Possibilities of application of crime prevention through environmental design (CPTED) in Lithuanian commercial objects

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Abstract

Five commercial objects (Soviet-time, fully reconstructed and newly built) located on one of the most crime-ridden and problematic streets of Kaunas city, Lithuania, are researched according to crime prevention through environmental design (CPTED) strategies: natural surveillance, access control, territoriality, maintenance, and activity support. Theft from motor vehicle, robbery and intentional damage of property are analyzed. Research results reveal that CPTED is poorly implemented in all analyzed objects. Though, in Soviet-time commercial objects it is even harder to implement activity support strategy. Correlation analysis demonstrates significant strong relations between the analyzed crimes and some criteria from surveillance, access control, territoriality and activity support strategies. Recommendations for safety improvement in commercial objects are proposed based on CPTED strategies.

Keywords: Theft from motor vehicle, robbery, damage of property, crime prevention through environmental design (CPTED), commercial

Introduction

Crime Prevention Through Environmental Design (CPTED) supports and develops great ideas on crime prevention through urban planning and design (Jeffery, 1971; Crowe, 2013; Cozens et al., 2005; Saville and Cleveland, 2008; Sutton et al., 2014; Atlas, 2013; Armitage, 2013). The process of designing security into urban planning and architecture is known as CPTED, and it is based on the proposition that the appropriate design and application of the built and surrounding environment can improve the quality of life by deterring crime and reducing the fear of crime (Atlas, 2013). The term Crime Prevention Through Environmental Design was first presented by American criminologist C. Ray Jeffery in 1971. CPTED differs from traditional security tools in urban planning and architecture. Traditional security tools mean building of fences, walls, installing of alarms, as well as police officers and guards on the streets. Whereas, CPTED focuses more on natural security strategies, such as natural surveillance, access control, territorial reinforcement, maintenance and activity support (Ekblom, 2013).

Natural surveillance strategy is closely related to "eyes on the street". The strategy says that the more a space is observed by residents, passengers, and police (through windows, entering and exiting the building, walking or standing in open public spaces) the more secure it is. J. Jacobs (1961) was the first who developed the theory of the "eyes on the street". She stated that the ability of residents to watch the streets and their presence on the street change criminals' behavior, and that the lack of natural surveillance promotes crime. She also points out that the clear differentiation of private and public spaces, diversity of use and highly used streets by pedestrians will make the city safer.

Access control strategy says that it is very important to make paths, doors, entrances, exits safe, visible, and easy accessible. Proper planning of fences, lighting, sings, paths etc. is important in this case. The goal of this planning is to deter the criminals from committing a crime.

Territorial reinforcement strategy pays great attention to the differentiation of public space from private. This definition can be done by different materials for pedestrian paths or parking lots, greenery, various signs and other elements of surrounding environment and urban design.

Maintenance is the most recently added strategy to CPTED. Unmaintained territories attract criminals, as in the case of the "broken window theory" (Kelling and Wilson, 1982) one broken and unrepaired window causes more broken windows, and as a result the territory becomes unmaintained and abandoned.

Activity support strategy encourages people to observe the area through their daily activities. Thus, their presence and behaviour will discourage ffenders from committing a crime.

I.

Research object and methodology

The aims of this study are to investigate if crime prevention through environmental design (CPTED) strategies were applied to the design of Lithuanian commercial objects, and to identify the elements of an urban environment (according to CPTED strategies) that affect crime on commercial sites.

Research objects

Most parts of Lithuanian cities were built in the Soviet times. For our research five commercial objects on Kreves street in the city of Kaunas are selected as a case study (Fig. 1). This is chosen due to high crime rates (according to Kaunas County Police Headquarters, Kreves st. is one of the most crime-ridden and problematic areas), and the street being a typical urban tissue of post-Soviet residential areas. Kreves street is actively used by public and private transport (both local and transit), as well as residents of surrounding areas. There is a big variety of land uses along the street. The biggest part of the area is occupied with 5 and 9 storey multi-flat residential buildings with inner yards and playgrounds connecting them. There is also a variety of commercial objects (bigger supermarkets and small businesses, including kiosks), a couple of banks, kindergartens and schools (secondary and professional), and two parks along the street. The end of the street is built up with industry, storage and infrastructure objects, many of them are abandoned, though, it this part of Kreves st. is not included in our case study.

[FIGURE 1 OMITTED]

Kreves st. 43a is a newly built Rimi supermarket. Kreves st. 43 and 49 are Soviet-built buildings with various small-businesses inside. Kreves st. 97a is also a Soviet-time building that is run by a funeral office now. Kreves st. 97 is a fully reconstructed Soviet building with a modern IKI supermarket on one side and automobile service on the back side of the site. Crimes committed on the site (but not inside the building) are selected for the analysis. The only types of crimes committed in the research objects are as follows: theft from motor vehicle (9), robbery (4) and intentional damage of property (1). This is the reported and registered data during 2010-2011. It is worth to mention, that in Lithuania the level of latent criminality is very high. This means that many crimes go unreported to the police, especially in instances of crimes with low damage value estimated.

Fig. 1. Researched commercial objects on Kreves street

Methodology

The designed research process consists of three steps: 1) site assessment according to CPTED strategies, 2) analysis of current situation on every site, 3) identification of factors of urban environment that affect crime.

Thefts from motor vehicles, robberies and intentional damages of property are analyzed according to crime rates that are simply the number of crimes committed at the particular address.

For the site assessment according to CPTED strategies the questionnaire is designed based on the analysis of literature and existing CPTED audit and site assessment checklists in different countries. The questionnaire with 82 questions in total is divided into five blocks according to CPTED strategies: 1) elements of surveillance, 2) elements of access control (and target hardening), 3) elements of territoriality (territorial reinforcement), 4) elements of image management (maintenance), 5) elements of activity support (Table 1). In the developed questionnaire, many

questions are designed to assess elements of landscape (trees, bushes, other greenery) and surrounding environment (fences, gates, paths etc.), as well as lighting (glare, color of light, illumination, height of illuminator pole, if different site areas and elements are well lit etc.).

For the identification of relations between nominal variables (elements of urban environment from the questionnaire that can be answered as 'Yes' or 'No') and scale variables (crime rate) Eta-squared correlation analysis and Chi-squared test were applied. A measure of association Eta-squared ranges from 0 to 1, with 0 indicating no association between the row and column variables and values close to 1 indicating a high degree of association. Eta-squared is appropriate for a dependent variable measured on an interval scale (interval and ratio variables are combined in the scale variable in SPSS) and an independent variable with a limited number of categories (for example, categorical variables such answers 'Yes' or 'No'). Small correlation is being observed at [[eta].sup.2]~0.02, medium correlation is when [[eta].sup.2]~0.13, large correlation is when [[eta].sup.2]~0.26. The Chi-squared test is used to determine whether there is a significant relation between the 2x2 table variables.

Geographical Information Systems (GIS), as well as Statistical Package for the Social Sciences (SPSS) were used for the implementation of this research.

Results

Five commercial sites with parking areas and surrounding environment are observed on Kreves street and checked according to the developed questionnaire, spending about 30 minutes for every site. Each element was assessed as 'Yes' or 'No', with the meaning of 'Yes' as the element meets CPTED criterion, and 'No' as does not meet. The research results demonstrate that the sites of the commercial objects (no matter if the object is a new built, fully renovated or Soviet-times built) are not designed to meet CPTED strategies at all. On different commercial sites the percent of elements meeting CPTED differs: for the elements of surveillance it is 30.43-69.57%, for the elements of access control it is 33.33-50.0%, for the elements of territoriality (territorial reinforcement) it is 30.77-71.43%, for the elements of image management (maintenance) it is 10.0-75.0%, for the elements of activity support it is 0-100%.

Kreves st. 43 object meets CPTED principles for 52% in total, having the weakest sides in surveillance and access control, and the strongest in activity support (Table 2).

Kreves st. 43a object meets CPTED principles for only 45.83% in total that is a shocking result considering that the building is new and the site looks like a well maintained at day time. The weakest side of this object is surveillance, and the strongest is activity support (Table 2).

Kreves st. 49 object meets CPTED principles for 56% in total, having the weakest side in maintenance, and the strongest in territoriality (Table 2).

Kreves st. 97 object meets CPTED principles for 52.78% in total, having the weakest side in territoriality, and the strongest in activity support (Table 2).

Kreves st. 97a object meets CPTED principles for 26.67% in total, having the weakest side in activity support, and the strongest in territoriality (Table 2).

The access control (42% of observed criteria meet CPTED) and territoriality (41.1% of observed criteria meet CPTED) of observed commercial sites are the biggest issues on Kreves street (as well as on many others in Lithuania). In the most of observed cases the private property is not defined and entrance/exit points and paths to and from the site are neither controlled nor secured. The situation concerning activity support (73.32% of observed criteria meet CPTED) looks much better. In most cases, commercial objects offer a variety of activities for customers. Additionally, the sites are generally vibrant and well used.

Thefts from motor vehicles

According to the correlation analysis (Eta-squared is calculated and Chi-squared test is applied) results (Table 3) there are relations between thefts from motor vehicles and three criteria according to three CPTED strategies:

* Natural surveillance strategy--the presence of white light color illuminating the parking area is related to thefts from vehicles ([[eta].sup.2]=0.890, p=0.016<0.05). According to CPTED practice in different countries, white-colored, bright light is the best solution for illumination of parking areas (Hushen, 2014).

* Territoriality strategy--the usage of signage such as 'Private Property' or 'No Trespassing' or 'Hours of Usage', and 'No Vehicle Traffic' is related to thefts from vehicles ([[eta].sup.2]=0.890, p=0.016<0.05). The signage brings order into the site aesthetics, as well as controlling pedestrian and vehicle routes.

* Activity support strategy--the criterion 'The site is vibrant and well-used' correlates with thefts from vehicles ([[eta].sup.2]=0.890, p=0.016<0.05). A vibrant and well used site generates activity, attracts more users and observers of the site. The more 'eyes on the street' the area has, the safer it is.

Robbery and Intentional damage of property

According to the correlation analysis (Eta-squared is calculated and Chi-squared test is applied) results (Table 3) the same significant relations are observed for robberies and urban criteria, and for damage of property and urban criteria. Both crimes correlate with two criteria according to two CPTED strategies:

* Territoriality strategy--the visibility and good definition of entry points into the site are related to robbery and damage of property (both [chi square]=5.000, p=0.025<0.05). According to CPTED, it is important to clearly define the entries/exits to and from the site. Hereby, the routes of pedestrians and vehicles are directed to the proper areas within the site and in the right directions.

* Access control strategy - the separation of visitors parking from employees is related to robbery and damage of property (both [chi square]=5.000, p=0.025<0.05). The separation of different zones within the site is important for a better control of pedestrian and vehicles routes, as well as for the easy identification of potential criminals on site.

Conclusion

Comparison of Soviet-time, fully reconstructed and newly built commercial objects reveals that in Soviet-time commercial objects it is harder to implement activity support, though it is possible and requires more effort. In many cases, inner spaces of the building have to be transformed and site areas have to be re-located. This notwithstanding, Kreves st. 43 is a good example of re-use of the Soviet building and site for the contemporary needs. Regarding surveillance, territoriality, access control and maintenance CPTED strategies, no significant difference is observed between all three types of objects.

Comparing research results according to all five CPTED strategies allows us to identify the strengths and weaknesses of commercial objects. Activity support is the strongest side (Soviet-time, fully reconstructed and newly built commercial objects fulfil the requirement of this strategy for 73.32%). Most commercial sites are vibrant and well used, there is a diverse range of land-uses at the sites, and the objects have restaurants / cafes /cinemas / play areas to attract people.

According to the correlation analysis results, significant and very strong relations are observed for white color lighting at parking areas and theft from motor vehicle ([[eta].sup.2]=0.890, p=0.016), visibility and good definition of entry points into the site and robbery as well damage of property (both [chi square]=5.000, p=0.025), signage on the site and theft from motor vehicle ([[eta].sup.2]=0.890, p=0.016), separation of visitors parking from employees and robbery as well as damage of property (both [chi square]=5.000, p=0.025), vibrancy and good usage of site and theft from motor vehicle ([[eta].sup.2]=0.890, p=0.016). Based on the correlation analysis results and site assessment data, recommendations for safety improvement according to CPTED strategies are provided:

1) Territoriality. There still is much to be done to improve elements of territoriality (as only 41.1% of observed criteria meet territoriality requirements). There should be signs to locate where you are. No confusing zones/levels should be on the site. The street address must be clearly visible from the street with numbers a minimum of 12.7 cm high and made of non-reflective material. Parking areas should be clearly marked and separated from pedestrian walkways. Entry points into the parking area should be visible and well-defined (different paving material, changes in street elevation, architectural, and landscape design, signs, gates). Property lines and private areas must be defined with plants, pavement treatments, short walls, or fences. There should be a signage used on the site such as Private Property--No Trespassing, Hours of Usage, and No Vehicle Traffic. Businesses should be identified by wall signs for those parking in the rear.

2) Access control is also a weak side of commercial objects in Lithuania. Only 42% of observed criteria meet access control requirements. There should be no pathways that lead to unpredictable places. Visitors parking must be separated from employee's parking. Pedestrian paths must be separated from vehicles. Landscaping should be used to divide the parking areas into smaller lots (applies for larger parking lots). Cut-through or high-speed traffic

must be discouraged in this space. Dead-end spaces should be blocked off with fences or gates. There should be a security / police present at the site.

3) Surveillance. 45.44% of observed criteria meet natural surveillance requirements. The main rule of good natural surveillance is that a person can be seen or heard everywhere and always. There should be no blind spots or hiding areas on the site, as well as no places where offenders could easily hide and conceal themselves. Loading areas and landscaping should not create hiding places. There should be clear visibility maintained from inside the business to the street, sidewalk and parking areas. Window signs must not cover more than 10% of window space. Angled or perpendicular parking in front of stores should be used rather than parallel to allow greater visibility between cars. The street address numbers, parking lots, footpaths, exterior, access to the building, walls, corners, closest surroundings should be clearly lighted at night. White color has to be installed for parking lighting. Lighting should not glare into the eyes, and it should be placed in such a way that it allows people to be recognized from 7.62 meters away. Pedestrian scale street lighting should be used in high pedestrian traffic areas to help people recognize potential threats at night. There should be no blind walls, or public art can be used for blind walls to decrease crime.

4) Maintenance. 47.33% of observed criteria meet maintenance requirements. To reduce crime, the aesthetics of the site has to be attractive to people. The site and closest surroundings have to be well-maintained and cared for. There should be no empty buildings or spaces, no old, abandoned automobiles or other vehicles stored on the site (including inappropriate outdoor storage). There should be no presence of drunkenness or nuisance, no evidence of rubbish, graffiti or vandalism. All the structures should be painted and in a condition of good repair. Landscaping should be tidy and in good repair. Weeds must be abated, bushes must be up to 0.91 meters high, trees must be pruned up to 2.13 meters from the ground. Trees and shrubs should be pruned back from windows, doors, and walkways. Exterior lighting has to be maintained. Parking areas have to be of high standard without pot-holes or trash. No faded posters, broken signs, and other displays that are beyond their useful lives.

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Elements of surveillance	YES	NO
No blind spots or hiding areas		
The driveway, or where you usually park your car, should be visible from either the front or back door and at least one window		
Lighting placed in such a way that it allows people to be recognized from 7,62 meters away		
Elements of access control (and target hardening)		
Entrance to the parking area is equipped with opening gates or barrier		
Dead-end spaces are blocked off with fences or gates		
Elements of territoriality (territorial reinforcement)		
Entry points into the parking area are visible and well-defined (different paving material, changes in street elevation, architectural, and landscape design, signs, gates)		
Property lines and private areas are defined with plantings, pavement treatments, short walls, or fences		
Parking spaces are clearly marked		
Elements of image management (maintenance)		
Bushes are up to 0,91 meters high		
There is no evidence of graffiti		
Exterior lighting is maintained		
Elements of activity support		
The site is vibrant and well-used		
There is a diverse range of land-uses at the site		

Table 1. Extract from the questionnaire

	Surveillance	Access control	Territoriality
Kreves st.43	33.33	33.33	57.14
Kreves st.43a	30.43	46.67	30.77
Kreves st.49	69.57	50	71.43
Kreves st.97	59.09	46.67	46.15
Kreves st.97a	34.78	33.33	46.15

	Maintenance	Activity support
Kreves st.43	75	100
Kreves st.43a	66.67	100
Kreves st.49	35	66.6
Kreves st.97	50	100
Kreves st.97a	10	0

Table 2. Commercial objects meet CPTED strategies, %

Surveillance	White color light is installed for parking area		
Territoriality	Entry points into the site are visible and well-defined (different paving material, changes in street elevation, architectural, and landscape design, signs, gates) Signage such as Private Property--No Trespassing, Hours of Usage, and No Vehicle Traffic is used on the site		
Access control	Visitors parking separated from employees		
Activity support	The site is vibrant and well-used		
	Theft from motor vehicle	Robbery	
Surveillance	[[eta].sub.2]=0.890 p=0.016		
Territoriality		[chi squre]=5.000 p=0.025	
	[[eta].sub.2]=0.890 p=0.016		
Access control		[chi squre]=5.000 p=0.025	
Activity support	[[eta].sub.2]=0.890 p=0.016		
	Intentional damage of property		
Surveillance			
Territoriality	[chi squre]=5.000 p=0.025		
Access control	[chi squre]=5.000 p=0.025		
Activity support			

Table 3. Relations between crimes and factors of urban environment

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