SOCIAL REALITY AND ITS COGNITION: THE ASPECT OF SAFETY

What does a City Master Plan Tell about our Safety? Comparative Analysis of Vilnius, Kaunas, and Klaipeda

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Abstract

High rates of crime have always been considered a serious threat to city development. Crime and urban development are strongly interconnected, therefore, local development policies cannot be successful without crime prevention strategies. One of the areas where local governments are characterized by quite a high degree of independence is that of urban planning, typically documented in a city master plan. In the light of the topic of safety in the urban space, one of the most notable measures of space evaluation is that of land use.

The paper is aimed at identifying land uses, the most vulnerable to crime and the safest ones, and their permutations in the three largest cities of Lithuania: Vilnius, Kaunas, and Klaipeda, in accordance with both different types of criminal acts and crime as a whole. The findings have been based on the analysis of about 50 thousand incidents of anti-social behavior, committed in open public spaces, along 17 types of criminal acts and 14 types of land uses and their permutations. The underlying approach is that of space syntax, as it best integrates social and spatial elements of a city.

The paper is novel in its attempt to access not only separate land uses, but also their clusters (i.e., permutations). In addition, the paper covers a broader range of anti-social behavior than most of the previously carried out research (i.e., the paper looks beyond theft, burglary, and robbery) used to. Therefore, the results might be of interest to a wider audience than the national one.

Keywords: crime, land use, open public space, space syntax, urban planning.

Introduction

Numerous researchers agree that a high rate of crime is a serious threat to city development (Cullen and Levitt, 1999; Vidaver-Cohen, 2003; Cook, 2009). Crime and urban development are strongly interconnected, therefore, local development policies cannot be successful without crime prevention strategies. The authors of the Global Study of Homicide of the United Nations Office on Drugs and Crime report (UNODC, 2011) pay attention to the fact that there is a clear link between violent crime and development. Crime inhibits human and economic development which, in turn, fosters crime. Thus, improvements to social and economic conditions go hand in hand with the reduction of crime. The World Bank (2012) further emphasizes a negative impact of crime on development: crime constitutes a serious barrier to economic and social development; in many urban centres across the world, high crime and violence rates strike growth down, threaten human welfare and hinder social development. Therefore, crime prevention is one of the top priorities in urban policy-making.

On the one hand, major crime causes are affected by social, economic, cultural, and other factors, which, more often than not, are outside city control due to national policies and the allocation of resources (Sinkiene, Stankevice and Navickaite, 2012). On the other hand, researchers (Dunning, 1992; Savitch and Kantor, 2002; Brenner, 2004) note that nation-states transfer increasingly more powers and responsibilities to local level authorities in order to take the advantage of globalization on the level where their expression is most intense. One of the areas where local governments are characterized by a pretty high degree of independence is urban planning. Typically, every city has its own master plan, a document that provides city planners, enterprisers, politicians, dwellers, and others with the information about how the city has to develop (Stankevice, Matijosaitiene and Sinkiene, 2012). It includes development priority areas, a number of land uses (e.g., commercial, forests), types of borders (e.g., borderlines of cultural reserves, protected territories), important objects (e.g., close ports, railway station, airport), and transport infrastructure (e.g., roads, railways). The territories are planned considering the current situation, vision, and the needs of the city.

In the context of safety in urban space, one of the most notable measures of the evaluation of space is that of land use. Monteiro (2012) has found out that in residences theft

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appears most often on internal roads of the neighborhood, whereas in commercial establishments it occurs on more integrated, that is, more accessible ones. Similarly, Baran, Smith and Toker (2007) suggest that commercial land uses have the strongest effect on crime counts. The research model of Hillier and Sahbaz (2009) has also incorporated land use as a distinctive parameter of different spaces. Then, Friedrich, Hillier and Chiaradia (2009) have investigated whether spatial factors, such as street or estate layout, can be shown to increase the levels of anti-social behavior occurrence and risk. Finally, land use has become so important in respect of safety within an urban space that specific areas of land use have been investigated separately, e.g., parks (Kaya and Kubat, 2007) or school surroundings (De Abreu and Trigueiro, 2012).

Hence, this paper aims at identifying the most vulnerable to crime land uses and their permutations. The paper presents the findings of theoretical and empirical research conducted by a group of scholars at Kaunas University of Technology, Lithuania, representing urban planning, public administration, and management fields. In 2012, with the support of the Research Council of Lithuania, the group examined the relationship between urban space and its impact upon crime in the three largest Lithuanian cities (Vilnius, Kaunas, and Klaipeda), searching for solutions to prevent the occurrence of crime employing architectural or urban planning tools. The present research has been based on the methods of space syntax, statistical data analysis, expert interview, and document analysis. Research results have helped identify drawbacks of and suggest corrections to previously implemented urban planning, also helping avoid mistakes in future projects. This change should enable achieving a higher level of safety in Lithuanian cities and, respectively, a higher level of their attractiveness and more successful development.

The paper is novel in its attempt to access not only separate land uses, but also their clusters (i.e., permutations). In addition, the paper dwells on a broader variety of anti-social behavior than most of the previous research; specifically, the paper looks beyond theft, burglary, and robbery. Hence, the results might be of interest to a wider-ranging audience than the national one.

Safety and open urban space

Safety has long been a focus of research on spatial configuration of cities. As Hillier and Sahbaz (2009) put it, a key priority in the design of cities is to make life difficult for criminals. However, different theories have concentrated on a number of varying aspects, thus leading to contradictory arguments and city planning policies. Moreover, a lack of empirically-based contribution remains an important impediment to effective and sustainable urban planning (Hillier and Sahbaz, 2009; Nunabi and Wineman, 2005).

In general, theories of crime location represent two categories: social science theories and urban design ones (Baran, Smith and Toker, 2007). In social sciences, a predominant theory of the spatial location of crime has been the social disorganization theory (Sampson and Groves, 1989). It emphasizes poverty, racial and ethnic heterogeneity, and residential mobility as the contributors to delinquent activities. The notion attributes a variation in crime over time and among territories to the absence or a breakdown of communal institutions, such as family, school, social clubs, local government, etc., and communal relationships that traditionally encourage cooperative relationships among people. As society is organized around individual and small group interests, it permits crime to persist.

The routine activity theory (Cohen and Felson, 1979), another important line of socially-oriented research on space and crime, is predominantly concerned with motivated offenders, attractive targets and/or opportunities, and with the absence of capable guardianship against crime as the factors, inducing crime. At the same time, the absence of capable policing can be associated with the statement of the previously-mentioned theory (Sampson and Groves, 1989) acknowledging that if society is fragmented, it is more vulnerable to crime, for a fragmented society cannot have an effective custody of social life. Accordingly, attractive opportunities for criminals emerge more often. However, the routine activity theory focuses more on personal motivation, and not on external conditions which lead to anti-social behavior.

The defensible space theory (Newman, 1972) relates to the stream of urban design. It argues that crime can be expected to be down in low density, single use environments with a restricted access to strangers. The prospect refuge theory (Jacobs, 1961) alleges precisely the opposite – in open and pervious mixed use environments, strangers passing through spaces, as well as inhabitants occupying them, form a natural guardianship mechanism which inhibits crime. However, the research has revealed that different types of anti-social behavior correlate with different urban spaces (Hillier and Sahbaz, 2009; Monteiro, 2012). For instance, pickpockets prefer crowded spaces, whereas robbers act more effectively on calm streets than within a crowd which hampers an easy and rapid escape.

And finally, the space syntax theory (Hillier and Sahbaz, 2009; Baran, Smith and Toker, 2007) regards urban environment to as a continuous whole, where each area is inter-dependent with its social and urban context. Hence, the latter paradigm serves as a bridge which enables the interaction of factors, taken into account by the other theories. For instance, Hillier and Sahbaz (2009) find out that the advantage of living in a flat is great for better-off people, but well-off people are particularly at risk in small *cul de sacs*. Thus, space syntax integrates social (household income) and urban (flat, *cul de sac*) elements of space into one whole. In addition, the proponents of the space syntax approach admit that, in order to indicate hot spots, one needs to integrate a number of aspects which overpass the frames of a single theory of crime location. Based on the arguments above, space syntax has been a leading conceptual approach of this paper.

In spite of the fact that the method of space syntax enables dealing with crime in open public spaces most

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effectively, it is important to specify the concept of open public space. According to Carr et al. (1992), urban public space is one of the most important elements of urban structure, covering non-built (open), limited by buildings (closed), and green (changing) urban spaces. Additionally, contemporary perspectives suggest the need to add other elements of public space, such as space above public and private buildings, as it creates the visual identity of a city.

Butkus (2010) assigns streets, passages, embankments, squares, parks, and cemeteries to typical public space elements. He also proposes including other public spaces with a different right of ownership, i.e. the inner space of municipal buildings (offices of municipal administration, public library, hospital, theatre, art gallery, etc.), private space, limited by public buildings, or space inside public buildings (airports, bus stations, concert halls, etc.) and bridges, viaducts, metro stations, tunnels as well as semi-private public spaces, expropriated public spaces, virtual urban space points.

In the Lithuanian law, public space is defined as a 'common area: land plots, squares, and parks with provided equipment and other landscape greenery' (Lauzikiene, 2010). From a wider perspective, it can be defined as a place where every citizen, regardless of his/her age, race, citizenship, sex or social class can enjoy the overall presence of other people, or represent collective and general interest without overshadowing and destroying its diversity.

The concept of public space, used in the Lithuanian court practice, has some limitations. Fedosiuk (2012) argues that a single and comprehensive definition of public space does not exist and this concept is often explained through legal precedents. He proposes to refer to the Ruling of the Supreme Court of the Republic of Lithuania of October 8, 2002, which denotes that "a public place is the place where, during the moment of commitment of the offence, other individuals are present or have the right to be present. The activity is considered to be committed in a public place regardless of the presence or absence of anybody in this place. It is important to note that due to a free access to the place at any moment, other individuals can appear who, due to the actions of the causer, will experience uncomfortable situation". The same ruling states that 'public order can be violated in usual places to visit: streets, roads, parks, stadiums, premises of companies and institutions, staircases of multi-apartment blocks, public transport, also in places usually not visited by people, but where they have the right to be and can appear at any moment — forest, lake shore, etc.'.

This discussion shows two main types of public spaces: open and closed ones. The authors of this paper have analysed urban open public spaces, sharing the following characteristics: firstly, it is in an open space (not covered by roof and walls) and, secondly, any individual has the right for a free access at any time. In general, spaces investigated during the research were: streets (including bus stops), squares, parks, river banks, beaches, cemeteries, passages, underground passages, bridges, and fenceless parking lots of multi-apartment buildings.

Methodology

Space syntax is a method for describing and analysing the relationships between the spaces of urban areas and buildings – 'the layout' (Klarqvist, 1993). In space syntax, spaces are understood as voids (streets, squares, rooms, fields, etc.) between walls, fences and other impediments or obstructions that restrain (pedestrian) traffic and/or the visual field. The theory of space syntax describes and measures quantitatively configurational properties of the urban space (Hiller and Hanson, 1984). The theory sees the built environment as a system and states that it affords or carries movement from one space to another space within a system. Built environments that are most directly linked to other built environments tend to attract higher densities of movement. The theory of space syntax also posits that the accessibility of potential victims serves as an opportunity to motivate offenders.

The research has aimed at investigating the distribution of crime committed in open public spaces of Vilnius, Kaunas, and Klaipeda. For that purpose two main documents, the Criminal Code and the Code of Administrative Offences of the Republic of Lithuania, have been analysed and a preliminary list of Code clauses stating criminal activities, typically committed in public open spaces, has been prepared. After consultations with Kaunas City Police officers, the final list consisting of 17 criminal activities was made: 1) Criminal Code clauses: desecration of state symbols, desecration of foreign national symbols, crimes against human life (murder, attempted murder), bodily injury (contusion), crimes against the freedom of sexual self-determination and inviolability, car theft, theft from a car, other theft, robberies; 2) clauses of the Code of Administrative Offences: intentional destruction of property or injury, cruelty to animals, damage to streets, structures and installations, small hooliganism (in words or gestures, etc.), hooliganism committed by minors, illegal shooting of a firearm, drinking of alcoholic beverages in public places or drunken apparition, engagement in prostitution or the usage of prostitution services.

Official data of the selected criminal activities, registered in a two years period (2010 – 2011), as well as master plans of the cities and other related documents have been analysed.

Findings

Distribution of crime in Vilnius city

The findings of the Vilnius city crime survey (Stankevice, Matijosaitiene and Sinkiene, 2012) have been based on the analysis of 30 527 incidents of anti-social behaviour along 17 types of criminal act, 14 types of land use and their permutations, and 676 streets. For the assessment of crime on city streets, Vilnius County Police Headquarters have provided a register of criminal acts, committed in Vilnius city during 2010-2011 (Zaleckis et al., 2012), 30 527 incidents in total. However, only 18 893 have been further analyzed, as only the incidents committed in open public spaces, as defined by De Abreu
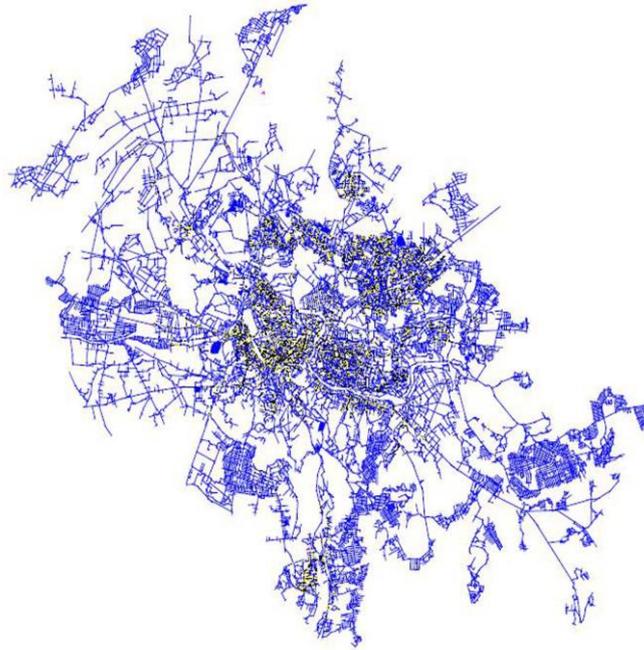
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Figure 1. Distribution of crime in open public spaces in Vilnius, 2010-2011 (Zaleckis et al., 2012).
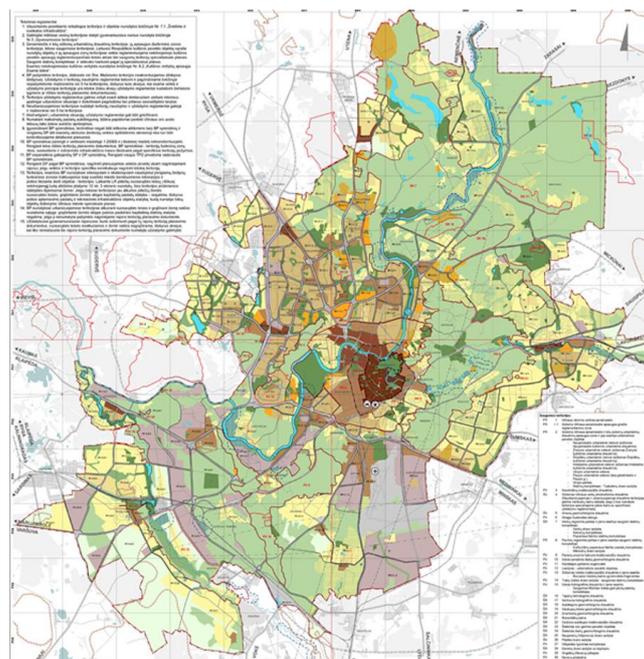

Figure 2. Vilnius city master plan until 2015 (Vilniaus planas, 2007)

and Trigueiro (2012), have been of interest for the survey. Their distribution is illustrated by Figure 1.

Vilnius city master plan until 2015 has been used for the assessment of land uses (Figure 2).

In this survey, the authors (Savitch and Kantor, 2002) have only investigated the following land uses: the Old Town; city centre, important local centres (further – city centre); local centres and other mixed areas with high building intensity (further – local centres); residential areas with high building intensity (further – dense residential areas); residential areas with moderate building intensity (further – moderately dense residential areas); residential areas with low building intensity (further – sparse

residential areas); gardeners communities' areas, converted into residential areas with low building intensity (further – gardens); areas for society needs, specialized and complexes' areas (further – specialized areas); areas for the society's needs, specialized and complexes areas with much greenery (further – planted specialized areas); infrastructure territories (further – infrastructural areas); business, production, and industrial territories (further – industrial areas); greenery for intensive and extensive usage (further – greenery); forests and forested territories (further – forests); waters and watering-places (further – waters).

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Table 1

Land use and relational vulnerability to criminal acts (adapted from Stankevice, Matijosaitienė and Sinkiene, 2012)

Type of criminal act	Relational vulnerability to crime within the clusters of land use, %									
	Cluster No.	1	2	3	4	5	6	7	8	9
	Sum, %	City centre, infrastructural areas, waters	Not land use specific cluster	Specialized areas, infrastructural areas, industrial areas, forests	Sparse residential areas, forests	Dense residential areas, specialized areas, greenery	Forests	Sparse residential areas	Dense residential areas	Local centres, dense residential areas, specialized areas, greenery
Desecration of the national symbols	0.05	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02
Crimes against human life	5.14	0.00	0.60	1.43	1.32	0.00	0.75	0.69	0.35	0.00
Crimes against human health	4.24	0.28	0.30	0.95	0.24	0.49	0.27	0.17	0.54	1.00
Crimes against human sexual freedom and immunity	6.36	1.11	0.42	1.18	0.69	0.37	0.66	0.64	0.49	0.79
Theft of motor vehicles	5.90	0.65	0.37	1.19	0.48	0.87	0.23	0.38	0.80	0.93
Theft from a car	4.52	0.18	0.32	0.84	0.23	0.55	0.20	0.10	0.60	1.51
Other thefts	3.58	0.24	0.49	0.74	0.15	0.24	0.11	0.22	0.50	0.90
Robbery	5.32	0.28	0.39	0.65	0.31	0.85	0.30	0.06	0.65	1.83
Intentional damage to or destruction of property	4.78	0.38	0.60	1.52	0.09	0.77	0.17	0.06	0.50	0.69
Cruel animal treatment	6.48	0.00	0.63	2.02	0.00	0.00	0.79	1.45	0.00	1.59
Damage to streets, their buildings and installations	2.86	0.00	2.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Small-scale hooliganism	4.64	0.31	0.66	1.02	0.11	0.68	0.07	0.11	0.47	1.19
Hooliganism by juvenile offenders	4.05	0.81	0.39	0.22	0.25	0.40	0.06	0.32	0.79	0.81
Illegal shooting from a gun	5.59	0.00	0.30	0.96	0.66	0.53	1.13	0.69	0.58	0.75
Drinking alcohol in public places or an apparition there while being drunk	4.30	0.26	0.56	0.97	0.11	0.53	0.10	0.16	0.57	1.06
Prostitution or repayable usage of the services	3.35	0.14	2.36	0.26	0.00	0.18	0.05	0.05	0.12	0.20
Sum across all the types of criminal act	**71.16**	**4.65**	**11.25**	**13.93**	**4.64**	**6.45**	**4.91**	**5.10**	**6.98**	**13.26**

Due to cluster analysis of the land uses which are crossed by streets, where at least one criminal incident happened during 2010-2011, nine clusters emerged. In order to identify the most vulnerable permutations of land use along the envisaged types of criminal acts, the relational distribution of criminal acts, expressed in percentage, was estimated in each cluster of land use. The results which explain 71.16 percent of the total crime distribution, are reported in Table 1.

As Table 1 indicates, on the streets of clusters 5, 8, and 9, which all include dense residential areas, robbery and thefts are rather common. However, cluster 5 is the safest one among them which leads to the conclusion that dense residential areas without any specialized areas and greenery are more crime-vulnerable than those integrating the above-named two other land uses.

The inclusion of specialized areas and greenery into dense residential areas would not only contribute to the prevention of crime on the streets, but also enrich social life and glamorize urban spaces. Greenery also seems to inhibit crime, when integrated into city centre and local centres and mixed with infrastructural areas and waters, as the analysis of cluster 1 suggests. On the other hand, if the mix of greenery, dense residential areas, and specialized areas are combined with local centres, this becomes even more attractive to criminals than dense residential areas alone, taken separately. Therefore, the implementation of policies which reduce building intensity in local centres and other mixed areas with high building intensity, but increase the number of specialized areas and greenery could be suggested.

Comparing clusters 4 and 7 which both include sparse residential areas, one would notice that the former cluster is, in general, a little safer. However, it is much more vulnerable in respect of crimes against human life, whereas cluster 7 is mostly unfriendly to animals.
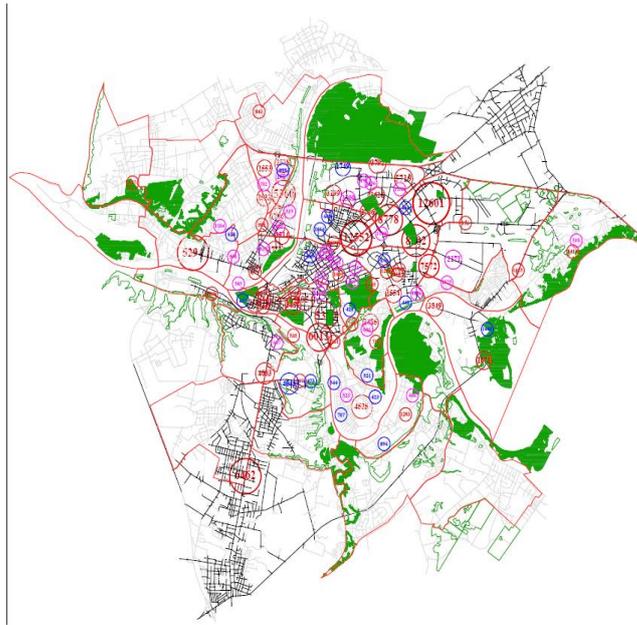
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Figure 3. Axial map of Kaunas with crime cases, green recreational areas and administrative borders of neighbourhoods (Zaleckis and Matijosaitiene, 2012a)

This leads to the conclusion that sparse residential areas should not be mixed with forests; at the same time, in these land uses, it is necessary to implement a number of social actions and make substantial effort, aimed against the cruelty towards animals. The same actions are also needed in respect of forests only, separated from residential areas or other land uses, as the analysis of cluster 6 suggests.

Specialized areas occur within clusters 3, 5, and 9. The latter two have already been discussed above. However, cluster 3 is most vulnerable to crime, therefore, specialized areas should not be planned in combination with infrastructural and industrial territories, or forests. Instead, infrastructure territories should be integrated into greenery and waters, i.e., cluster 1. Nonetheless, city's financial life requires that infrastructural areas are inseparable from the industrial ones. If so, this mix could finely embrace greenery and waters, but it should definitely exclude specialized areas and forests.

Distribution of crime in Kaunas city

The analysis of crime location on the Kaunas city map has demonstrated that some spaces are safer than others (Figure 3). In the case of Kaunas, the most recent our survey was aimed at estimating components of urban structure which, to some extent, cause crime in certain places of the city (Matijosaitiene et al., 2012).

The survey (Matijosaitiene et al., 2012) rests on the hypothesis that urban patterns of high and low-activity are related to urban crime. The space syntax method and the statistical approach to data have been applied for the verification of the hypothesis. According to the method, open public spaces are crossed by axial lines until there remains no space which is not crossed by an axial line. Thus, an axial map of Kaunas city was prepared (Figure 3). Axial maps consist of the longest and fewest straight lines

that go throughout all convex spaces and make all axial links (Hillier, Hanson and Peponis, 1987; Topcu and Kubat, 2007). Axial structure is one-dimensional and it describes the degree to which any space extends linearly. Axial structure provides with the information about where passengers might go in the system; thus, it is related to movement. Black axes on the Kaunas city axial map (Figure 3) represent the foreground network of high-activity linked centres, while grey axes represent the background network of lower activity spaces. The map demonstrates that the greatest part of foreground is covered by crimes which correlate with a certain social spatial characteristic. It means that most of crime happens in the foreground network of Kaunas city.

Then, according to the space syntax method, connectivity, control, global depth, fast choice, global integration, local integration R2, and local integration R3 are important measures of urban structure. Connectivity is defined as the number of nodes that connect directly to a given node (Raford and Ragland, 2004). Control measures the degree of control when one axis controls the entrance to and from other axes which are directly linked. Depth defines the number of steps from any node to any other node (Raford and Ragland, 2004). The streets with the lowest depth distance values are said to be nearest to all the other streets. Depth is related to integration. According to Hillier, the integration of axial lines correlates well with the number of pedestrians found to be walking along the axial line (Hillier et al., 1993). Integration measures how easily accessible a node is from other nodes in the system (Raford and Ragland, 2004). Integration can be measured at a global scale by the choosing radius Rn: in this case, a person can reach all the segments in the system. One can also analyze local integration at various scales (R1, R2, etc.): in this case, a person has to make one turn (R1), or two turns (R2), or more turns to reach the segment.
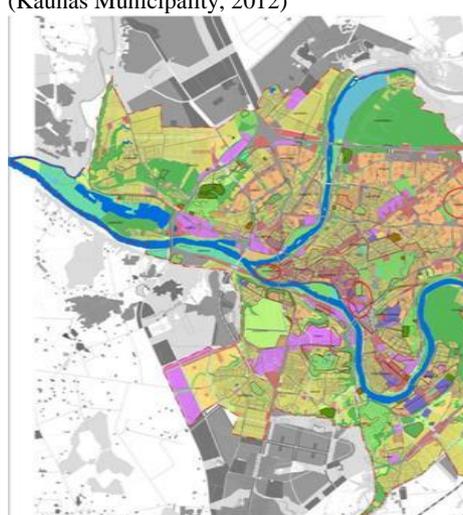
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Table 2

Pearson and Spearman's rho values (Matijosaitiene et al., 2012)

Types of crime	Correlation coefficients	Connectivity	Control	Depth	Fast choice	Global integration	Local integration R2	Local integration R3
Crimes against human health	Pearson	.202**	.187**	-.043**	.209**	.053**	.123**	.103**
	Spearman	.098**	.064**	-.047**	.095**	.060**	.090**	.087**
Theft from cars	Pearson	.307**	.234**	-.106**	.240**	.123**	.188**	.168**
	Spearman	.158**	.054**	-.211**	.042**	.213**	.174**	.182**
Intentional destruction of or damage to property	Pearson	.250**	.178**	-.086**	.160**	.110**	.132**	.122**
	Spearman	.079**	.022**	-.120**	.013	.129**	.089**	.098**
Small-scale hooliganism	Pearson	.353**	.284**	-.097**	.205**	.111**	.176**	.154**
	Spearman	.124**	.054**	-.157**	.044**	.149**	.128**	.135**
Hooliganism by juvenile offenders	Pearson	.324**	.250**	-.086**	.098**	.096**	.165**	.142**
	Spearman	.097**	.040**	-.120**	.039**	.112**	.104**	.104**

** Correlation is significant at the .01 level (2-tailed)

Table 3

The most crime-vulnerable open public spaces in Kaunas, 2010-2011

	Area	Land use
Figure 4. Kaunas city master plan until 2013 (Kaunas Municipality, 2012)	Areas around Kaunas castle and Rotušės square (the Old Town)	• Parks • Waters • Land of public buildings • Dwellings • Infrastructure lands • Commercial and service lands
	Areas close to the Railway and Bus stations (city centre)	• Infrastructure lands • Industrial lands • Commercial and service buildings • Parks • Some dwellings
	Area close to the Trade City *Urmas* (dense residential area)	• Dwellings mostly • Close to a park • Close to industrial lands • Close to a college

And finally, fast choice shows how many times an axis is being used in comparison with all the shortest paths.

For the assessment of crime numbers, all 5 Local Police Units of Kaunas City have provided a register of criminal acts, committed in Kaunas city during 2010-2011, which includes 3 440 incidents along the envisaged types of criminal acts. However, as Kaunas County Police Headquarters had refused to collaborate, and the information from 5 territorial police units varied and was not complete, some types of crime remained uncovered, that is: desecration of national symbols, theft of motor vehicles, cruel animal treatment, illegal shooting from a gun, drinking alcohol in public places or an apparition there while being drunk, and prostitution or repayable usage of the services. All the other crime became subject to correlation analysis in order to assess relations and the strength of relations between various types of crime and urban structure of Kaunas city.

According to the correlation values, presented in Table 2, the following social spatial characteristics should be taken into account for further analysis of urban crime and urban structure in Kaunas city. First, connectivity should be considered for the analysis and prediction of crimes against human health, theft from cars, intentional destruction of or damage to property, small-scale hooliganism and hooliganism by juvenile offenders. Second, control should be taken into account for the analysis and prediction of theft from cars, small-scale hooliganism and hooliganism by juvenile offenders. Third, depth should be examined for the analysis and prediction of theft from cars. Fourth, fast choice should be investigated for the analysis and prediction of crimes

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against human health, theft from cars, and small-scale hooliganism. And fifth, global integration should be considered for the analysis and prediction of theft from cars.

The results lead to the conclusion that, in general, hooliganism and crimes against human health tend to occur on the streets which are both well-connected to other streets and are often used as the shortest ways to get to an object. The same characteristics are typical of theft from cars; however, in this case, the streets are easily accessible from different parts of the city and, at the same time, integrated into the urban structure in a way which makes a rapid escape possible (i.e., the number of steps from a node to any other node is small and the street is nearest to all the other streets). Finally, intentional destruction of or damage to property is the least demanding: it tends to occur on literally well-connected streets.

A more detailed analysis of crime in Kaunas (Zaleckis et al., 2012) has revealed that there are three districts which are induced to an aggregate of different crimes with substantial numbers (Table 3), i.e., many different crimes occur in these areas. For the assessment of land uses in these territories, Kaunas city master plan until 2013 has been used (Figure 4), where the distinguished territories are marked by circles.

It is important to note that the comparison of Kaunas to Vilnius compounds the felony, as the above-mentioned municipalities use different legends. For instance, Vilnius city master plan differentiates between dense and sparse residential areas, while this is not the case of Kaunas city master plan; then, the latter differentiates between low-rise and high-rise buildings, differently from Vilnius city master plan; greenery and forestry, industrial and commercial areas are also detailed to varying extents.

Nonetheless, one would firstly notice that the areas around the Railway and Bus stations of Kaunas correspond to the most dangerous cluster of land use in Vilnius, i.e. the mix of specialized areas, infrastructural areas, industrial areas, and forests. Secondly, the areas around Kaunas castle and Rotuses square correspond to the mix of local centres, dense residential areas, specialized areas, and greenery in Vilnius. Moreover, the situation is even worse in Kaunas due to the existence of commercial and industrial lands on these territories. Thirdly, the area near the Trade City *Urmas* corresponds to the cluster of dense residential areas in Vilnius. Hence, these insights lead to the conclusion that the recommendations provided to planners of Vilnius city also apply to those deciding the future of Kaunas.

Some more interesting findings reveal the relationship between crime and urban space in Kaunas city. According to Zaleckis and Matijosaitiene (2012b, 2012c), Kaunas downtown has become, in terms of the space syntax method, deeper and less integrating since the Soviet times, and it is even less integrating nowadays. The integration of some inner spaces has decreased now and they have become partly isolated from other inner spaces during the independence period. The connectivity and accessibility of most of the spaces have increased since the Soviet period, but the connectivity and accessibility of major inner spaces

have decreased during the period of independence. It means that crime tends to occur near the streets which are well-connected to other streets, are easily accessible from different parts of the city, are often used as the shortest ways to get to an object, and are integrated into the urban structure, allowing for a rapid escape. To put it differently, most of the crime occurs in inner spaces of highly integrated territories, for example, parks near main roads, residential areas near commercial lands or main roads, etc. This is the tendency which applies to Vilnius as well. Different socially-attractive objects are located near major streets, but most of the crime happens on the streets nearby, as those are typically used as the shortest way to get to an object by potential victims. At the same time, they allow for a rapid escape of offenders because these streets and territories are partly isolated, but close to other streets (i.e., behind a closely located corner, a criminal dissolves in a crowd).

Distribution of crime in Klaipeda city

For the analysis of urban structure of Klaipeda, the space syntax method has been applied, similarly to the survey of crime in Kaunas city. Axial maps of Klaipeda city have been prepared and analyzed, i.e., connectivity, control, global depth, fast choice, global integration, local integration R2, and local integration R3. The axial maps were then covered with the maps of the data on the quantity and location of various types of crime during 2010-2011. The more detailed data has not been available, as both Klaipeda County Police Headquarters and the territorial police units refused to collaborate.

For the assessment of relations and the strength of relations between various types of crime and Klaipeda urban structure, correlation analysis has been applied. Spearman's correlation coefficient (Spearman's rho) is a non-parametric measure of statistical dependence between two variables. The results of our analysis are reported in Table 4.

Spearman's rho correlation coefficient (Table 4) reveals weak negative relations between all the types of crime, except explosives, and depth. There are also weak relations between all the types of crime, except explosives, and global integration. This combination means that in Klaipeda, similarly to Vilnius and Kaunas, unsafe areas are layered by the foreground of global integration, whereas they represent not the major streets or the most attractive areas themselves, but the streets which are near to them. Therefore, the same conclusions apply.

The prepared maps of global integration (Figure 5) and global depth (Figure 6) of Klaipeda city reveal potentially the most and the least dangerous open public spaces from the point of view of crime and urban structure.

In the figures above, light colours mean very integrated spaces on the global integration map as well as shallow spaces on the global depth map, in other words, the foreground network of high-activity linked centres. According to correlation analysis, these spaces are the most crime-vulnerable: the more a certain space is integrated and shallow, the more accidents happen there.

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Table 4

Spearman's rho correlation coefficient values (adapted from Matijosaitiene, Zaleckis and Stankevice, 2012)

	Connectivity	Control	Depth	Fast choice	Global integration	Local integration R2	Local integration R3
Destruction of property	0.162**	0.078**	-0.242**	0.121**	0.297**	0.164**	0.175**
Public nuisance	0.168**	0.078**	-0.270**	0.088**	0.319**	0.181**	0.202**
Theft	0.180**	0.088**	-0.240**	0.113**	0.300**	0.187**	0.195**
Crime against a person	0.155**	0.083**	-0.247**	0.089**	0.310**	0.160**	0.176**
Explosives	0.097**	0.049*	-0.134**	0.079**	0.182**	0.107**	0.124**
Other crimes	0.170**	0.080**	-0.291**	0.082**	0.335**	0.190**	0.212**
All the crimes	0.156**	0.056*	-0.314**	0.051*	0.394**	0.205**	0.243**

** Correlation is significant at the .01 level (2-tailed)
* Correlation is significant at the .05 level (2-tailed)
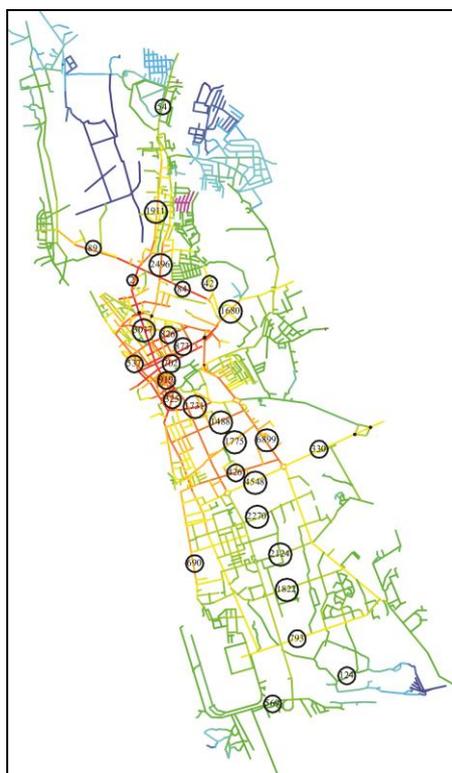

Figure 5. Global integration of Klaipeda city
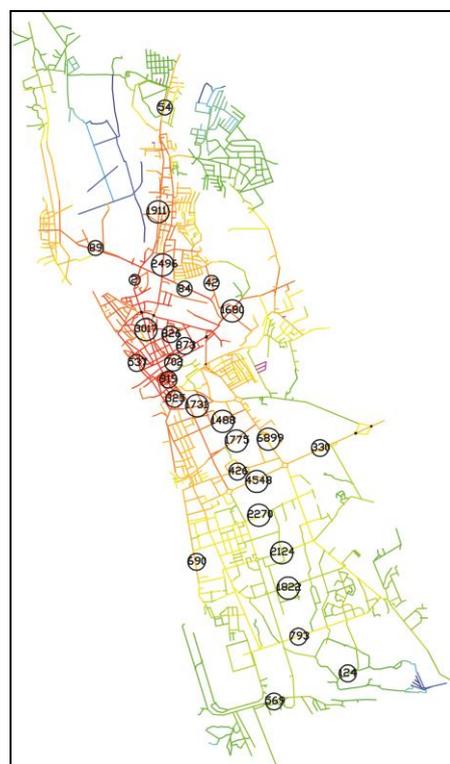(Matijosaitiene, Zaleckis and Stankevice, 2012)

Figure 6. Global depth of Klaipeda city
(Matijosaitiene, Zaleckis and Stankevice, 2012)

Dark colours represent the background network of lower activity spaces. According to the correlation analysis, these spaces are the least crime-vulnerable. The quantity of crimes is presented in the circles for some streets.
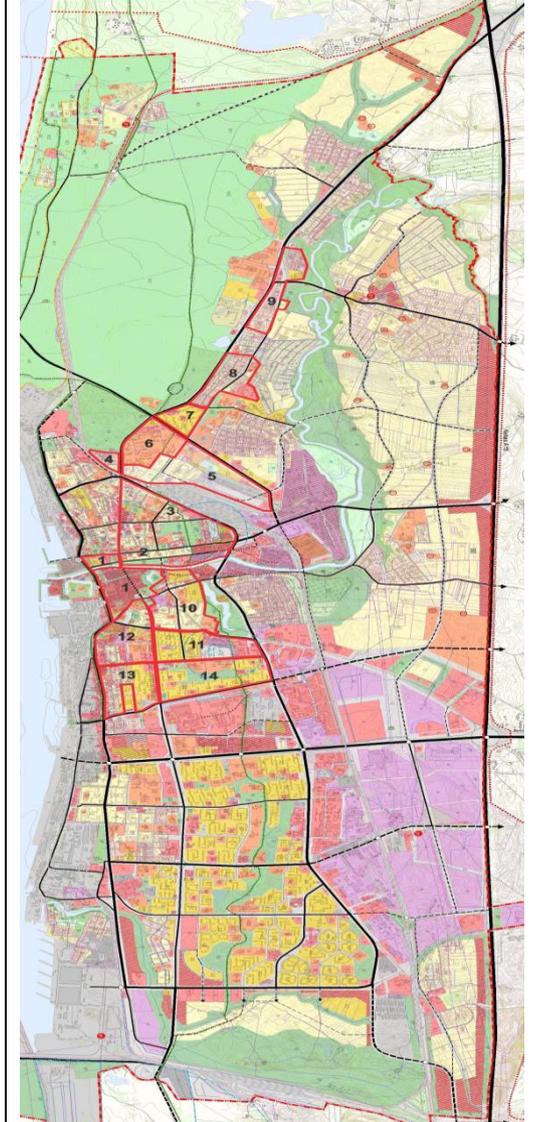
Thus, the most unsafe city parts are: the Old Town and the New Town, Lietuvninkai, Pusynas, Kretinga, Universitetas, Miskas, Mazasis kaimelis, Liepoja, Baltikalne, Rumpiske, Birute, Vėtrunge, and Kaunas districts, Siaures and Silutes avenues, as well as Liepojos, Mokyklos, Kauno, and Dubysos streets. A comparative analysis of these city parts is presented in Table 5. These urban parts and streets have evolved into very integrating and shallow open public spaces. This may be the reason of their insecurity. However, other factors, such as land use,

street segment length, the angle they intersect with each other, etc. may also affect urban crime. The analysis of these factors is envisaged for the future research. The analyzed Siaures and Silutes avenues as well as Liepojos, Mokyklos, and Dubysos streets, are B category streets, and Kauno street is of a lower, C category, street. The traffic on these streets is intense.

Again, the differences of legend of master plans of the three cities make it difficult to compare the distribution of crime along land uses and their permutations. Despite the fact that almost all the most unsafe parts of Klaipeda city include residential, public and commerce land uses, one cannot conclude that these land uses affect a higher urban crime.

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Table 5

Comparative analysis of the most unsafe parts of Klaipeda city (Matijosaitiene, Zaleckis and Stankevice, 2012)

Figure 7. Master plan of Klaipeda city (Klaipėda Municipality, 2012)	City part	Land use
	Old Town (1)	*Commercial lands* occupy the most part of this area; green areas, residential (very few), infrastructural (very few)
	New Town (2)	*Mixed land use*: residential (blocks of flats and private houses), commercial, public, green areas, recreational, industrial, infrastructural
	Lietuvninkai (3)	*Blocks of houses and commerce* occupy most of this area; public, commercial, green areas
	Pusynas (4)	*Private residential houses and 2-3 storey houses of flats* (sparse residential areas and forests)
	Kretinga (5)	*Blocks of houses* occupy the largest part of this area. There are very very few private houses; infrastructure, commercial (very few), greenery
	Universitetas (6)	*Public lands* occupy the largest part of this area
	Miskas (7)	It is a prestigious part of Klaipeda city; *5-12 storey houses of flats* dominate here; also: commercial (very few), public (very few)
	Mazasis kaimelis (8)	One of the most prestigious parts of Klaipeda city. *Luxurious private houses* dominate; commercial (very few), public (very few)
	Liepoja (9)	*1-3 storey residential houses* dominate; commercial (very few)
	Baltikalne (10)	*Blocks of flats* occupy the biggest part of this area; also: public, commercial, industrial
	Rumpiske (11)	In the western part, *5 and some 9-storey blocks of flats* are situated. In the eastern part of Rumpiske commerce, *idunstrial and infrastructural* areas dominate; public (very few)
	Birute (12)	In the easthern part, *5-storey blocks of flats* dominate. In the western part, mixed land use, various buildings: 2-3 storey residential houses, storehouses, garages, scholastic institutions and various companies (i.e., *commercial, industrial, public, greenery, infrastructural*)
	Vetrunge (13)	*Residential lands* mostly; commercial, public, infrastructural (very few)

It is logical that residential, public and commerce lands attract more people – inhabitants and passengers. As one might suggest, the more people pass the space, the more accidents may happen in it, as the defensible space theory (Newman, 1972) alleges. However, in a space with more eyewitnesses it becomes more difficult to commit crime, according to the prospect refuge theory (Jacobs, 1961). Thus, for a more detailed analysis and identification of urban factors which influence crime in cities more detailed data on urban crime and existing urban structure is needed.

Still, the table demonstrates that the city centre (1 and 2 together) which encompasses a mix of different land uses, including dense residential areas, is vulnerable to crime. The analysis of Vilnius city has revealed the necessity to reduce the intensity of residential buildings in these territories, and the suggestion can also be applied to Klaipeda. Then, sparse residential areas in combination with forests nearby (e.g., Pusynas, Mazasis kaimelis, Liepoja) are also in risk. Similarly to the previous results from the other two cities, commercial, industrial and infrastructural areas worsen the situation, and the case of Klaipeda demonstrates that even a relatively safe combination of dense residential areas, greenery, and specialized territories, when combined with either type of the above land uses and their combination especially, turns into an unsafe place. The analysis of Klaipeda reveals one more significant pattern: public lands alone (e.g., the University district) become of interest to criminals as well.

Concluding remarks

The analysis of the three major Lithuanian cities allows for the identification of some common tendencies.

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Moreover, the results assessed from different cities enable to supplement internecine findings.

Thus, dense residential areas without any specialized areas and greenery are more crime-vulnerable when two other land uses are integrated. The inclusion of specialized areas and greenery into dense residential areas would not only contribute to crime prevention on the streets, but would also enrich social life and glamorize urban spaces. Greenery also seems to inhibit crime, when integrated into a city centre and local centres, and mixed with infrastructural areas and waters. Nevertheless, if the mix of greenery, dense residential areas, and specialized areas is combined with local centres, commercial and/or industrial areas, it becomes even more attractive to criminals, compared to dense residential areas alone, taken separately. Therefore, it is purposive to implement policies which reduce building intensity in local centres and other mixed areas with high building intensity, but increase the number of specialized areas and greenery there.

The findings presented in this paper suggest that specialized areas should not be planned in combination with infrastructural and industrial territories and forests, or left alone as a territory, significant in size and clearly separated. Instead, public lands should be combined with dwellings and greenery, but an overload in the shape of different land uses, especially in city centres and local city centres, should be avoided. What makes safe combinations of land use vulnerable to crime are commercial, industrial, and infrastructural territories, or their permutations. Nonetheless, city's financial life requires infrastructural areas to be inseparable from the industrial ones, and often even commercial ones. If so, this mix could finely embrace greenery and waters, but it should definitely exclude specialized areas, forests, or residential areas, either dense or sparse. In this case, the example of the USA is instructive, where the largest shopping and entertainment centres are typically distant from city centres or residential areas in that country.

What concerns sparse residential areas, it could be noticed that, in combination with forests, they are crime-vulnerable, especially in respect of crimes against human life. This leads to the conclusion that sparse residential areas should not be mixed with forests; in these land uses, it is necessary to implement a number of social actions and make substantial effort, aimed against cruelty towards animals, as these areas are least friendly to animals. The same actions are also needed in respect of forests only, separated from residential areas or other land uses.

Attempting to deeper investigate the patterns of crime within land uses in the three cities, some important conclusions can be made. In these cities, different socially attractive objects are located near major streets, but most crime happens on the streets nearby, as these ones are typically used as the shortest ways to get to certain objects by potential victims and, at the same time, they allow for a rapid escape of offenders because these streets and territories are both partly isolated and located close to other streets. To put it differently, streets and territories, located near the mostly integrated areas, deserve the greatest part of attention by planners, enterprisers, politicians, dwellers,

etc. The same rule applies to sparse residential areas, combined with forests: the areas have their own major streets and areas, which are perfectly connected to less important, but more crime-vulnerable streets and areas, regarded by numerous potential victims as the shortest ways to approach an attractive object.

Unfortunately, the paper bears some limitations caused by the refusal of Kaunas County Police Headquarters and Klaipeda County Police Headquarters and its territorial police units to provide the data. This has resulted in a varied, not enough systemized data across the three cities, thus leading to partly different investigated types of crime and methods of the analysis. Also, city master plans do not have common guidelines for the definition and identification of land uses, types of borders, important objects and transport infrastructure. Undoubtedly, every city is unique and might have specific features. Yet this is not an excuse for using different entitlements of the same attributes.

Despite the indicated drawbacks, it can be concluded that innovative urban planning would result from synergy between social and structural elements of a city. As the findings have demonstrated, the actions originally aimed at crime prevention, when implemented, would also lead to the enrichment of social life, city aesthetics, and a more harmonized relationship between the inhabitants and the surrounding environment. Hence, this synergy is precisely the way of creating an attractive city.

Acknowledgements

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Ką miesto bendrasis planas sako apie mūsų saugumą? Lyginamoji Vilniaus, Kauno ir Klaipėdos analizė

Santrauka

Nusikalstamumo mažinimas – vienas iš pagrindinių daugelio pasaulio miestų gyventojų rūpestis. Nors mokslinėje ir praktinėje nusikalstamumo miestuose mažinimo strategijų erdvėje dominuoja socialinių mokslų atstovų (socialinės dezorganizacijos teorijos (Sampson ir Groves, 1989) ir įprastinės veiklos teorijos (Cohen and Felson, 1979)) siūlomi sprendimai, straipsnio autoriai pabrėžia, kad būtina pažinti ir kartu aktyviai taikyti miestų planavimo srities specialistų (parankios gynybai erdvės teorijos (Newman, 1972) ir perspektyvaus prieglobsčio teorijos (Jacobs, 1961)) siūlomus nusikalstamumą mažinančius metodus. Straipsnyje išsamiau pristatomas erdvės sintaksės metodas, padedantis nustatyti miesto urbanistinės struktūros ir nusikalstamų veikų įvykdymo sąlygų ryšius (Hillier ir Sahbaz, 2009; Baran, Smith ir Toker, 2007). Pastarasis metodas integruoja socialinius ir urbanistinius nusikalstamumo ir jo prevencijos tyrimo aspektus, taip suvienydamas aukščiau minėtas teorijas.

Praktikoje vietinė valdžia neretai susiduria su nusikalstamumo mažinimo problemomis. Šios problemos paprastai atsiranda dėl nepalankios socialinės, ekonominės, kultūrinės, nacionalinės politikos aplinkos bei nepalankaus išteklių paskirstymo. Kita vertus, mokslininkai (Dunning, 1992; Savitch ir Kantor, 2002; Brenner, 2004) pažymi, kad nacionalinėse valstybėse ryškėja vis didesnė decentralizacija, kadangi joms būtina pasinaudoti globalizacijos plėtra ypač miesto lygmenyje. Viena iš sričių, kurioje miesto valdžia turi santykinai daug galių, yra miesto planavimas, kuris dažniausiai atsiskleidžia bendrame miesto plane. Miesto bendrasis planas yra dokumentas, pateikiantis miesto planuotojams, verslininkams, gyventojams, lankytojams ir kitiems informacijos apie tai, kaip miestas turėtų vystytis. Vienas iš esminių miesto bendrojo plano komponentų yra žemės paskirtis. Kita vertus, žemės paskirtis yra ir vienas iš plačiausiai naudojamų erdvės sintaksės metodo taikymo matų, siekiant nustatyti ir pamatuoti ryšį tarp nusikalstamumo ir erdvinės miesto struktūros, atsižvelgiant ir į socialinius miesto gyvenimo aspektus (Baran, Smith ir Toker, 2007; Kaya ir Kubat, 2007; Hillier ir Sahbaz, 2009; Friedrich, Hillier ir Chiaradia, 2009; Monteiro, 2012; De Abreu ir Trigueiro, 2012).

Straipsnyje siekiama nustatyti labiausiai nusikalstamumo pažeidžiamus žemės paskirties tipus ir jų derinius. Pristatomi tyrimų, atliktų Kauno technologijos universiteto mokslininkų, reprezentuojančių architektūros ir kraštotvarkos, viešojo administravimo bei vadybos sritis, rezultatai. 2012 m. grupė ištyrė ryšį tarp miesto erdvinės struktūros ir nusikalstamumo trijuose didžiausiuose Lietuvos miestuose (Vilniuje, Kaune ir Klaipėdoje). Straipsnyje integruojami tyrimai, kuriais buvo siekiama, pritaikant erdvės sintaksės metodą, nustatyti trijų Lietuvos

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miestų mažiausiai saugias atviras viešąsias erdves ir pateikti konkrečius siūlymus miestų vadovams aukšto nusikalstamumo lygio priežastims šalinti, taikant ne tik socialinius ir ekonominius, bet ir miesto planavimo srities sprendimus. Tyrimuose naudoti ne tik erdvės sintaksės, bet ir statistinės duomenų analizės, ekspertų interviu, dokumentų analizės metodai.

Straipsnyje teigiama, kad intensyvaus užstatymo gyvenamosios teritorijos yra saugiausios tada, kai į jas yra integruoti želdynai ir visuomenės poreikiams skirtos teritorijos. Toks žemės paskirties tipų derinys yra ne tik saugesnis nei „plikos" gyvenamosios teritorijos, bet ir leidžia pagyvinti šių teritorijų socialinį ir kultūrinį gyvenimą bei padidinti estetinį patrauklumą. Kita vertus, kai minėtas derinys įkomponuoja vietinius miesto centrus, pasižyminčius daugelio skirtingų žemės paskirties tipų kombinacija, jis tampa dar pavojingesniu nei gyvenamosios teritorijos be želdynų ir visuomenės poreikiams skirtų kompleksų. Todėl nėra tikslinga apkrauti intensyvaus užstatymo gyvenamąsias teritorijas per didele žemės paskirties tipų įvairove, bent jau siekiant saugumo. Taip pat svarbu pažymėti, kad visuomenės poreikiams skirtos teritorijos neturėtų būti planuojamos derinyje su infrastruktūros/pramonės ir miškingomis teritorijomis; kita vertus, nusikalstamumas yra didesnis ir tada, kai visuomenės poreikiams skirti kompleksai reprezentuoja aiškiai atskirtas nuo likusios miesto erdvės teritorijas.

Mažo užstatymo gyvenamosiose teritorijose, jeigu netoliese yra miškingų žemių, itin didėja nužudymų rizika. Mažo užstatymo gyvenamosios teritorijos be miškų yra pakankamai saugios žmonėms, tačiau ne gyvūnams, tai yra, jose gana paplitę nusikaltimai prieš gyvūnus, kaip, beje, ir miškuose. Taigi darytina išvada, kad mažo užstatymo gyvenamosios teritorijos neturėtų būti planuojamos šalia miškų, tačiau jose būtina vykdyti aktyvią socialinę politiką, nukreiptą į pagarbos gyvūnams ir rūpinimosi jais skatinimą.

Pramonės, infrastruktūros ir ypač – komercinės teritorijos ir jų deriniai daro net ir palyginti saugius žemės paskirties tipus bei jų derinius labiau pažeidžiamais nusikalstamumo aspektu. Dažnai miesto finansiniai poreikiai reikalauja, kad šios teritorijos rastųsi viena greta kitos. Visgi tyrimų rezultatai rodo, kad minėti žemės paskirties tipai galėtų sudaryti gana saugias kombinacijas su želdynais ir vandenimis, tačiau derėtų vengti pramonės, infrastruktūros ir komercinių teritorijų planavimo šalia miškų, kompleksų visuomenės poreikiams ir gyvenamųjų teritorijų.

Detalesnė nusikalstamumo miestuose analizė atskleidė, kad didžiausia nusikalstamumo dalis tenka gatvėms, kurios yra greta pagrindinių (didžiausių) miestų gatvių. Skirtingi socialiai patrauklūs objektai dažnai randasi būtent pagrindinėse gatvėse, tuomet kai greta esančios antraeilės gatvės dažnai naudojamos miesto gyventojų ir svečių kaip trumpiausi keliai iki norimo aplankyti objekto. Viena vertus, santykinai didesnis potencialių aukų skaičius pritraukia nusikaltėlius, o, kita vertus, nepagrindinės gatvės yra ir pakankamai izoliuotos nusikalstamai veikai įvykdyti, ir gana palankios greitam pabėgimui dėl artumo pagrindinėms miestų gatvėms. Tyrimų rezultatai rodo, kad, deja, vidinių erdvių izoliacija padidėjo per nepriklausomybės metus, ypač miestų centruose, o tai galėtų būti dar viena nusikalstamumo nemažėjimo priežastis ir, atitinkamai, klausimu vietinės valdžios darbotvarkėje.

Pastebėtina, kad straipsnyje pristatomas tyrimas pasižymi ir keletu ribotumų. Visu pirma, jie yra sąlygoti Kauno apskrities Vyriausiojo policijos komisariato ir Klaipėdos apskrities Vyriausiojo policijos komisariato bei Klaipėdos miesto teritorinių policijos komisariatų atsisakymo suteikti tyrimui būtinus duomenis apie nusikalstamumą šiuose miestuose. Tai lėmė dalinę variaciją duomenų rinkimo ir, atitinkamai, analizės etapuose. Be to, miestų bendruosiuose planuose naudojami iš dalies skirtingi žymėjimai net ir tam pačiam žemės paskirties tipui nurodyti, o tai apsunkino lyginamąją nusikalstamumo miestuose analizę.

Nepaisant minėtų ribotumų, darytina išvada, kad įžvalgus miesto planavimas - sinergijos tarp miesto socialinių ir erdvinių struktūrinių element rezultatas. Straipsnyje pristatomas tyrimas leidžia teigti, kad neretai priemonių, nukreiptų į nusikalstamumo mažinimą, įgyvendinimas taip pat praturtintų miesto socialinį gyvenimą, padidintų jo estetinį patrauklumą ir sąlygotų harmoningesnį ryšį tarp miesto gyventojų ir supančios natūralios bei sukurtos aplinkos.

Reikšminiai žodžiai: atvira viešoji erdvė, erdvės sintaksė, miesto planavimas, nusikalstamumas, žemės paskirtis.