Analyzing Transport Problems in Tirana on a Sound Scientific System Base

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ABSTRACT

The globalization process taking place recent years has significantly increased the need for mobility. Due to the urban population growth and urbanization, the role of transportation engineering in daily life has mainly increased accompanied by the challenges featuring it. Of importance is the mobility on urban areas, considering the socio-economic and environmental effects. Furthermore in developing countries to such situations contribute the weak enforcement of traffic rules and regulations.

This study illustrate, analyze and provides new methodologies on optimizing traffic congestion in the capital of Albania, Tirana.

Focusing on the road network and public transportation impacts on mobility, the research seeks to outline new strategic solutions for the rapid developing capital, oriented toward society wealth as follows; i) The investigation and illustration of the strengths, weakness and improvements that could be implemented on road network and reorganization inside the urban area of the capital is of first call. ii) As the main motorized transportation mode, reorientation and coordination of public transport system directly affect the socio-economic behavior and smoother traffic flow. iii) The lack of coherent data concerning traffic information system in problematic bottlenecks directly affect traffic management in those zones. In this context, implementation of different techniques for data gathering and application of intelligent transportation system in particular areas like CBD, improves the management of the congestion. Beside, reassessment of the existing and implementation of new parking areas due to future requirements, efficiently smoothers unpredicted congestion situations. iv) Last but not list, the establishment of a framework for actions for the road network and public transportation systems of Tirana results in provision of successive recommendations and analysis. Moreover it shall evaluate the relationship and impact that and public transportation system have on each other and their effect to socio-economic development and environmental issues of the capital.

Keywords: road network, traffic volume, public transportation systems, congestion, socio-economic development.

INTRODUCTION

Motivation

The globalization process taking place recent years has significantly increased the need for mobility. Transportation engineering as the major area concerning mobility, is experiencing different challenges with a growing impact to social, economic and environmental issues of the globalization process. [1]

Due to the urban population growth and urbanization, the role of transportation engineering in daily life has mainly increased accompanied by the challenges featuring it. Of importance is the mobility on urban areas, considering the socio-economic and environmental effects on these areas [2]. According to Olayiwola et al. the main challenges concerning urban mobility are traffic congestions and management. Furthermore in developing countries to such situations contribute the weak enforcement of traffic rules and regulations [3].

In this study the main concern will be the road and public transportation systems in the capital of Albania, Tirana.

Tirana is the capital of Albania located in western of Balkan Peninsula. In last two decades it has experienced drastic changes stressed by the country's democratization and other socio-economic events and developments.

The democratization which started in 1991 accompanied by the urbanization progress in the capital city of Tirana, enforced a rapid increase of city population due to the migrations from the rural and mountainous areas [4]. According to INSTAT, the population is 640,000 counting 270% growth compared to 1989. The process of urbanization keeps progressing, predicted that by 2025 the city population will reach one million [5]. This rapid urbanization has affected the urban development, especially transportation. Knowing that 70% of urban residential areas are composed of informal settlements where the development of infrastructure and public transport access are the poorest [6].

Tirana has a strategic location regarding transportation, making it strategic connecting hubs of Southern Europe to the Black Sea strengthen by new European Highway 8. Beside, existing Tirana-Durres urban corridor linking the capital directly to the port city increases the traffic flow due to the dynamism it provides. The northern part of Albania, International Airport of Tirana (IAT) and Arber Road (under construction) connecting Tirana with Skopje acutely increase the traffic flow, knowing that all the flux actually is supported by the middle ring of the capital. Such situation requires strategic short, middle and long term studies regarding present transportation situations [7].

Objective

Strategic location of Tirana serving as a connecting hub to Durres Port, Tirana International Airport, north of Albania and soon European Highway 8 burdens the city traffic due to the high income and diversity of vehicles helped also by the lack of bypasses. Such situation stresses traffic congestions and creates negative social, economic and environmental impacts into the city area. The aim of this research is to illustrate a framework to optimize traffic congestion and it negative impacts to the environment and society.

A main concern is the problem of traffic during the peak hours inside the CBD (defined as the area inside the Middle Ring) caused by firstly, occupation of line spaces from illegal stoppages or parking which reduce the road capacity and secondly, some roads with small capacity carry large traffic volume per line neither do some others with high capacity carrying low traffic volume per line, thus contributing to congestions in particular areas of CBD [4].

The study proposes the enforcement of rules and establishing a balance between the traffic demand and road supply as a consequence expect to improve of traffic flow during peak hours. The lack of traffic monitoring systems is another factor contributing to traffic congestion [8]. The study suggests the provision of coherent traffic information in urban roads and congested areas, and usage of traffic signal control as well as Intelligent Transportation System (ITS) to locate the bottleneck, resulting to the smoothing of traffic flow.

The increase of private vehicles requires the increase of parking capacities in the capital, especially CBD. The non-effective management of authorized parking areas and on street illegal parking reduces the road capacity, causing traffic disorder, travel time increase and

traffic pollution [9]. With reconsidering on street parking regulations and construction of parking facilities especially inside CBD, paying special attention to commercial activities, business and transportation nodes better traffic flow is expect thus reducing the negative impact of traffic congestion to CBD activities.

Non-motorized mode of transportation in Tirana is widely developed. According to URPTM 30% of all trips in Tirana are ''on foot'' [6]. The insufficiencies of pedestrian facilities especially along main roads make them prone to accidents. The study expect with the improving of facilities like crosswalks etc. and sidewalks along urban roads to increase pedestrian safety and also enhances urban amenity and environment.

The bicycle lines often are occupied by illegal stopping or parking of private vehicles even their development to a certain extend. By extension of the bicycle lines and an overall reconsideration of non-motorized user needs the study aims to improve the safety of this transport mode user's.

Public transportation mode in Tirana is bus transportation, which is one of main factors effecting traffic congestion. City bus transportation is composed of ten lines mainly organized based on radial system from suburb to the city centre, as well as through centre lines (43,000 passengers/ day) and circular lines along Middle Ring (54,000 passenger/ day) [7](Figure 1).
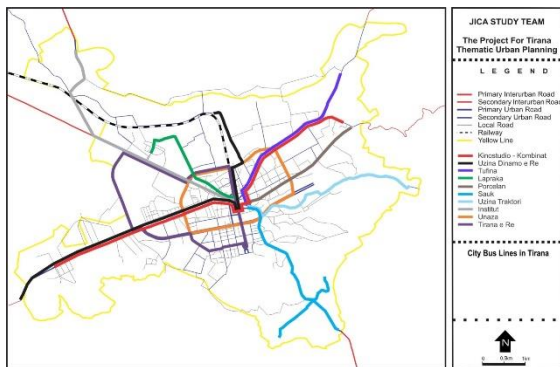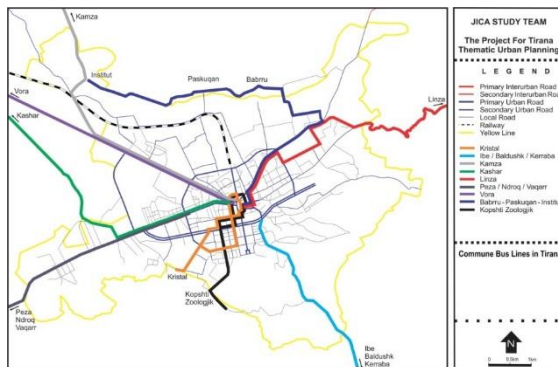

Figure 6 City bus line in Tirana   Figure 7 Commune Bus Lines in Tirana

In some road sections dedicated bus lines area applied including physical separation and markings but in limited length and continuity [6].

In order to increase the safety and regularity in traffic, the study suggest regulations of separating the public from private vehicles by considering the extending of dedicated bus lines resulting in smoother public transportation services.

In addition there are nine more commune bus lines connecting Tirana with the surrounding communes (Figure 2). The non-fixed service frequencies, overlapping with city bus lines and illegal transportation of passengers inside Tirana stresses chaotic situations resulting in traffic congestions, noise and environment pollution and increase of waiting time [7]. Thus in this study reconsidering and rationalizing of the existing bus route structure, suburban feeder bus services and possibility of regional transportation management authority is considered to be of immediate call.

Besides, the lack of a bus terminal in Tirana has encouraged creation and random location of bus stations mainly South, North and West bus stations, van stations, individual bus stations and international bus station having no toilets, waiting rooms, ticket windows etc. (Figure 3).
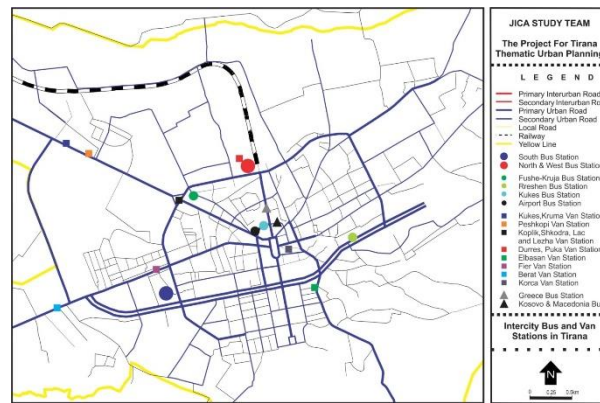
Figure 8 Intercity Bus and Van stations

This study proposes the integration of intercity bus lines into one terminal and locating outside the city area which as a consequence would secure easy access to or outside Tirana, prevent large vehicles entering the CBD and smoothing transfer of public transportation inside Tirana.

LITERATURE REVIEW

The development approaches to transportation of the past years have created significant benefits, including the increase of mobility, job creation and as a product gave economic growth. However the negative effects of these approaches are substantial. Thus the consequences include the increasing of traffic congestion, deteriorating suburban and urban areas, acute water and air pollution etc. [10]. According to Aderamo [11], congestion takes place when the transport demand exceeds transport supply at a certain time and certain section of the transportation system. Traffic and transportation challenges, especially improper public transportation has significant impact on traffic congestion. This contributes to increasing of socio-economic expenditures [12]. Olayiwola et al. [3] state that traffic congestion situation in developing countries is because of weak enforcement of traffic rules and regulations. The negative effects are the waste of time and resource of commuters and motorists; delays; difficulties in forecasting travel time and plan journeys and increase of pollution and gas emission. According to Stamos et al. [13] the complexity of managing traffic congestions in urban environments is rapidly increasing and responsible for the amelioration of these situations is Travel Demand Management (TDM). As an important TDM measure Stamos et al. (2012) presents and discusses the hypothetical implementation of High Occupancy Vehicle line in CBD, Thessaloniki. The evaluation was done through traffic simulation modelling techniques. The gained data were considered on basis of environmental and traffic evidences. The main issues of HOV line study were environmental and energy. The study proved to be beneficial, nevertheless further examinations demand of the impacts on networks. The management and control of traffic flow due to its dynamic data and continuously state changes is a hard task. Active Traffic Management is usable tool to deal with the dynamic of data and stabilize traffic flow Gu Shao-long et al. [14]. In their work authors analyse the traffic flow parameters mainly; standard deviation speed (SDS), average speed and occupancy, and develop a threshold which would activate Variable Speed Limit (VSL) system in ATM, Beijing, China. Basically the activation of VSL depends on the SDS and other evaluated parameters relationship. The continuous state change of traffic data make the management and control of traffic a very difficult task. The case gets harder in congestion bottleneck generally consisting of roundabouts or crossroads. Dealing with this problem Pappis and Mamdani [15] proposed the usage of fuzzy logic to develop a linguistic based model to control the signalized intersection. The case study was on a two way street. During the study they considered a uniform for the coming vehicle

and the signals cycle was based on green and red. To control traffic at the intersection an if-then algorithm was developed. The results were positive compared to the standard previously used methods. The rapid changes in traffic require new assessing methodologies and management. Kaparis et al. [16] introduce a framework combining traffic management and Intelligent Transport System (ITS). The idea of this work is to assist in a new developing methodology increasing the urban transport performance. The study considered the mobility and traffic accidents known to be as Two Key Performance Indicators (KPIs). The results showed this methodology to be applicable and relevant. Based on ACCESS2ALL FP7 research project, in the work Bekiaris and Gaitanidou [17] propose a roadmap in short, mid and long term considering the accessibility of public transport (PT). The research is structured by defining the goals and time meanwhile consulting experts of the area the topics were evaluated and actual and further research proposal were suggested thus driving a roadmap to further studies in making PT more accessible. Zyryanov and Mironchuk [18] evaluated the intermittent bus line by using microscopic traffic simulation. The aim of the study is to define the pro and cos of IBT under changing background traffic and bus signal priority. It was chosen a two line road for the implementation. The results of the simulation compared to real data were positive. The change of traffic volume indicated change in speed of traffic and buses for both standard and IBL bus routes. In their work Combes and Van Nes [19] developed e new strategy of analysing the structure of transport system of public transport mode using traveller perspective. The methodology is by developing three phases; detecting the service modes, locating the offered service modes and establishing a relationship between them. They analysed the functionality of the public transport modes and their relationships based on competitive point of view, spatial odd and respective hierarchical relations. The result was a strategic representation of the urban transport system structure in Ile-de-France.

METHODOLOGY

Overview

This study tends to illustrate, analyse and provide new methodologies on optimizing traffic congestion in Tirana. Focusing on the road network and public transportation impacts on mobility, the research seeks to outline new strategic solutions for the rapid developing capital, oriented toward society wealth. i) The investigation and illustration of the strengths, weakness and improvements that could be implemented on road network and reorganization inside the urban area of the capital is of first call. Roads accessibility for different transportation modes will lighten the traffic congestion, as a consequence improve the traffic flow inside urban area. ii) As the main motorized transportation mode, public transportation plays a crucial role in mobility of the capital. Having direct impact to social and economic issues. For this reason the analysing, reorientation and coordination of public transportation system directly affect the socio-economic behaviour and smoothen traffic flow. Moreover the improvement of public transportation system facilities increase the user's number thus reducing the private vehicles usage. iii) The lack of coherent data concerning traffic information system in problematic bottleneck directly affect traffic management in this zones. Implementation of different techniques for data gathering and application of intelligent transportation system in particular areas like CBD improves the management of the congested zones. Besides, the dynamic of traffic data, ambiguity and uncertainty make difficult the management task. For this reason, to specific zones different modelling techniques might be implemented. Including here fuzzy techniques as linguistic based universal approximators in solving traffic and transportation problems [20]. iv) The illegal parking and insufficient legal parking areas create road narrowing and create undesired traffic situations. The reassessment of the existing parking areas and

implementation of new parking areas due to future requirements, efficiently smoothers unpredicted congestion situations. v) The establishment of a framework for actions for the road network and public transportation systems of Tirana results in provision of successive recommendations and analysis. Moreover it shall evaluate the relationship and impact that road network and public transportation system have on each other and their effect to socio-economic development and environmental issues of the capital.

Space Description

Mainly, target groups are suburban areas and CBD which is the most congested area in the capital [7] . Topical research for both road network and public transportation systems are presented and synthesized, directing to the raising of some common questions. The objective is to provide the development of transportation facilities to the common wealth of the society. Featuring further researches, the ultimate objective will be achieving knowledge that will encourage improvement in road and urban transportation.

This study will be basically based on JICA [7] framework in illustrating and evaluating the requirements of roads and urban transportation system of Tirana. JICA [7] states that the roads traffic and network as well as public transportation system must be efficiently used in order to neglect the negative impacts of traffic congestion and better serve to society. Future studies may consider the sustainability and public oriented transportation systems of the metropolitan area. JICA [7] study revealed the importance of reform effort in two main areas concerning Tirana. Firstly, related to the need for reforms concerning the integration of public transportation to suburban society and secondly the reorganization of transportation systems itself to effort better traffic flow in coherence with the city traffic requirements.

CONCLUSION

This study will be using a case study technique in order to provide that a sustainable road and urban transportation system re-reformation is required in the capital, Tirana. The transportation data require observation and surveys in order to gather information about the present condition. Thus descriptive research method will be implemented in the study. According to Creswell [21] the descriptive method of research is to collect coherent data information regarding the present condition. The aim of using this research method is to be able to draw the existing situation at the time of study and explore the causes of different phenomena. The researcher selected this type of research having the desire of gaining first hand data so as to be able to build up sound conclusions and recommendations for the study. Due to the dynamism of traffic data and continuously change, in particular areas modelling techniques might be implemented, here considering fuzzy logic approach [15], [22], [23], [24].

The research described in the document also includes the qualitative research method. This kind of research is based on natural settings of the study things, trying to interpret them based on people approach. So the qualitative elements are opinions, attitudes, behavior or beliefs thus having no standard measure. The research intends to find theories that could explain relationships among elements, effectively using them hoping to get better results. Basically, approaching to the problem subjectively, makes the analysing task quite difficult to approximate to real situations. In order to approximate subjective decisions to objective results by using linguistic approach Ross [25] proposes fuzzy logic techniques. Proved to result successful in different subjectively approached and vague problems.

Particularly, the research in this study is based on quantitative research method, enabling flexible approach. Based on ongoing analyses, the methods of collecting data are regularly

changing. Thus creating the possibility to concentrate on main issues and avoiding unimportant areas from the original plan.

The study area will include Tirana metropolitan zone. In order to deploy expert opinions regarding the roads and urban transportation system in the capital, researcher would pick up interviews with engineers, transportation experts and personalities familiar to the situation. The study framework is illustrated below.
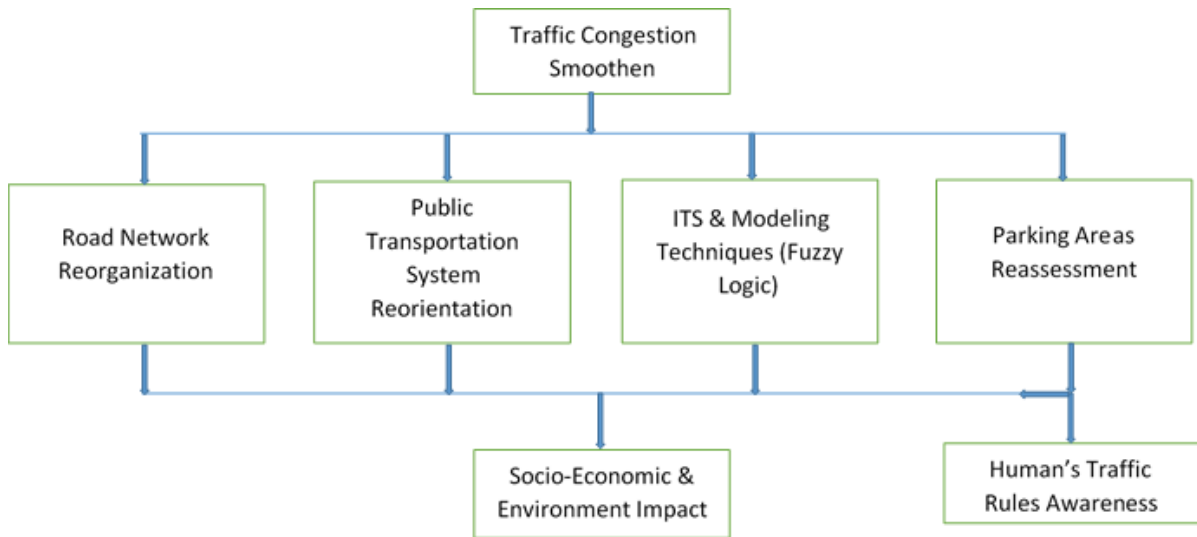

Figure 9 Study framework

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