

# TRANSPORT SUSTAINABILITY IN KAUNAS CITY (LITHUANIA) AND JELGAVA CITY (LATVIA)

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## Abstract

This research study explores urban planning for transport sustainability in two cities Kaunas (Lithuania) and Jelgava (Latvia). As part of the analyses, a transport sustainability was compared in relation to three main aspects – economy, environment and society. The aim of this research is to review the existing transport system in two cities – Kaunas and Jelgava, and to evaluate their sustainability in environmental, social and economic dimensions. The study is based on the information about configuration and location of the existing transport system in two cities – Kaunas and Jelgava. It is important to submit proposals to decision making bodies in order to improve sustainability of transport.

Key words: land management, sustainability in urban territories, sustainable transport.

## Introduction

The city is an important state or a particular region's economic and social development engine. It is concentrated in the cities is the most important commercial, industrial and residential areas, public authorities. In a world of accelerating urbanization and growing number of people living in cities, and they have certain ecological, economic and social problems. Urban development and its sustainable development in terms of the developed countries have started long ago, and not the exception, and Lithuania and Latvia. However, sustainable urban development strategy is a complex process which must be included in the whole community: authorities, various organizations, businesses and local residents. Every city in the world is unique, only exposed its inherent environment. Some kind of social, economic, natural environment is an industrial European or North American countries, quite different - in poor regions of Africa. Therefore, obstacles that hinder the sustainable development of cities, is also different. Evaluation of urban coherence, it is necessary to take into account a number of parameters - or a convenient city transport in relation to whether it is free from contamination, or have enough green areas and the like (Ciegis, Zaleviciene, 2012).

Sustainability tools are not new. Architects, industrial designers and engineers (and even economists) have assessment tools that are intended to improve the performance of buildings, structures and objects. Thinking about sustainability on the large scale infrastructure project, a neighborhood, a city or even a region has to take various dimensions into account: environment, mobility systems, social structure and society, culture and identity, the creation of economic welfare, complex negotiations and development processes, participation and so on. The three main themes – economy, environment and society – are a logical division of sustainability however as they are so general, they have allowed much confusion and false or incomplete interpretation of the approach.

Seeking to evaluate sustainability in urban territories, it is necessary to take into account many factors: whether the city has convenient transportation with respect to whether it is free from contamination, or have enough green areas and so on. Jabareen Y. R. (2006) identified seven criteria for sustainable city: compactness, sustainable transport, density, mixed buildings, diversity, the use of solar energy, ecology (landscaping) (Narijauskas, Banaitiene, 2010).

Sustainable transport covers one of these mentioned criterias that have recently become highly relevant to sustainable urban development. Transportation is the most prominent challenge in the field of sustainable urban development, followed by socio-cultural awareness. The concern of transportation and socio-cultural conscious issues can propel sustainable urban development forward and improve other problems related it (Hassana, Leea, 2015). Besides, three forces can be identified that would shape the future development of cities: the attraction of existing urban centres; the attraction of major transportation links; and the aesthetic attractions for people of proximity to seas, lakes, rivers and other places of scenic beauty (Marull, Fonta, Boix, 2015). The transport sector is a major user of fossil energy, which causes air pollution and also contributes to global warming. Negative environmental and social impacts of transport imposes large costs on society. It is estimated that air pollution, noise and accident related costs are at least 5% of GDP for industrialised countries. Hence, the transport sector with its significant environmental, social and economic impacts is an important element of urban sustainability (Reisi, Aye, Rajabifard, Ngo, 2015).

This work aims to explore cities of Kaunas and Jelgava as sustainable cities, a situation assessment of the transportation system and its impact on the environmental, social and economic aspects. The aim of research is to review the existing transport system in two cities – Kaunas and Jelgava, and to evaluate their sustainability in environmental, social and economic dimensions.

### Methodology of research and materials

Scientific, historical literature analysis, inventory methods were used for the preparation of the article. The object of research is existing transport system in Kaunas and in Jelgava. Comparative, analytical as well as statistical and logical analysis methods were used for this research. Lithuanian, Latvian and other foreign scientific literature and legal acts were analysed in the article. The analysis of cartographic material was done. Also, the spacial planning documents were analysed. The collected material was analyzed, systematized and generalized.

### Discussions and results

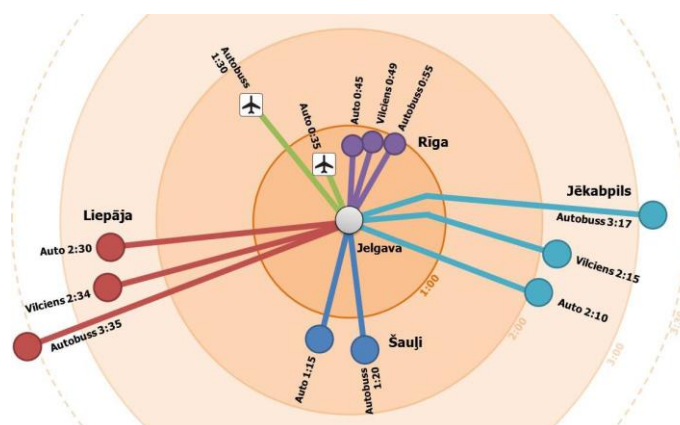
#### The current situation in Kaunas city.

**Roads.** Due to favorable geographical position, Kaunas is connected by road to other major Lithuanian and foreign centers. The first roads connecting Kaunas to Vilnius, Riga and Warsaw appeared in the middle ages. In year 1836 the construction of the St. Petersburg-Warsaw highway Kaunas-Zarasai stretch has been completed - the first in Lithuania with the pavement, a solid compacted gravel surface. In year 1939 the first paved street in Lithuania - Zemaiciu linking Kaunas and Klaipeda has completed.

**Public transport.** The first Kaunas public means of transport were horse trams, known as the Konkan, which operated from 1892 to 1929, when it was replaced by bus services. In the period from 1915 to 1935, public transport services and Kaunas civil use narrow-gauge railway were used. On December 31, 1965, trolley was introduced in Kaunas. At present in Kaunas there are four types of public transport: buses, trolley buses, taxis and shuttle taxis. 160 trolleybuses operate in 16 routes connecting the various city districts. The total route length is 368.3 km. The annual traffic volume is about 33 million passengers. Every day the route served by 31 after Kaunas city and relatives in the suburbs. Their total length is 1,160 km. On a work day buses travel 36,000 km. The average daily traffic volume is 90,000 passengers. There are also a 7-route taxi lines.

#### The current situation in Jelgava city.

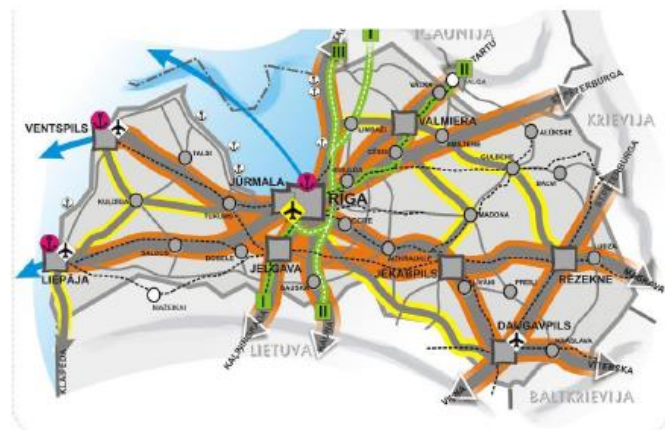
**Roads.** Jelgava is an intersection of six national roads and five railway lines, it is a transit centre of national importance. Street network is a prerequisite for economic development creating urban spatial environment. Jelgava has 368 streets which are 270 km long, 58% of streets are covered with asphalt, 40% are gravel roads. Some main streets have been reconstructed and infrastructure has been improved during 2007-2013, but it is necessary to continue the improvement of streets and traffic modernization by providing better condition for people with special needs and by building bike paths. The length of bike paths at present is 18.3 km, there are plans to develop cycling infrastructure as an alternative mode of transport. Jelgava is a city of the national importance with good accessibility to other cities - Riga, the capital, Liepaja, Jekabpils, as well as the city in Lithuania - Siauliai (Fig. 1).



**Fig. 1.** Connection of Jelgava with other cities (measured by the required time)

Source: Jelgavas pilsetas attistibas programma 2014-2020

Jelgava is linked to the capital of Latvia, Riga; it is an important centre for both cargo and passenger transport: Riga as a large city concentrates the majority of the Latvian business, transport and logistics companies, and business environment causes a stable, continuous traffic flow (Fig. 2).



**Fig. 2.** Jelgava's location  
 Source: Jelgava city development program 2014-2020

*Railway.* Jelgava Latvia is a significant railway junction, where several lines intersect Zilupe - Krustpils - Jelgava - Ventspils, Riga - Jelgava - Liepaja, Riga - Jelgava - Gluda - Mazeikiai, Riga - Jelgava - Meitene - Šiauliai. These lines are very busy except for the line to Mazeikiai which has stopped operating. The most important cargo line is Krustpils - Jelgava - Ventspils, through which a great number of transported cargo move to the port of Ventspils; a less amount of cargo is transported via other routes, such as Riga - Jelgava, Jelgava - Liepaja. The most intensive passenger flow is in the direction of Jelgava – Riga, but the train to Liepaja leaves only twice a week.

*Public transport.* Jelgava has well-developed public transport network, the city is connected by roads and rails with other destinations. Bus transport provides connections by inter-regional and local routes to other cities, however, bus connections to Liepaja and Jekabpils (via Riga) are considered to be insufficient. Public transport services in Jelgava are also provided by mini-buses and taxis.

Kaunas city and Jelgava city territorial-urban problems.

The analysis and comparison of data of existing solutions of transport systems in Kaunas and in Jelgava helped to determine the common territorial-urban problems of both cities which have been divided into six groups:

*Asymmetric configuration of the city.* We can conclude that development in both cities has occurred asymmetrically from their central part in the direction of north-east and north-west. Due to the increased distance between the centre and residential and industrial districts, the travel time to work places has increased thus increasing environmental pollution. The southern part of Kaunas, despite being close to the center, is underdeveloped; a lot of funds are required for the construction of bridges, streets and engineering networks. To reduce pollution in the city centre of Jelgava, it is necessary to finish the construction of bypass for intercity and cargo transport in the northern part of Jelgava that will foster logistic and industrial development.

*Excessive functional differentiation.* Large areas of one predominant purpose are formed in the cities, especially in Kaunas, such as residential (homestead and multifamily housing) and industrial sites. There is a lack of a balance among areas of work places, housing and recreation areas in all parts of the cities that could decrease residents' commuting from work to home.

*Physical and built environment features.* The elements of natural environment, the rivers Nemunas and Neris in Kaunas and the Lielupe and Driksa in Jelgava, are of great value, however, small streams and their valleys in Kaunas and flood threat in Jelgava cause many difficulties in developing urban structure designs and improvement. Kaunas needs 300-400 m long bridges, installed slopes, which, in turn, eliminate valuable ravines and valleys of the natural environment.

*The connection among cities' other parts goes through the centre.* Most of the traffic flow connecting the parts of Kaunas city and Jelgava city go through the centre of the cities and the Old Town. The centre has become the distribution node connecting different parts of the cities. There is a good connection among the parts of the cities, but such a connection is missing outside the centre.

*Insufficient attention to the natural environment.* Kaunas city in its plan's structure with the main streets and squares is detached from natural values – the rivers and slopes. The banks of the rivers are separated from the city with public and residential industrial plots, warehouses and highways streets. Green areas and riverside slopes are neglected and therefore unattended. Slopes block the access to industrial and residential areas, their users deplete the slopes. There is a lack of safe illuminated paths, green terraces, playgrounds. Jelgava city faces these problems in some parts of the city, however, it should be noted that in recent years infrastructure projects have renovated and improved the area between the two rivers: a pedestrian bridge across the Driksa was built, the territory of an island has been improved, there are many walking paths, public swimming sites, an open-air stage as well as illuminated promenades.

*Maintenance of Urban Environment.* The created environment in Kaunas and Jelgava of streets and utility networks gradually gets worn out or damaged (a high degree of amortization). Annual capital investments in construction and repairs do not cover the environmental support costs.

#### Infrastructure development in Kaunas city.

Actual places for development of infrastructure in Kaunas city seeking to become as a sustainable city and sustainable region – connecting Kaunas district with Kaunas city, and other municipalities (Fig. 3):

1. South-East Kaunas city road (Kaunas-Vilnius A1 magistral road);
2. Tilto str. connection with Marijampole road and Rokai village (Kauno district munic.);
3. Baltu pr. connection with Zeimenos str.;
4. Kedainiu str. connection with Juodelynes str. (Kauno district munic.);
5. Raudondvario pl. connection with Pakalnes str. (Kauno district munic.);
6. Lakunu pl. connection with Z. E. Zilibero str. and Ironiskiu str. (Kauno district munic.);
7. Alksniu str. connection with Garsves str. and Roku village (Kauno district munic.);
8. Europos pr. connection with magistral road A5 ir Gelzkeliuko str. (Kauno district munic.);
9. Piliakalnio str. connection with Kalkines str. and Karkazu str. (Kauno district munic.);
10. Varniu str. and Prusu str. connection with Kedainiu str.



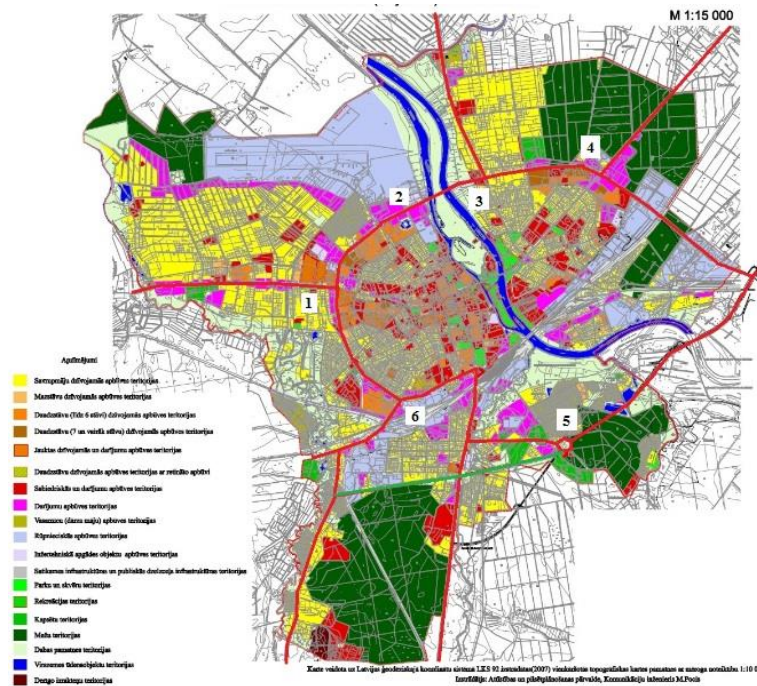
**Fig. 3.** Proposed places for development of transport (infrastructure) in Kaunas city  
*Source: Kaunas city municipality general (master) plan for 2013-2023*

#### Infrastructure development in Jelgava city.

Actual places for development of infrastructure in Jelgava city seeking to become as a sustainable city and sustainable region – connecting Jelgava district with Jelgava city, and other municipalities (Fig. 4):

1. Reconstruction of Dobeles soseja and Atmodas iela;
2. Dobeles soseja connection with Loka magistrāle (building of new bridge) via Kalnciema cels;
3. Reconstruction of Kalnciema cels;
4. Kalnciema cels connection with South-East Jelgava city road (Joniskis-Jelgava-Ryga A8 magistral road);

5. South-East Jelgava city road (Joniskis-Jelgava-Ryga A8 magistral road) connection with Rupniecibas iela;
6. Rupniecibas iela connection with Tervetes iela.



**Fig. 4.** Proposed places for development of transport (infrastructure) in Jelgava city  
 Source: Jelgava territory plan 2009 – 2021 year (the planned use the territory)

According to these findings of the transport system, the development of evaluation is carried out (Table 1):

**Table 1**

Evaluation of transport sustainability in environmental, social and economic aspects

Economic aspects (possible)	Environmental aspect (possible)	Social aspect (possible)
<p><i>Positive:</i> Attract investment; decrease vehicle operating costs</p> <p><i>Negative:</i> Long drafting (preparation of territorial planning documents); The high cost of the projects</p>	<p><i>Positive:</i> Evenly will be distributed the existing pollution in urban areas and its approaches for shorter passing time</p> <p><i>Negative:</i> The slight increase in pollution in areas where new roads will be constructed; Some parts of new roads will pass through protected areas, culture heritage areas</p>	<p><i>Positive:</i> Create new jobs; It will reduce traffic congestion; Shorten the transport time between highways; Residential areas will be populated and social infrastructure will be created</p> <p><i>Negative:</i> Some residential areas become unattractive</p>

### Conclusions and proposals

1. The implementation of infrastructure projects would have an influence on the mobility of both cities – Kaunas and Jelgava, and it would let to achieve the decreasing of air pollution and noise in richly populated Kaunas and Jelgava urban areas, promote investment, pruned congestion and contribute to the well-being of the population.

2. For the cities, especially for Kaunas, in the protected areas (parks, reserves and etc.), cultural heritage sites, the implementation of some parts of the city is not without engines. Also, in order to address the issue of an "environmentally friendly" aspect the project cost would be increased.
3. Kaunas city and Jelgava city would become more attractive, more open for investment.

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