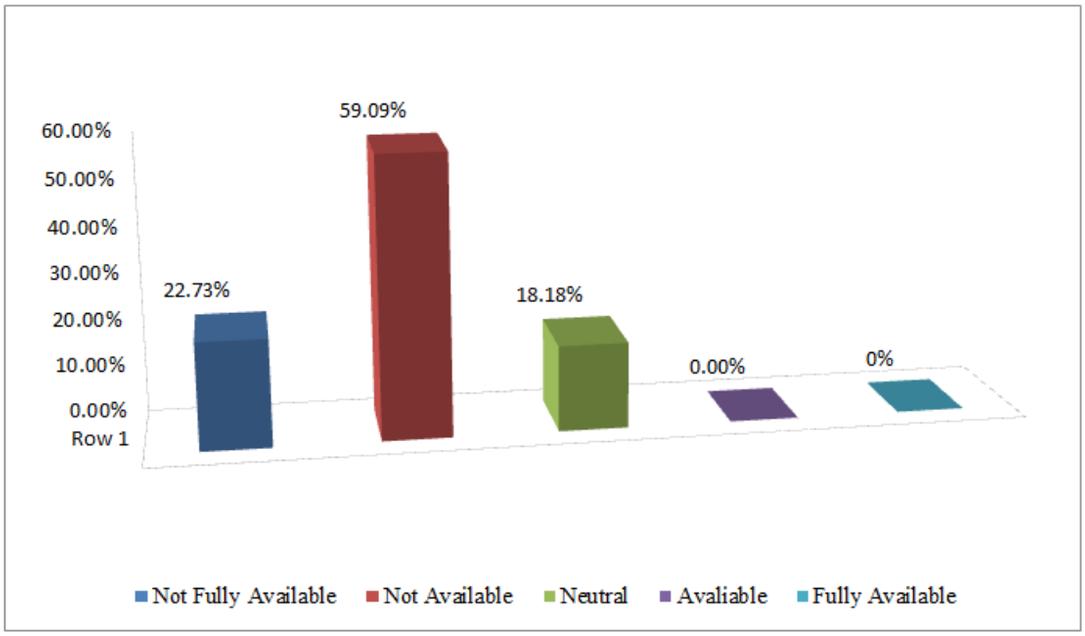
Source: Own Survey, 2019

Fig. 1: Pedestrian Roads and Traffic Accident

As evidenced from Fig. 1, most of the respondents (about 68%) perceive that Addis Ababa pedestrian is not available to the expected standard commensurable to the number and the frequency of people mobility within the city. On the other hand, about 32% of the respondents replied adequate pedestrian road is available in Addis Ababa City.

Weak Links Related to Parking Services in City Logistics

Parking Service, 1 = not available, 5 = fully available



	NOT FULLY AVAILABLE	NOT AVAILABLE	NEUTRAL	AVAILABLE	FULLY AVAILABLE	TOTAL
ROW 1	22.73%	59.09%	18.18%	0.00%	0.00%	
	5	13	4	0	0	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	1.00	3.00	2.00	1.95	0.64

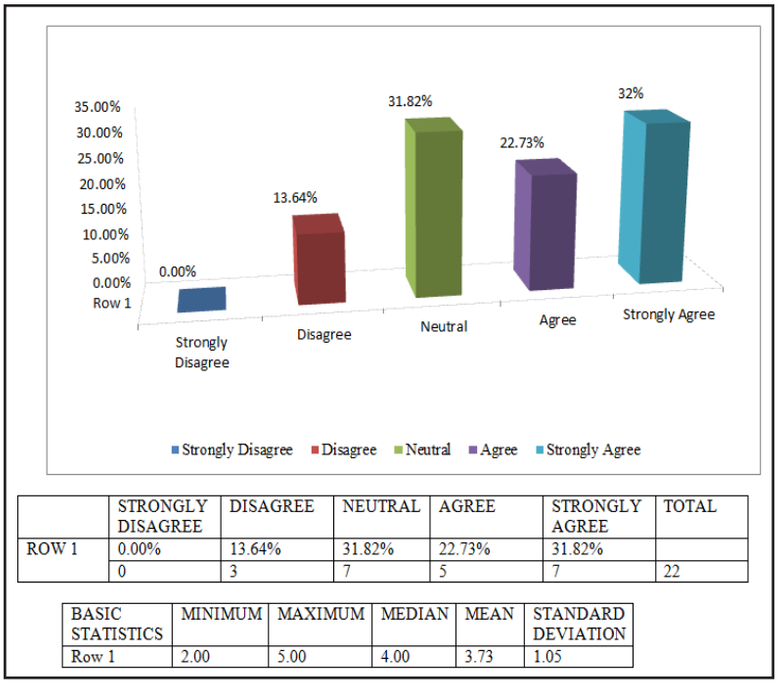
Source: Own Survey, 2019

Fig. 2: Parking Services

Fig. 2 depicts experts' opinion with regard to avaialability of adequate parking services in the city. Accordingly, mean response is 1.94 with 0.64 standard deviation. This indicates that parking service in Addis Ababa is not avaialble to the expected capacity to accommodate vehicles in the city as confirmed with majority response of about 81%.

Weak Links in Green Logistics

Banning of old vehicles, 1 = strongly disagree, to 5 = strongly agree



	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	TOTAL
ROW 1	0.00%	13.64%	31.82%	22.73%	31.82%	
	0	3	7	5	7	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	2.00	5.00	4.00	3.73	1.05

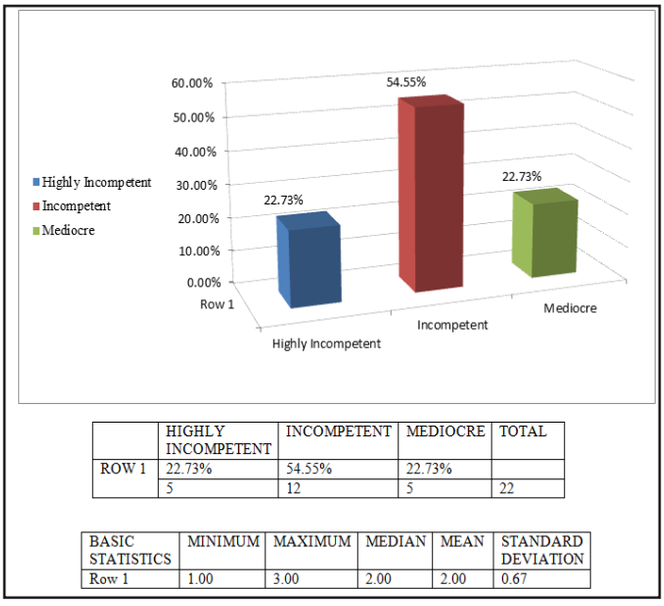
Source: Own Survey, 2019

Fig. 3: Green Transport

As portrayed in Fig. 3, majority of the respondents gave their opinion on their agreement on the need to ban old vehicles by introducing green transport policy in the city with a majority response rate of about 54%. The presence of large number of old vehicles in Addis Ababa has created many problems in addition to increased air pollution through carbon emission. These are high fuel consumption, frequent and high maintenance cost for which foreign currency is required to replace spare parts, nonavailability of spare parts for old models, etc.

Driver's Competence Issues in Terms of Behavior and Skill

Rate drivers competence as 1 : highly incompetent, to 5 = fully competent



	HIGHLY INCOMPETENT	INCOMPETENT	MEDIOCRE	TOTAL
ROW 1	22.73%	54.55%	22.73%	
	5	12	5	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	1.00	3.00	2.00	2.00	0.67

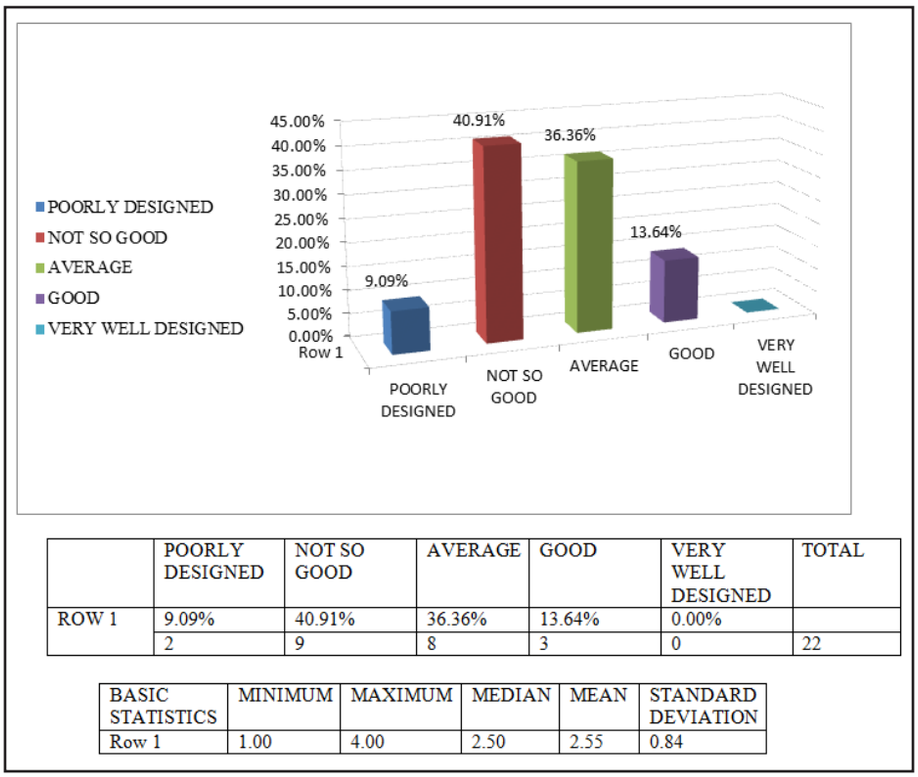
Source: Own Survey, 2019

Fig. 4: Driver's Competence

As shown in Fig. 4, respondents rated competence of drivers (in terms of behavior and skill) below average with mean of 2 and standard deviation of 4. As driving demands technical expertise, being rated below average by the expert opinion is worrisome for license-issung agency of the city where incompetence in the areas of driving may contribute to traffic accident in addition to other factors explained in another section.

Roads Design Problems (Cross Roads, Roundabout, or Square)

Round about ('adebabay'), 1 = poorly designed, 5 = very well designed



	POORLY DESIGNED	NOT SO GOOD	AVERAGE	GOOD	VERY WELL DESIGNED	TOTAL
ROW 1	9.09%	40.91%	36.36%	13.64%	0.00%	
	2	9	8	3	0	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	1.00	4.00	2.50	2.55	0.84

Source: Own Survey, 2019

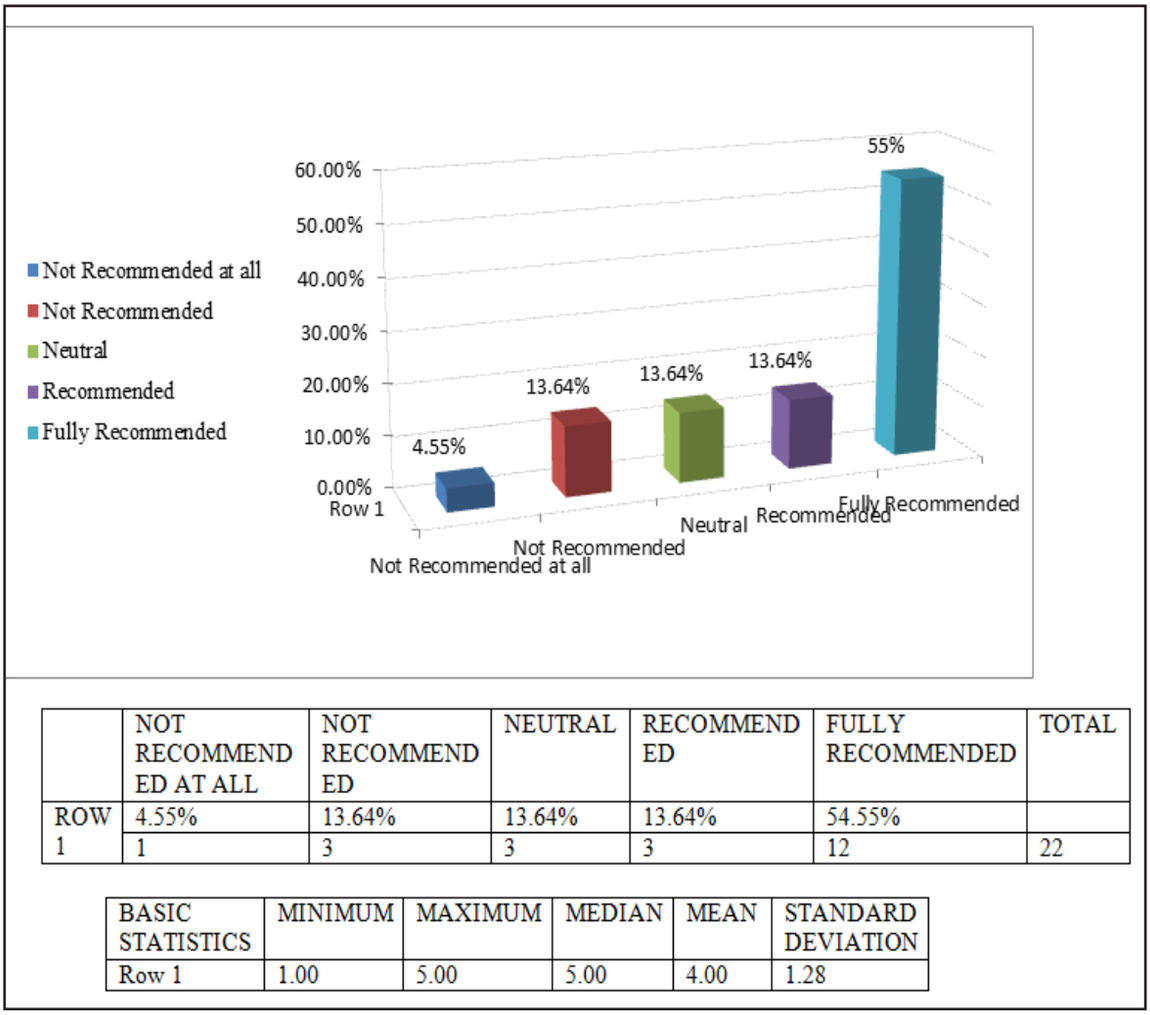
Fig. 5: Roads Design

As depicted in Fig. 5, roundabouts' design is identified as one of the weakest links in the roads design of Addis Ababa City. As this bottlencek determines the capacity of traffic flow in the city, the strength of seamless transport system in the city is as good as the strength of the weak system (roudabout design) in the city to affect the rate at which vehicles pass through roundabouts. Furthermore, a five-day observation (from 19/09/2019 to 24/09/2019) on two variables lengeth of the queue of the vehicle from the roundabout on 168 road squares (roundabouts) and number of passengers crossing the roads on 21 railway junctions were made in two shifts of the morning (7 am to 9 am) and afternoon (4 pm to 6 pm). The study found that on average vehicles queue with 650 and 500 meters distance from the square with standard deviation of 200 and 120 meters in the morning and afternoon, respectively, and it took vehicles on average of 11 and 6.5 minutes with standard deviation of 3.5 and 3 minutes in the morning and afternoon, respectively, to cross the road square to the intended direction. This distance and duration will positively increase in the future due to exponential increase in the number of vehicles entering in to the city without equivalent infrastructure development to accommodate the new entry vehicles to the already existing congested vehicles. Based on five days observation, number of passengers' traffic from railway station to main road per minute are found to be mean of 46 with standard deviation of five passengers. As shown in the empirical data, the road squares and cross roads on the railway cross Addis Ababa City are the major bottlenecks that mitigate the smooth traffic flow in the city. Even though, currently the city has

less car population (over 600,000 vehicles), which is in principle expected to be less congested traffic flow for Ethiopia's capital Addis Ababa City of estimated around five million population.

Absence of Legal Infrastructure for Sharing Transport

Sharing transport, with private plate number like Ride, 1 = Not recommended, 5 = Fully recommended



	NOT RECOMMENDED AT ALL	NOT RECOMMENDED	NEUTRAL	RECOMMENDED	FULLY RECOMMENDED	TOTAL
ROW 1	4.55%	13.64%	13.64%	13.64%	54.55%	
	1	3	3	3	12	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	1.00	5.00	5.00	4.00	1.28

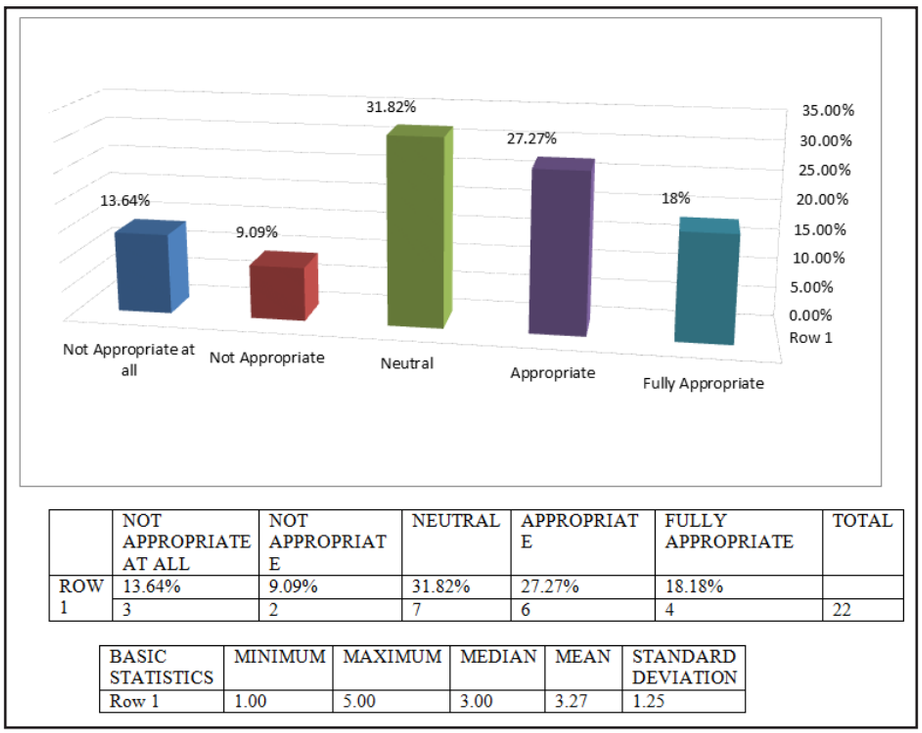
Source: Own Survey, 2019

Fig. 6: Sharing Transport

Fig. 6 portrays experts' opininon with regard to the importance of sharing transport in public transport with private plate number, coded as number 2 in Ethiopia, and replied positively (about 68%) with mean response of their recommendation of 4 point in a five-point scale. This implies that sharing transport such as the Uber model in the world can be a replicable cas to minimize weak links related to supply shortage of public transport and enhance smooth mobility of people in the city logistics of Addis Ababa.

Banning Freight Logistics Services from the City During Working Hours

Banning freight logistics during public transport, 1 = not appropriate at all, 5 = fully appropriate



	NOT APPROPRIATE AT ALL	NOT APPROPRIATE	NEUTRAL	APPROPRIATE	FULLY APPROPRIATE	TOTAL
ROW 1	13.64%	9.09%	31.82%	27.27%	18.18%	
	3	2	7	6	4	22

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Row 1	1.00	5.00	3.00	3.27	1.25

Source: Own Survey, 2019

Fig. 7: Banning Freight Logistics in the City

Fig. 7 depicts experts' opinion on the appropriateness of the bannning of freight logistics during day time in favour of easing congestion for public transport and significant number of respondents rated as appropriate (about 46%) and about 32% remain neutral about the appropriateness of the directive in banning freight logistics during day operation in the city. The City Government of Addis Ababa issued a directive in 2018 to ban fregith logistics service during working hours and allowed to move only during evening after 8 pm, which has only shifted the city traffic congestion from day to evening and disrupted import and export logistics of the country. As a result, the failed implementation was attributed to lack of proper consultation with key stakeholders for not giving buffer time to prepare on the viability of the proposed directive to ban freight logistics in Addis Ababa City.

Lack of Synchronized City Logistics Schedule

Focus group discussion was made with experienced professionals on the level of synchronized city logistics in Addis Ababa and almost all of them perceived that "there is lack of synchronized city logistics system in Addis Ababa in terms of regulation, operation, infrastructure and ownership to centrally coordinate the system." Addis Ababa is a metropolitan city with complex socioeconomic and political activity of Ethiopia and is the seat of African Union. Synchronized logistics in to and out of the city is deemed necessary to achieve multiple goals of mobility, livability, and sustainability.

Discussion

Addis Ababa City Government report indicates that significant majority (more than 60%) of Addis Ababa residents are pedestrians who walk on foot from home to work and vice versa. Because of the low level of economic development of the country and over population as compared to its infrastructure, a large number of pedestrians are expected and observed in Addis Ababa City until they reach middle-income group and buy their own car. Infrastructure (roads, rails, cables, pipelines, etc.) is designed to enable the mobility from source to destination and vice versa. According to their customized need, all need their own infrastructure for pedestrian, bicycle, motorcycle, flood, vehicles, rail, etc. In the absence of synchronized logistics in terms of infrastructure, regulation and operation, freight logistics and people mobility can not be optimally served in city logistics. Accordingly, in the context of Addis Ababa City, contrary to the fact that majority of residents are pedestrians, the city government is instead focused on constructing roads dedicated to vehicles and rail, ignoring

pedestrian roads as reflected in the budget for roads in the city. Lack of standard pedestrian roads in the city, which resulted in competing behavior of the same lane especially on the cross roads between vehicles and pedestrians, has also resulted in significant number of regularly observed traffic accident in the city. This is further explained by "the law of large number"—as more people are exposed to traffic flow, the probability that individual person got hit is less. On the other hand, it is statistically high probable that the vehicle hits the exposure unit on the road. Pedestrians and passengers of commercial vehicles are the most vulnerable in Ethiopia, whereas in high-income countries' crashes involve primarily privately owned vehicles with the driver being the main car occupant injured or killed. In the United States of America, for instance, 60% of the fatalities account to car drivers, while in Ethiopia, 5% account to drivers (UNECA (2009)). This implies that in one crash the number of people killed or injured in Ethiopia is about 30 times higher than in the US. Furthermore, the study done by Matiwos (2015) showed that on average car-related fatal yearly accident to the pedestrian is on average 330 and over 42 million Birr material damage. This trend of traffic accident is expected to increase in the coming 10 years and start to decline then after Ethiopia envisaged becoming a middle-income country by 2030.

With regard to parking service availability linked to weak link factor in the city of Addis Ababa, with the increasing number of vehicles, buildings, narrow lane roads, and large number of pedestrians on the Addis Ababa roads, it is becoming evident that parking service for vehicles becomes a strategic issue for the Addis Ababa City Council to be addressed. The existing parking space and station is inadequate and suffers from structural problems, mainly street parking, and loading and unloading at curb roads. Consequently, it has contributed to inefficient utilization of the road network, safety, and congestion problems. Thus, parking remains one of the critical issues that needs to be addressed through the transport planning of the city. The basic flaw in the parking services of Addis Ababa is allowing vehicles to park on asphalt road on both right and left sides, where from the outset we do have narrow lanes, spontaneous crossings, and with no predetermined seamless flow of vehicles with predicted speed, that also mitigate the smooth traffic flow. Furthermore, anything that hinders the traffic flow for parking, loading/unloading of goods, passengers pick up or drop out, street trading will mitigate the smooth flow of traffic system of the city and create unnecessary congestion in the future.

On the third variable of Addis Ababa City logistics weak links, green transport policy was found to be a factor as explained by old vehicles imported as salvage products from the Middle East and developed nations due to affordability of the vehicles in Ethiopia, which has significantly contributed to the Addis Ababa City pollution. Green transport is a concept used to use transport assets in an environmentally friendly way in the provision of transport services for the customers while moving goods or mobilizing people from source to destination. The transport asset has to go with the year of its manufacture (age), type of technology of the vehicle, and the energy it uses during movement. Most transport assets, in Ethiopian context, are almost all vehicles rely on fuel energy for movement, which emits carbon. Such kind of carbon emission from aged car is presumed to be higher, which contributes significantly to the air pollution of Addis Ababa in addition to the other factors. Empirical evidences and participant observations witness that most of the vehicles in Addis Ababa and the country are of old-age category with their manufacturing period dating back to the 1980s and 1990s. Most of the vehicles manufacturing period were before 2000s.

With regard to drivers' competence in the city of Addis Ababa, consistent to the experts' opinion implies that people who engage in private, commercial, or government vehicles' driving lack the required behavioral competence required to use shared public road in harmony in addition to adherence to traffic law for city logistics operations.

The other variable that was found to be bottleneck in the city logistics of Addis Ababa is road design, especially roundabout. In the absence of standard roundabout roads design, it is expected that traffic congestion is created around road squares in every corner of the city. This is partly attributed to lack of robust design around road squares. Almost all road squares in Addis Ababa can be considered as bottlenecks (weak links) to the normal traffic flow, because they not only mitigate the momentum of traffic flow, but also affect the improved asphalt roads anywhere in the city that will take the vehicle via the road square, as vehicles come with normal speed and stop at square to compete and pass. Even, the speed of the vehicle is affected by the capacity of the road squares to serve competing vehicles to pass using the same lane, which is observed to be substandard roundabouts with long queue for vehicles passing to different direction. Therefore, it can be concluded that the quality of road infrastructure of Addis Ababa is as good as its road squares' design in different parts of the city that affects the smooth traffic flow of vehicles in the city. Improving road capacity in Addis Ababa anywhere else without improving the weak links (the road squares) will only exacerbate the existing traffic congestion of the city logistics. In the Author's view,

it is only the "Gotera" Road Square that is robustically designed to serve vehicles to keep their momentum and cross the square without stoppage or decreasing the speed.

One way to address weak links related to shortage of vehicles for city logistics services in Addis Ababa is through the practice of sharing transport derived from sharing economic theory. The sharing economy refers to economic and social systems that enable shared access to goods, services, data, and talents. These systems take a variety of forms but all leverage information technology to empower individuals, corporations, nonprofits, and government with information that enables distribution, sharing, and reuse of excess capacity in goods and services.[3] Resources shared on peer-to-peer rental platforms may be goods, such as apartments, tools, cars, entertainment equipment, clothing, etc. However, they may also have service character, as for instance a spare car seat on the way from Amsterdam to Zagreb, or the use of the living-room couch for an overnight stay Hawlitschek Florian and Teubner Timm (2016). Based on the data analysis, factors attributed to city logistics weak links of Addis Ababa among other factors are: vehicle supply shortage, long queue to get the available transport service, high traffic congestions especially around bottlenecks (cross roads, road squares and narrow lanes) in the city for vehicle owners, and increased rural migration to the city, lack of pedestrian roads, demand for more transport service in terms of quality and quantity in the city, and high traffic accident prevalence in the city. Such weak links necessitates, among other solutions, the need to avail alternate solutions like sharing transport from private automobile owners to address the city's transport problems.

On the other hand, banning of freight logistics from Addis Ababa City was a temporary measure with failed implementation due to lack of proper consultation with stakeholders, effective solution was sought on how to trade-off between efficient transport system in the city by accommodating freight logistics through devolution of some of logistics services in Addis Ababa. Accordingly, key informant interview with five experts in the areas of logistics as professionals, practitioners, and academia on way city logistics in Addis Ababa should be managed. The discussion was triggered based on the new directive issued by the city government in June 2018 that banned freight logistics services during peak hours in and complete ban of motor cycles for public transport. The directive lacks comprehensive approach in addressing effective solution by linking city logistics to import and export logistics of the country due to lack of stakeholder engagement before issuance of the directive. As a result, the directive was partially lifted the ban of freight logistics during daytime as it has severely affected import and export logistics of the country. Accordingly, discussants explained that as Addis Ababa is an international city hosting African union, economic, socio-political hub of Ethiopia, it should evolve in to a service city that balances the three goals of mobility, livability, and sustainability. This is possible through evolving the city in to service logistics by devolving heavy asset intensive logistics functions like manufacturing, warehousing, hauling, containerization, packing, etc., in to suburb of the city and other regional headquarters in the country.

Finally, synchronized city logistics requires public mobility using public transport that also includes walking, bicycling, and private and public transport assets such as buses, automobiles, light rail transport (LRT), air transport (conventional in the future, chartered, drone, cable, etc.) to be served in streamlined way. On the other hand, freight logistics for the residents should be distributed to retail shops in a way it serves time and place utility. These two functions of public mobility and freight logistics should be carried out without affecting the livability of the city. Both mobility and livability should take in to the future aspects of logistics (sustainability), i.e. logistics should operate in harmony with nature. As observed in the city, the three common goals of city logistics of Addis Ababa fall short of mobility, livability, and sustainability. This is justified by the observed long queue of passengers in the city, as city pollution mainly attributed to carbon emission from logistics assets and waste and disposals from freight logistics, and the use of old cars in the city.

Conclusions

Based on the expert's opinion key informants' interview, observation of traffic congestion, and participant observation over five years and empirical literature, the following conclusions are drawn with regard to city logistics of Addis Ababa. One of the weakest links in the city logistics of Addis Ababa is substandard roads design, which ignored the majority pedestrians of the city, which is characterized by inadequate, under invested and exposed people to traffic accident. Besides, parking services in Addis Ababa City are becoming inadequate and found to be among the weakest link of City logistics in Addis Ababa. On the other hand, the banning of freight logistics without stakeholders consultation was found to be in appropriate, as it has severely affected the import and export logistics service by disrupting their timely

[3] BBC News, December 5, 2014.

flow of goods in and out of the city. The banning of old vehicles in the city was found to be appropriate that should be supported with green transport policy. Finally, lack of synchronized city logistics in Addis Ababa failed on mobility, livability, and sustainability factors for residents of Addis Ababa.

Based on the conclusions drawn, the following recommendations are forwarded to address city logistics weak links in city logistics of Addis Ababa in a systematic was by introducing the following policy and executive measures. Introduce green transport policy (electric car by 2040), which should immediately begin by banning import of old vehicles. Addis Ababa city air pollution caused by old vehicles can be mitigated through introducing carbon tax based on the level of their emission. Besides, the country should introduce a green transport policy by starting the prohibition of import and of old vehicles to Ethiopia. On the other hand, Traffic congestion in poorly designed roundabouts, narrow lanes, and inadequate parking services can be mitigated through implementation of information technology policy to enforce traffic regulations and establishing management schemes, such as congestion charging and toll road pricing. Furthermore, scheduling vehicle traffic for public transport, private cars, commercial vehicles, and heavy trucks demands the arrangement of twenty-four hours integrated logistics services in the city with full safety protections and insurances. To accommodate livability, mobility, and sustainability for city residents of Addis Ababa, city logistics must accommodate green transport policy by implementing investment incentives to help cargo owners and freight carriers start new, environmentally friendly initiatives for domestic assembly of electric cars, and investment on logistics infrastructure such as warehousing that are often costly to implement. Other executive decisions that optimize the devolvement of city logistics services is the arrangement of parking lots for freight logistics assets (heavy trucks) in five direction of the city, to unload goods and empty trucks to be parked including maintenance services in the suburb of the city. Devolution of logistics services from the city of Addis Ababa requires the relocation of the logistics facilities and functions (such as cleaning, packing, hauling, manufacturing, warehousing, stuffing, etc.) from the city to be served at industrial parks or at the farm gate and detour from Addis to its import destination. Finally, the city government of Addis Ababa should focus on two decision-making areas to address the weakest link at a time. Reduce exposure units (the law of large number) through economic development and robust road design to allow over pass, under pass, and zebra crossing only at traffic light areas; and focus road budget utilization on construction of pedestrian roads. Addressing Addis Ababa city logistics weak links require systematic approach that begins by budget reallocation to construct more pedestrian roads in the city, prohibit street lane parking on the right and left side of the main roads especially during peak hrs. (7-9 am in the morning and 4 pm-8 pm in the evening), building parking stations, licensing private parking real estates, and availing parking services by organizations in the city to their employees.

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