

# THE CHANGE OF ANTHROPOGENIC COMPONENTS IN KAUNAS CITY

Giedrė Ivavičiūtė

Aleksandras Stulginskis University, Lithuania, Kaunas Forestry and Environmental  
Engineering University of Applied Sciences, Klaipėda State University of Applied Sciences

## Abstract

The article presents the comparative analysis of the Kaunas city anthropogenic landscape change during the period between 2006 and 2014. For this analysis, the land fund statistics of the Republic of Lithuania, were used. The components of anthropogenic landscape change is graphically shown in the figures. During the analysis the Kaunas city statistics were compared with the data of Kaunas County and the Republic of Lithuania.

Comparative, analytical as well as statistical and logical analysis methods were used for the investigation.

The object of the investigation is anthropogenic components of Kaunas city.

The aim of the investigation is to carry out the analysis of the change of Kaunas city anthropogenic components in the period of 2006 – 2014.

The work analyses the change of urban landscape components, the reasons of the established change. The built-up territories comprise the majority of anthropogenic landscape of Kaunas city i.e. 90.05 per cent, while the damaged territories make up 0.06 per cent and Kaunas city roads constitute 9.89 per cent of the analysed landscape. It was established that during the analysed period the built-up territories of Kaunas city increased by 312.78 ha i.e. 3.53 per cent. Within 9 years the road area increased by 14.04 ha or 1.44 per cent, while the damaged areas increased by 1.89 ha.

Having analysed the statistical data of Kaunas city anthropogenic landscape areas it was estimated that within the period of 2006 – 2014 the area of these territories increased by 328.71 ha or 3.34 per cent.

**Keywords:** landscape, anthropogenic components, anthropogenisation.

## Introduction

Cities are the mirrors of societies' development. They represent the level of humanity's development, economic potential of a country, positive and negative social phenomena, traditions, cultural and scientific achievements. Every city is different. A lot of them can be described as unique according to their spatial or functional structure, factors influencing the development or its extent, social phenomena, prevailing development tendencies (Cereškevičius, 2012).

A modern city faces new forms and functions (Loureiro, 2014). Cities endure periods of prosperity and depression. The change of politics and external environment brings changes to social processes influencing the change of cities (Wekel, Koriakina, 2014).

The man's activity is seen in various territories: protected, agricultural, settlements. Currently more than three quarters of the Earth's dry land have been restructured. It is a constant transformation of Earth including anthropogenic changes, climate change as well as changes in hydrographic network, biodiversity (Ellis, 2014).

Anthropogenic influence to environment is usually destructive i.e. irrational human activities worsen the environmental quality, reduce the natural resources and biodiversity, damage the heritage. In extreme cases, it may cause ecological crises and catastrophes, natural disasters. All of these phenomena are in turn related to the decline in human health and their economic welfare (Pileckas, 2004).

The process of landscape polarisation began when humans started to intensify their activities. The anthropogenic environment started forming gradually, while natural environment became smaller. The term landscape polarisation came into landscape science in the second half of the twentieth century. At that time, polarised landscape was understood as a consequence of territorial planning i.e. highly structuralised and strictly zoned landscape (Eckel, 1978).

Throughout time the understanding of the term landscape polarisation changed. Currently the term landscape polarisation is used ambiguously i.e. on the one hand it is understood as an expression of landscape fragmentation while on the other hand it is a simultaneous existence of highly urbanised and deserted (uninhabited) territories. The research on landscape polarisation, as it is known today, has been started only recently. Therefore there is no appropriately prepared and universally acknowledged methodology of its calculation and since research is based on different methods thus the provided results cannot be compared. One of the most topical problems is not only the methodology of landscape polarisation but also regards the landscape naturalness / artificiality in other research on landscape (Vinclovaite, Veteikis, 2011).

Landscape and its condition change due to various reasons. The changes originating from human activity that strains the landscape, which, in turn, influences the change of its condition, are important in terms of environmental protection (Pileckas, 2004).

In order to understand the reasons for landscape change, scholarly research, knowledge and diffusing of the outcomes of landscape change on global, regional and national levels is necessary (Magliocca et. al., 2015).

In the majority of cases the concept of anthropogenesis can be narrowed down to the phenomenon described by employing the term technogenesis i.e. the influence of technology on landscape. Landscape technomass definition includes origin, content and its position in the system of landscape masses and phenomena. It encompasses buildings (volumetric – buildings, linear – communication lines) and movable elements (means of transport). Natural and household human activities often leave a lot of waste, which is stored in landfill sites, warehouses. Finally the volume of technology-created objects is practically equal to the volume of natural material, therefore the occurrence of technomass in one place results in depressive forms in other place, or, to put it in simple terms, technological activities leave negative relief forms i.e. quarries, mines, pits, canals, ditches (Veteikis, 2005).

In urbanised environment, where the anthropogenic and natural processes occur, the changes in urbanised and natural areas may be significant to the landscape system, quality, and suitability to live. Therefore it is important to establish the relation of urbanised and natural areas separately in built-up urban territories and city territories up to administrative boundaries (Veteikis, Jankauskaitė, 2004).

Anthropogenesis influences natural environment therefore the expansion of cities results in its reduction, while its components are vulnerable. Therefore, landscape changes are related to the expansion of cities, change in relation of urbanised and natural territories, landscape condition.

**The object of the investigation** is anthropogenic components of Kaunas city.

**The aim of the investigation** is to carry out the analysis of the change of Kaunas city anthropogenic components in the period of 2006 – 2014.

**Tasks of the investigation:**

1. To analyse the historic development of Kaunas city.
2. To analyse the changes in Kaunas city anthropogenic components of landscape during the period between 2006 and 2014.
3. To carry out the analysis of city anthropogenic landscape areas.

**Methodology of research and materials**

Comparative, analytical as well as statistical and logical analysis methods were used for the investigation. The article analyzed Lithuanian and foreign scientific literature and legal acts. Also, the Spatial planning documents were analysed in the work. The collected material was analyzed, systematized and generalized.

The land fund statistics of the Republic of Lithuania (Nacionalinė žemės, 2006-2014), graphically depicted in figures, were used for the fulfilment of the research of the Kaunas city anthropogenic landscape change for the years 2006 - 2014. Every component is analysed and its change is established. During the analysis the Kaunas city statistics were compared with the data of Kaunas County and the Republic of Lithuania.

**Discussion and results**

*Historic development of Kaunas city.* The history of Lithuanian landscape is dynamic and includes evolution and stages of rapid change. It is related to the changes of social, political and economic conditions, various social and economic reforms. The abovementioned factors influence the changes in land structure, development of various landscape types.

Archeological excavations and their findings show that people started to settle in the confluence of the rivers Nemunas and Neris in the 7<sup>th</sup> – 6<sup>th</sup> century BC, while locations of large amount of findings refer to the 2<sup>nd</sup> – 1<sup>st</sup> century BC. At that time, people started settling in Kaunas i.e. Eiguliai, Zaliakalnis, Kaniukai, Lampedziai, Sargenai, Marvele, Pajiesys, Romainiai, Linkuva, Petrasionai, Versvai and Santaka regions (Vasarskyte, 2014).

The history of the analysed city municipality began in 15<sup>th</sup> century, when in 1408 the city received Magdeburg rights (Kauno..., 2014).

The stamp of Kaunas city coat of arms originated at the beginning of the 15<sup>th</sup> century during the reign of Vytautas and is known as the oldest stamp of city herb in the Grand Duchy of Lithuania (GDL). Kaunas experienced the highest economic rise at the end of the 16<sup>th</sup> – the beginning of the 17<sup>th</sup> century. At that time, a lot of masonry houses were built. However the mid-17<sup>th</sup> century brought wars and the

majority of houses were destroyed, the crafts and trade decreased. Later on, the nearly rebuilt Kaunas was severely damaged by the Great Northern War. In 1701 – 1707 the city was destroyed and burned down and in 1708 – decimated by hunger and plague. In 1732 Kaunas was destroyed by fire. Conditions for craft and trade improved in the third quarter of the 18<sup>th</sup> century. 1771 marked the beginning of the reconstruction of Town Hall and parish church. Having recovered, Kaunas, which was the biggest and the most important city of GDL, entered the changes occurring during the Four-Year Sejm period. However in 1795 after the collapse of the state, Kaunas was under the Russian authority (Vasarskyte, 2014).

At the end of the 18<sup>th</sup> century Kaunas city territory was restricted by the defensive wall. Agricultural lands were stretched at the east and further from it was the Carmelite Monastery and Kaunakiemis village. The city development plan, which was drawn in 1821, was not implemented, the existing condition was not evaluated and the change of street network was not intended. In 1843 Kaunas was announced the centre of a new governorate and in 1847 a project of Kaunas city plan was prepared and approved. It was decided to expand the city to the east between the Nemunas river bed and its slopes to Girstupis without changing the formerly built-up territories. The implementation of the plan continued for two decades. The perimetrical development of Nicholas prospect (currently Laisves aleja) was completed only at the end of the 19<sup>th</sup> century. The real plan was not as correct as it was projected, since the existing city garden territory i.e. private Kartofliskes folwark, was to be taken into consideration. The train station complex was built and the remaining area was given to the city by the state treasury in exchange for the pasture land. Since in 1847 the development of Zaliakalnis and Karmelitai was not intended, the additional plan was prepared in 1869 and approved by tsar in 1871. Karmelitai was designed based on the principles of regular plan with regards to the existing road from Petrasiumai and Zemieji and Aukstieji Sanciai network as well as the Girstupis stream. In 1869 the roadway of the current Vytautas prospect was started to install. In 1909 a market was opened near the Church of the Holy Cross and a local centre started to form. At the beginning of the 20<sup>th</sup> century Karmelitai region already contained a lot of factories, shops, taverns, hotels, other institutions, numerous residential houses (Lietuvos..., 2012).

Since the majority of Lithuanians were peasants, the village landscapes prevailed in the cultural memory. The first significant stream of urbanisation was observed when creating the independent state, excluding Vilnius and Klaipeda townsmen. Kaunas became the capital of the state and the architects working here started to form urban face of a new Lithuanianism. The Soviet occupation interrupted their activities and in the 60s Lithuania became an urbanised land. After the war, newcomers started to pour to the empty Vilnius and Klaipeda and villagers became townsmen. Only Kaunas' community retained its identity, since the visual urban heritage of formerly independent state prevailed (Rubavicius, 2013).

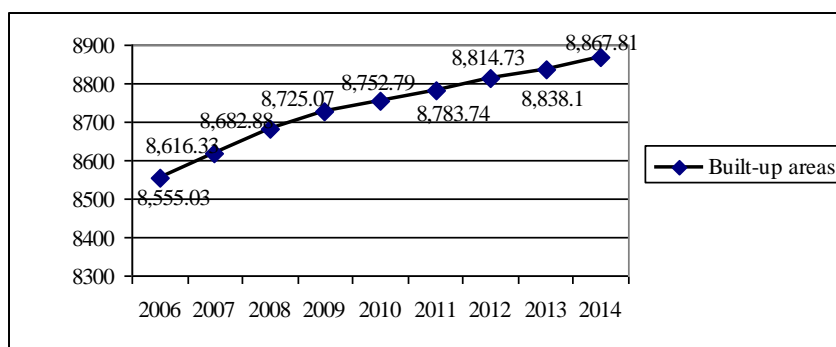
Currently Kaunas is the second metropolitan city in Lithuania, a large centre of industrial, cultural, technological and scientific potential. The city is located at the intersection of the main Lithuanian roads and national and international integration axes; it is crossed by two international transport corridors, existing and planned European gauge railway tracks, potential river corridors, not far away – the airport and a free economic zone (Zaleckis, Kamicaitytė – Virbasienė, Ramanauskas, 2013).

Kaunas city has a municipal status; it is divided into 11 subdistricts. The city covers an area of 15,688.47 hectares, i.e. 1.94 percent of Kaunas County and 0.24 percent of the area of the Republic of Lithuania. There are 1,232 objects of cultural heritage in Kaunas city, of which 1,043 objects include immovable and 189 – movable cultural heritage.

*The change of Kaunas city urban components.* City anthropogenic components consist of built-up territories, roads, damaged land. Anthropogenic areas include: built-up areas, roads, damaged land.

Built-up territory – land covered with structures (excluding roads): squares, public places, stadiums, aerodromes, fields, lawns, cemetery, household land plots or parts of them.

In 2014 built-up territories constituted 2.79 per cent of Lithuanian territory and 4.29 per cent of Kaunas county. In Kaunas city, such territories comprise 8867.81 per cent or 56.43 per cent of the territory of municipality. Compared to the data of the period of 2006 – 2014 it was estimated that each year the built-up territories increased (Fig. 1) and within the analysed period the area of built-up territories in Kaunas city increased by 312.78 ha i.e. 3.53 per cent.



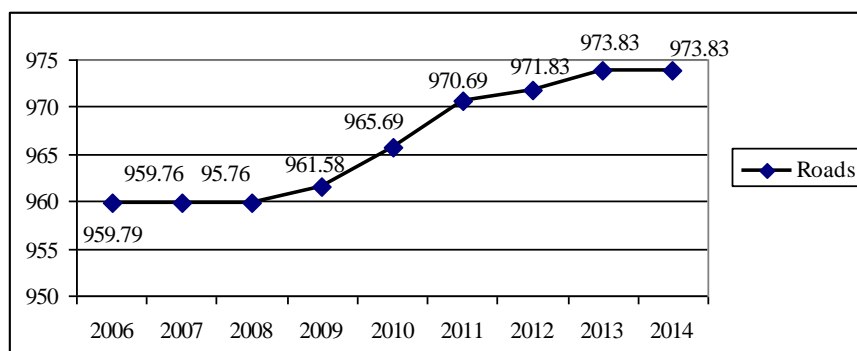
**Fig. 1.** Built-up areas change of Kaunas city in hectares during the period between the years 2006 and 2014

The area of built-up territories increased by reducing agricultural land as well as natural and anthropogenised landscape. In Lithuania, the growth of the demand of new development areas and infrastructure does not agree with the demographic situation. It is necessary to orient towards the restoration of the already built-up, devastated territories, motivate conversion and not investments to plain field. In such a way, Kaunas city economic vitality and ecological balance of the environment are ensured.

Roads – land areas covered with engineering structures employed for the traffic of vehicles and pedestrians.

In 2014 roads made up 131385.45 ha or 2.01 per cent of the territory of the Republic of Lithuania, 2.17 per cent in Kaunas county and 6.20 per cent in Kaunas city.

Having carried out the analysis of road changes in the period of 2006 – 2014 it was estimated that within the period of nine years, the road areas increased by 14.04 ha or 1.44 per cent (Fig. 2).



**Fig. 2.** Roads change of Kaunas city in hectares during the period between the years 2006 and 2014

Since the areas of built-up territory increased every year, the areas of city infrastructure needed for its maintenance increased as well. Kaunas district and external arterial road network is not equally linked to Kaunas city street structure.

Junctions in the north eastern part of the city are good, while those in Petrasiuonai, southern part of the city and Vilijampole are unsatisfactory. The greatest problems in terms of traffic organisation rise in the Old Town, centre of the city and sub-centre area. The increase of the number of transportation means brings about the important issue of vehicle parking in Kaunas centre. The need for transportation is constantly increases therefore the number of cars on the road increases and has great influence on the load of road and street network. The increasing number of cars should result in the installation of the development of road and street network, reconstruction of the existing network, improvement of continual maintenance and means of traffic organisation.

Damaged land – exploitation of mineral quarries, moors, landfill sites.

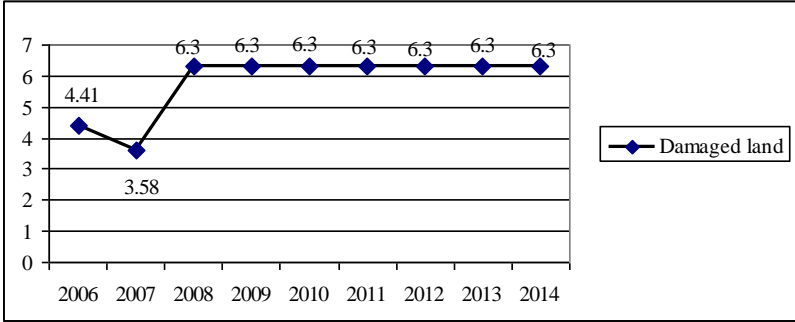
In 2014 the damaged land constituted 0.3 per cent of Lithuanian territory and 5.5 per cent of other land areas. During the analysed period the area of the damaged land decreased by 3922.65 ha or 16.46 per cent.

In 2006, 850 municipal waste landfill sites (contaminated sites) were registered in Lithuania; 350 of them were still in use (Valstybes..., 2013). Some of them operated illegally, were not registered, were not granted permits. In 2009, there were about 680 small (up to 1 ha) municipal waste landfill sites,

about 120 average (1–5 ha) landfill sites, and approximately 35 large (larger than 5 ha) landfill sites in Lithuania. In 2011, 11 regional landfill sites were established and prepared for utilisation in accordance with the environmental requirements.

In Kaunas county, the analysed territories constituted 0.3 per cent of the Lithuanian area and 6.32 per cent of the county area. A decrease of the damaged land area was observed in the county, i.e. by 656.16 ha or 21.10 per cent. In Kaunas county, the largest number of damaged territories is observed in the district municipalities of Kedainiai (21.27 per cent), Prienai (21.03 per cent) and Kaunas (19.56 proc.), whereas the lowest number of damaged territories is in the municipalities of Kaunas city and Birstonas. 409 damaged territories were determined in Kaunas county. Kaunas municipal waste management region encompasses 6 municipalities. In the region, 58 old landfill sites were closed, 2 regional landfill sites of non-hazardous waste were established: Lapes regional landfill site (Lepsiskiai village, Kaunas district) and Zabeliskis regional landfill site (Zabeliskis village, Kedainiai district); 3 waste transfer stations (Raseiniai, Kasiadorys, and Jonava districts), 11 bulky waste collection sites, 3 green waste composting sites were set up, mechanical and biological waste treatment equipment was set up in Kaunas city and Zabeliskis village, Kedainiai district, 30000 individual composting containers were purchased.

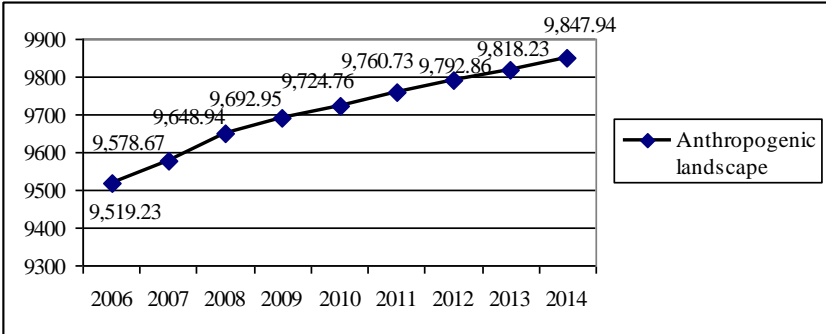
During the analysed period, damaged land areas in Kaunas city increased by 1.89 ha (Fig. 3) as opposed to the statistics in the country and in the county, and constituted 0.04 per cent of the urban land area and 1.6 per cent of other land area.



**Fig. 3.** Damaged land area change of Kaunas city in hectares during the period between the years 2006 and 2014

Successful socio-economic development of Lithuanian regions and city municipalities should be based on sustainable and efficient utilisation of minerals, and rational management of waste. It is important to follow the principles of sustainable development so that mineral prospecting, extraction and exploitation of landfill sites would not cause harm to the natural environment of the regional and individual municipalities.

*The change of anthropogenic landscape areas.* Due to urbanisation processes, in the period from 2006 to 2014 anthropogenic landscape areas in Kaunas county increased by 79.84 ha or 0.15 per cent. Having analysed the data of the change of anthropogenic landscape areas, it was determined that the area of these territories increased by 328.71 ha or 3.34 per cent in the period from 2006 to 2014 (Fig. 4).

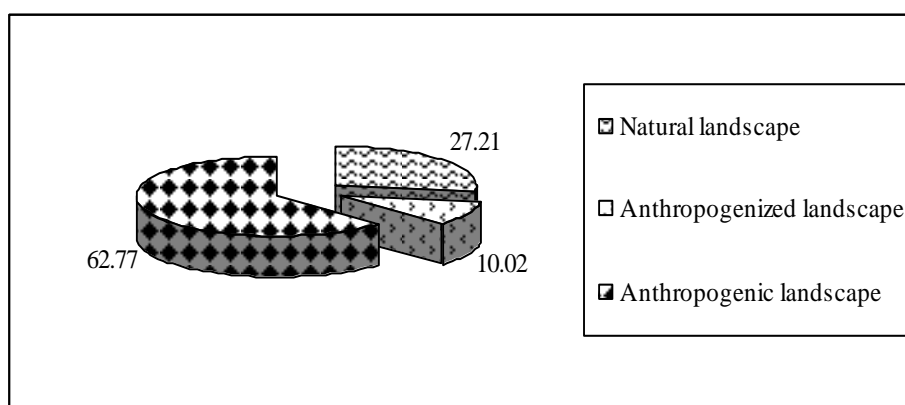


**Fig. 4.** Anthropogenic landscape change in Kaunas city in hectares during the period between the years 2006 and 2014

It was determined by the increase of the areas of built-up territories by 312.78 ha (1.3 per cent), roads by 14.04 ha (1.44 proc.), damaged land by 1.89 ha.

Over the entire analysed period, the major part of Kaunas city anthropogenic landscape, i.e. 90.05 per cent, has been occupied with built-up territories, and the smallest part has been occupied with damaged territories, i.e. 0.06 per cent.

In 2006, the total area of anthropogenic territories (built-up territories, roads, damaged land) occupied 9519.23 ha, constituting 60.68 per cent of Kaunas city area. In 2014, anthropogenic territories constituted 62.77 per cent (9847.94 ha) of the analysed city area. The analysis of the percentage distribution showed that anthropogenic landscape constituted the greater part of Kaunas city (Fig. 5), whereas anthropogenized landscape constituted the smallest part.



**Fig. 5.** Distribution of Kaunas city landscape in 2014, in percent

The main factors influencing the quality of the living environment of the city are urban natural and seminatural and built-up areas ratio (rate of naturalness). With increasing urbanisation, it is necessary to maintain natural green areas that provide comprehensive value to the city and its residents. Urban development must be carried out in accordance with the principles of sustainable development by maintaining the balance between the components of natural and anthropogenic landscape.

### Conclusions

1. In 1408, Kaunas city received Magdeburg rights. At the end of the 16<sup>th</sup> century – beginning of the 17<sup>th</sup> century a lot of masonry houses were built, economic rise was being experienced. Although later on wars and fires destroyed the city, the third quarter of the 18<sup>th</sup> century brought better conditions for the restoration of Kaunas. Kaunas city development plans were prepared (years 1821, 1847, 1871, etc.).
2. The city covers an area of 15,688.47 hectares, i.e. 1.94 percent of Kaunas County and 0.24 percent of the area of the Republic of Lithuania.
3. The following territories have been assigned to Kaunas city anthropogenic components: built-up territories, roads, damaged land. In 2014 it was estimated that built-up territories comprised 2.79 per cent of Lithuanian territory and 4.29 per cent of Kaunas country. In Kaunas city, such territories constituted 8867.81 ha and made up 56.43 per cent of municipality area and 90.05 per cent of anthropogenic landscape area. Within the period of 2006 – 2014 built-up territory area increased by 312.78 ha i.e. 3.53 per cent. The area of built-up territories increased when decreasing the agricultural lands, natural and anthropogenised landscape.
4. In Kaunas city, roads comprise 6.20 per cent. Having carried out the analysis of road changes in the period of 2006 – 2014 it was estimated that within the nine-year period, the road area increased by 14.04 ha or 1.44 per cent. Such increase was influenced by the development of built-up areas and the increase of areas of infrastructure needed for the city's maintenance. During the analysed period, damaged land areas in Kaunas city increased by 1.89 ha and constituted 0.04 per cent of the city and 1.6 per cent of other land areas as opposed to the statistics in the country and in the county.
5. Due to the on-going urbanisation processes, areas of anthropogenic territories in Kaunas city increased by 79.84 ha or 0.15 per cent within the period of 2006 – 2014. Having analysed the data of the changes of Kaunas city anthropogenic areas it was estimated that in 2006 – 2014 the area of such territories increased by 328.71 ha or 3.34 per cent. In 2006 the total area of anthropogenic territories (built-up

territories, roads, damaged land) constituted 9519.23 ha or 60.68 per cent of Kaunas city area. In 2014, anthropogenic territories made up 62.77 per cent (9847.94 ha) of the area of the analysed city.

## References

1. Čereškevičius S. (2012). Besitraukiančių miestų fenomenas: erdvinės struktūros pokyčiai, revitalizacijos principai ir vystymo galimybės. [Phenomenon Retreating urban: the spatial structure changes, obvious revitalization principles and development opportunities]. *VI Lietuvos urbanistinis forumas. Šiuolaikiški miestai ir miesteliai: situacija, vystimosi tendencijos, vizija*. 2012, p. 24-32.
2. Ekkel B. M. (1978). Poliarizacija struktury urbanizirovannykh territorii v tselyakh uluchsheniya uslovii zhizni naseleniya i okhrany okruzhajushchey sredy. *Seriya geograficheskaya*, p. 54-63.
3. ELLIS E.C. (2014). Ecologies of Anthropocene. Global Upscaling of Social-Ecological Infrastructures. *New Geographies 06. Grounding Metabolism*, p. 5-27.4.
4. Kauno miesto bendrasis planas (2013 - 2023 metams) [General Plan of Kaunas Municipality area] (10-04-2014, Nr. T-2019). [seen 15-11-2016]. Internet site: [http://www.kaunoplanas.lt/bendrieji\\_planai/kauno\\_miesto\\_bendrasis\\_planas\\_esama\\_bukle](http://www.kaunoplanas.lt/bendrieji_planai/kauno_miesto_bendrasis_planas_esama_bukle) .
5. Lietuvos Respublikos Kultūros ministro įsakymas „Dėl Kauno miesto istorinės dalies, vadinamos Naujamiestiu, teritorijos ir apsaugos zonos ribų plano patvirtinimo“. [Order of the Minister of Culture of the Republic of Lithuania "Historical part of the city Kaunas called Naujamiestis, territory and security zone plan"] (08-05-2012, Nr. IV-322). *Valstybės žinios*: 2012, Nr. 57-2881.
6. Loureiro V. (2014). *Favela: informality leading spontaneity into contemporary city. Our Common Future in Urban Morphology*. FEUP, Porto. Vol. 1, 199 pp.
7. Magliocca N. R, Rudel T. K., Verburg P.H., Mcconnell W. J., Mertz O., Gerstner K., Heinimann A., Ellis E.C. (2015). Synthesis in land change science: methodological patterns, challenges, and guidelines. *Reg. Environment Change* 15, p. 211-226.
8. Nacionalinė žemės tarnyba prie Žemės ūkio ministerijos. *Lietuvos Respublikos žemės fondas. [The Land Fund of the Republic of Lithuania]*, Vilnius. 2006 - 2014.
9. Pileckas M. (2004). Aplinkosauginių indikatorių taikymas Lietuvos kraštovaizdžio monitoringui: būklė, problemos, perspektyvos. [Environmental indicators for monitoring the application of Lithuanian landscape: status, problems, perspectives]. *Geografijos metraštis* 37 (1-2) t., p. 112-123.
10. Rubavičius V. (2013). The visibility of cultural memory: urban aspect. *Sovijus*, 1(1), p. 60-67.
11. Valstybės kontrolė (2013). Valstybinio audito ataskaita. Regioninių atliekų tvarkymo sistemų veikla. [The National Audit Office. (2013). State audit report. Management systems activities of regional waste]. (02-08-2013, Nr. VA-P-20-9-11). Vilnius, 44 p.
12. Vasarskytė, R. (2016) Kauno miesto istorinė apžvalga. [*Historical Survey of Kaunas City*]. [interactive], [seen 15-11-2016]. Internet site: [http://datos.kvb.lt/index.php?option=com\\_content&task=view&id=21&Itemid=81](http://datos.kvb.lt/index.php?option=com_content&task=view&id=21&Itemid=81) .
13. Veteikis D. (2005). Kraštovaizdžio technogeninės masės sampratos ir kiekybinio įvertinimo problema. [Concept of landscape technogenic mass and quantification of the problem]. *Geografijos metraštis* 38 (1) t., p. 90-96.
14. Veteikis D., Jankauskaitė M. (2004). Urbanizuotos aplinkos monitoringo sistemos elementai ir jų skyrimo problema. [Monitoring system elements of urban environmental and their allocation problem]. *Geografijos metraštis* 37 (1-2) t., p. 95 -105.
15. Vinclovaitė G., Veteikis D. (2011). Kraštovaizdžio poliarizacijos metodologinės problemos. [Methodological problems of landscape polarization]. *Geografija*. T. 47(1), p. 38-45.
16. Wekel J., Koraikina P. (2014). *Changing features of the urban structure in a transitional city*. Our Common Future in Urban Morphology. FEUP, Porto. Vol. 1, 210 pp.
17. Zaleckis K., Kaimičaitytė - Virbašienė J., Ramanauskas E. (2013) Kauno miesto identiteto formantų išsaugojimo galimybės planuojant miesto vystimąsi. [*Kaunas city identity formants conservation opportunities in planning urban development*]. *VII Urbanistinis forumas. Miestas ir vanduo*, p. 43-4.

## Information about author

**Giedrė Ivavičiūtė**, Lecturer, Institute of Land Use Planning and Geomatics, Water and Land Management faculty, Aleksandras Stulginskis University. Address: Universiteto g. 10, LT – 53361 Akademija, Kauno raj., Lithuania. Tel. 8 – 37 75 23 72, e-mail: [ivavice@gmail.com](mailto:ivavice@gmail.com). Fields of interest: landscape architecture.  
Lecturer, Kaunas Forestry and Environmental Engineering University of Applied Sciences. Address: Liepų st. 1, Girionys, LT -53101, Kauno raj. Lithuania. e-mail: [ivavice@gmail.com](mailto:ivavice@gmail.com).  
Lecturer, Klaipėda State University of Applied Sciences. Address: Jaunystės st. 1, LT-91274, Klaipėda, Lithuania. e-mail: [ivavice@gmail.com](mailto:ivavice@gmail.com).