

ANALYSIS OF FIRE RISK IMPACT ON REAL ESTATE IN LATVIA

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Abstract. The economic development of the country is very often measured by the development of construction and other industries and the real estate market. Consequently, buildings are very important for the national economy. Real estate management is connected with the owners' responsibility for real estate, its long-term existence, maintenance of the property and all related processes. One of the most important risks in facility management is fire risk. Fire has become an important part of civilization and a factor in the development of society. Among different types of disasters, fire constitutes a significant threat to life and property in urban and rural areas. In Latvia, fire risks are under the control of the State Fire and Rescue Service of the Republic of Latvia. The aim of the research is to investigate statistics of fires in Latvia during the period from 2012 to 2017, and to find the main causes of fires and potential ways to improve the situation. The authors used data analysis, comparison and logical access methods and developed some recommendations. Statistical data for research has been offered by the State Fire and Rescue Service of Latvia and the State Land Service. Research results show that the main causes of the fire are: careless handling of fire, heating systems, fire setting, phase fault, electrical equipment and other equipment, children playing with fire, lightning and other reasons.

Key words: fire risk, real estate, fire risk analysis, fire risk management, fire safety

JEL code: R19, L89

Introduction

Buildings are very important for the national economy. The economic development of the country is very often measured by the development of construction and other industries and the real estate market. The State Land Service is responsible for surveying buildings and groups of premises in Latvia. It was established in 1992 as a government institution for the implementation of land reform. The SLS is also responsible for collecting and accumulating data about real property objects and disseminating it to institutions responsible for supervision and land management. The SLS is also responsible for the cadastral surveying of buildings and groups of premises, i.e. to obtain spatial and textual data of buildings and groups of premises; to update the information in the State Information System of Real Property Cadaster, and to manage the methodology for the cadastral surveying of land and buildings.

Statistical data provided by The State Land Service shows that the total number of building in Latvia from 2012 to 2017 is between 1.377 million to 1.4 million (Table 1).

Table 1

Number of buildings and their categories in Latvia

Year	2012	2013	2014	2015	2016	2017
Residential houses	353338	356177	358890	359897	360736	361832
Non-residential buildings	1000679	1004517	1008037	1007622	1007522	1007192
Engineering structures	23961	23510	25001	26270	28706	30022
Total:	1377978	1384204	1391928	1393789	1396964	1399046

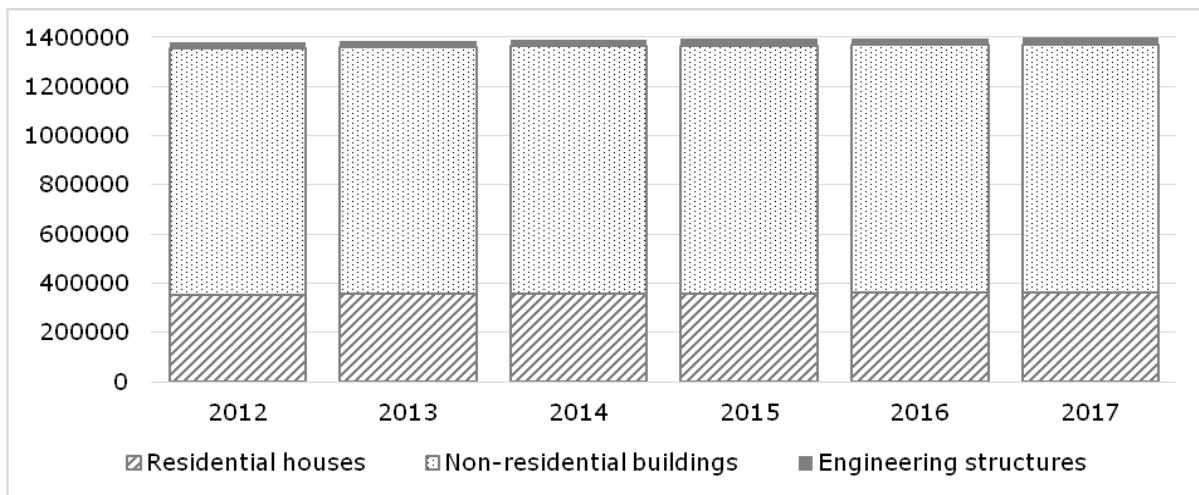
Source: State Fire and Rescue Service (2018)

Table 1 show that all buildings were categorized in 3 categories: Residential houses, Non-residential buildings and Engineering structures. The total number of buildings is virtually unchanged during the study period from 2012 to 2017.

Figure 1 illustrates the number of buildings and their categories during the period from 2012 to 2017 in Latvia.

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Source: author's calculations based on the State Fire and Rescue Service (2018)

Fig. 1. Number of buildings and their categories in Latvia

Figure 1 shows that for the period from 2012 to 2017 the number of residential houses increased about 2.4 percent, the number of non-residential buildings increased 0.65 percent, but the number of engineering structures increased about 25 percent, but in total only 1.5 percent.

Real estate management is connected with the owners' responsibility for real estate, its long-term existence, maintenance of the property and all related processes. One of the most important risks in facility management is fire risk.

The Latvian Ministry of Economics implements many construction projects using public funds (The Ministry of Economics of the Republic of Latvia, 2017). All of these buildings and structures could potentially be at risk of fire.

The Cabinet of Ministers determines the procedure as to how the State Fire and Rescue Service carries out and manages firefighting and rescue work in Latvia. The Fire Safety and Firefighting Law, Article 10, paragraph one, establishes that "the owner (possessor), manager, lessee or, in accordance with the agreement, other user of the building, structure, parts thereof or land parcel, who is responsible for fire safety at the object, has a duty to ensure compliance with fire safety requirements laid down in the laws and regulations" (Cabinet of Ministers, 2013).

The number of fires can influence house prices in the market. For example, Eriksen and Carson (2017) constructed panel data of house prices in the USA and correlated decreases in local house prices with the total number of fires and calculated the probability of determined causes of accidental fires.

Many authors also tried to explore the situation with fires in their own countries. For example, fire prevention and cross sector collaboration in Norwegian municipalities (Halvorsen, K., Almklov, P. G. & Gjøsund, G., 2017;), or fire safety management and fire insurance in public buildings in China (Zhai, FY& Xie, LL., 2011).

The authors agree that one of the most important aspects of human fire safety in the event of fire is the possibility of safe escape (Kobes et al. 2010; Hoyos & Zimolong, 2014). Various fire safety facilities and fire protection systems provide independent and adequate response and fire safety for the building's users.

Many countries have their own codes and standards associated with fire safety. For example, Procedures for development and revision of codes and standards associated with fire safety in the USA were investigated by Hirschler (2017).

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However, the practice shows that the measures required by the law do not always provide the support that people need in burning buildings. Therefore, it is very important to study and understand the behaviour of people in the event of fire and fire evacuation. This can help prevent incidents and improve fire safety (Kobes et al, 2010).

Many authors have explored ways of reducing the risk of fire injury and promote fire prevention. They mention smoke alarms, which can reduce the risk of dying in house fire (Rohde, D. et al, 2016; Marshall, SW. et al, 1998; Runyan, SW. et al, 1992).

However, very often people ignore fire protection standards established in the country; this happens both at workplaces and in homes. To promote fire safety requirements it is necessary to educate people and to give them specific knowledge and skills. Fire safety regulations state that any person has the obligation to prevent a fire, report the fire to a responsible institution, and to know how to act in the event of a fire. During a fire, it is important that people do not lose the ability to quickly make the right decision how save themselves, their family members, neighbours and their property. Public opinion taken from a number of surveys shows that people trust the State Fire and Rescue Service, positively assess its work, and are always grateful for saving their lives and property.

Malahova, Ievins and Ketners (2017) evaluated the creation of voluntary fire safety, firefighting and rescue service models at a municipal level in the Republic of Latvia.

It is known that most fires usually occur in the cold season when heating appliances are used. For various reasons, the heating season may not start on time, and as a result some people tend to use other home heating solutions, such as using different electric heaters, or heating a home with a gas stove or oven. In turn, private house owners have fire stoves and fireplaces. Such home appliances and equipment can often cause fires and result in major loss (Malahova J., Jemeljanovs V., Ketners K., 2017).

The purpose of the study is to investigate statistics of fires in Latvia during the study period for 5 years from 2012 to 2017 and to find the main causes of fires and potential ways of improving the situation. To achieve the purpose of the research the authors set following tasks: to collect information about number of fires in Latvia from 2012 to 2017; to analyse main causes of the fires; to suggest some potential improvement steps.

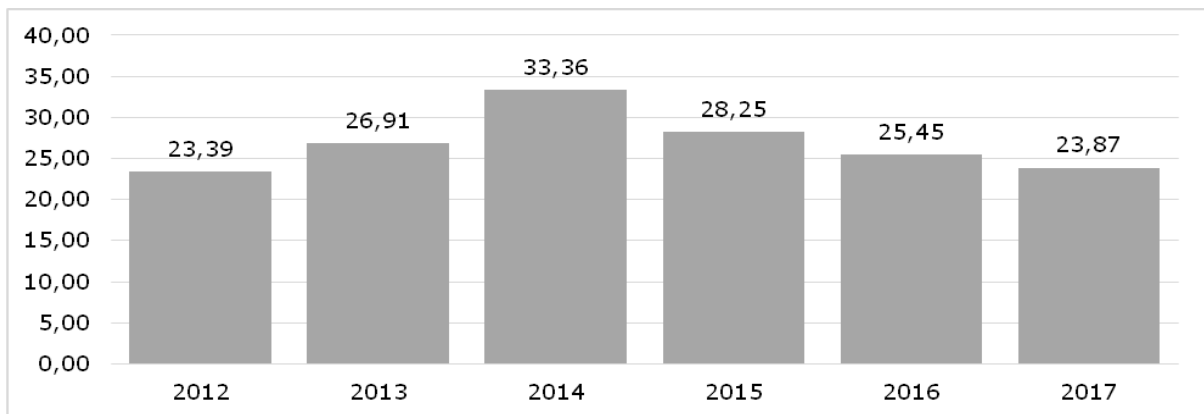
The research is very topical and significant. This is determined by the fact that the solution of the fire safety problem, as well as the development of fire safety activities in the construction sector, real estate management and insurance affects the social and economic development of the country.

Research Results and discussion

The authors have investigated the number of the fires, the main reasons for fires and the different causes of the fire.

The cause of many fires is burnt soot. The State Fire and Rescue Service published information that burnt soot was the cause of 598 fires in 2014 and 588 fires in 2015 (Leta, 2014).

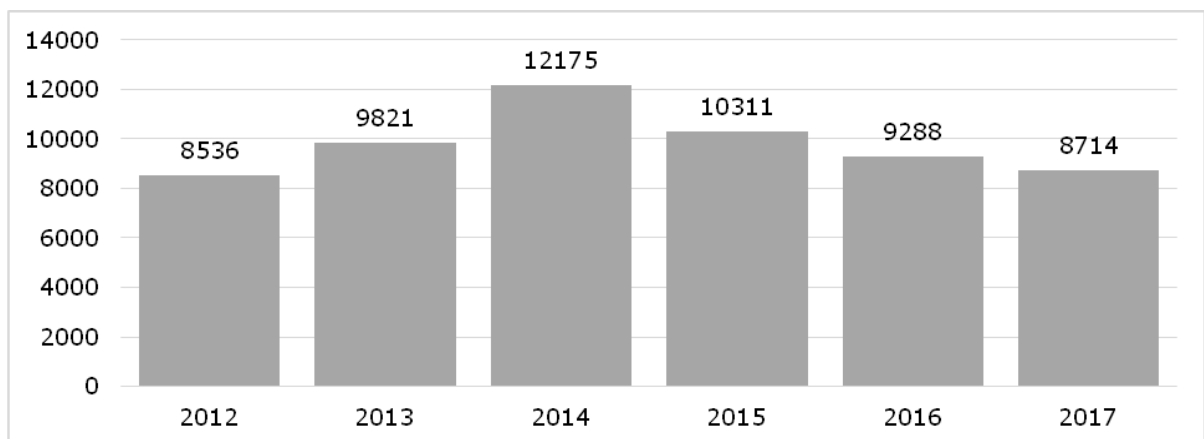
Figure 2 shows the average number of fires per day during the period from 2012 to 2017.



Source: author's calculations based on the State Fire and Rescue Service (2018)

Fig. 2. Average number of fires per day in Latvia from 2012 to 2017

The number of fires in Latvia every day is between 23 and 33. In the opinion of the authors this number is very high for Latvia. Figure 3 shows the total number of fires in Latvia from 2012 to 2017.



Source: author's calculations based on the State Fire and Rescue Service (2018)

Fig. 3. The total number of the fires in Latvia from 2012 to 2017

As we can see from Figure 2 and Figure 3, the number of fires decreased during the last four years by approximately 3,500 fires. This can be considered as a positive trend.

There are many reasons for fire, therefore the authors have decided to categorise fire risks into following groups:

- careless handling of fire,
- heating systems,
- firesetting,
- phase fault,
- electrical and other equipment,
- children playing with fire,
- lightning,
- other reasons.

Fire occurrences grouped by causes of the fire in Latvia in the period from 2012 to 2017 are summarised in Table 2.

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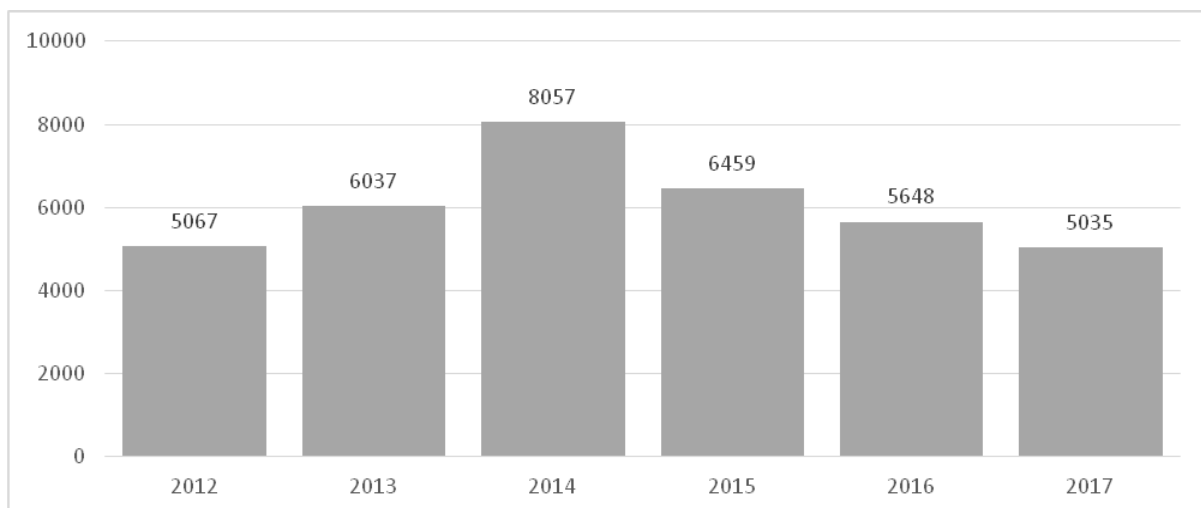
Table 2

Causes of fire from 2012 to 2017

Causes of fire/year	2012	2013	2014	2015	2016	2017
Careless handling of fire	5067	6037	8057	6459	5648	5035
Heating systems	1099	949	1020	903	921	1053
Firesetting	836	1227	1444	1388	1157	1125
Phase fault	718	774	794	776	805	765
Electrical equipment / equipment	312	349	361	308	330	298
Children playing with fire	107	87	68	68	39	68
Lightning	31	49	53	16	27	10
Other reasons	254	343	371	388	361	360
unspecified reasons	112	6	7	5	0	0

Source: The State Fire and Rescue Service (2018)

Table 2 data shows that the main reason for fires is the "careless handling of fire" – over 60 percent every year during the study period. The second cause of the fire is "firesetting" – it changes from 10 percent to 13 percent per year, mostly in the heating season. "Heating" is in third place – about 8 percent – 13 percent per year from total number of fires. "Phase fault" is in fourth place - about 8 percent of the total number of fires per year. There are many causes that could come under the heading "Phase fault", eg. fault of household equipment, commercial and manufacturing equipment, and others.



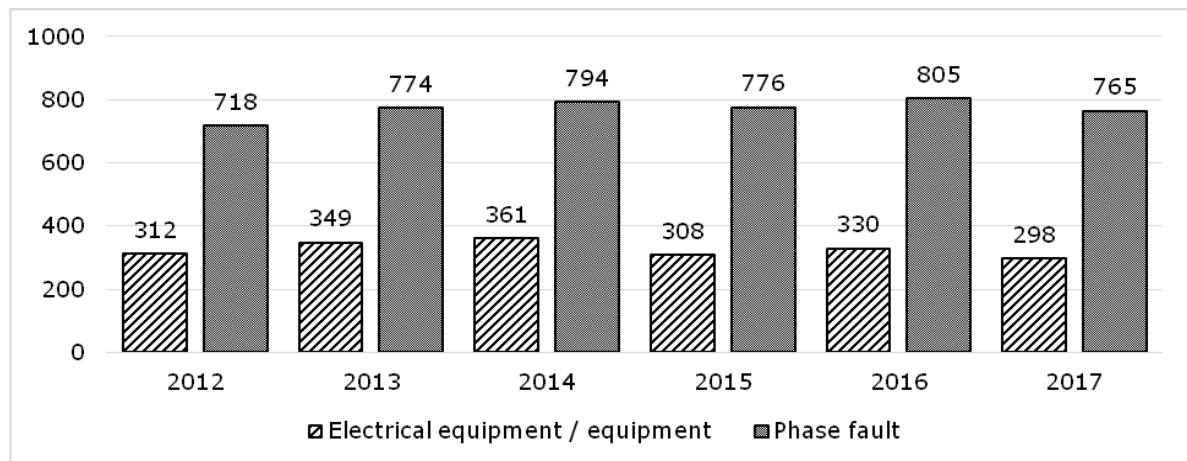
Source: author's calculations based on the State Fire and Rescue Service (2018)

Fig. 4. Careless handling of fire from 2012 to 2017

Figure 4 shows the number of instances of careless handling of fire during the study period from 2012 to 2017. The number varies between 5000 and 8000 per year. The results could be related to the low culture of fire safety in society in Latvia.

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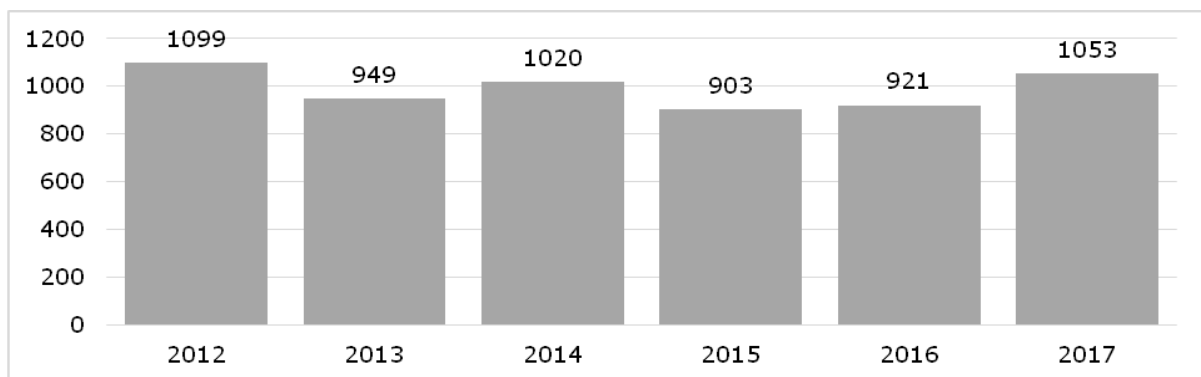
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Source: author's calculations based on the State Fire and Rescue Service (2018)

Fig. 5. Number of fires caused by Electrical equipment and Phase fault from 2012 to 2017

Figure 5 illustrates the number of fires caused by electrical equipment and phase fault. Every year of the study period the number of fires caused by phase fault was over 700, and the number of electrical equipment fault fires was over 300. Every day in Latvia two fires are caused by phase fault and one by electrical equipment. The authors believe that people in Latvia must pay more attention to the use of both commercial and household electrical equipment.



Source: author's calculations based on the State Fire and Rescue Service (2018)

Fig. 6. Number of fires caused by Heating from 2012 to 2017

Figure 6 shows the number of fires caused by heating systems. Every year of the study period heating appliances caused more or less 1000 fires. One of main reasons is the fire safety in real estate management and long-term existence of property is correct and safe operation, maintenance and inspection of heating system. On average, every day three fires in Latvia are caused by heating systems.

Many authors suggest using the Building Information Modeling (BIM) as an integrated smart monitoring technique and modern tools for planning of fire safety, providing early detection and alarm responses, directing efficient evacuation, facilitating fire rescue and controlling efforts (Cheng, MY. et al, 2017; Sanches, L., Hippert, MA. & Abdalla, GF., 2016; Wang, SH. et al, 2015; Wang, B., 2014). Unfortunately, in Latvia BIM is at the initial stage of development and use in the design of buildings. The authors hope that its development will help prevent fires and offer future solutions.

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Conclusions, proposals, recommendations

- 1) The total number of buildings from 2012 to 2017 is between 1.377 million to 1.4 million, and this figure remains virtually unchanged during the study period.
- 2) During the study period from 2012 to 2017 there were approximately 8,000 to 12,000 fires, with this figure decreasing for the last four years decreased by around 3,500 fires from 12175 to 8714. This can be considered as a positive trend.
- 3) The three main causes of fires are: careless handling of fire (over 60 percent), firesetting (varies from 10 percent to 13 percent) and heating (about 10 percent to 13 percent) per year from the total number of fires.
- 4) The State Fire and Rescue Service of Latvia should promote fire safety precautions in the mass media and publish all data about number of fires and their causes. This will elevate fire safety as an issue in society.
- 5) The State Fire and Rescue Service of Latvia should discuss with the government the development of rules for inspecting heating systems once per year or once every two years in every building. Such rigorous inspection would decrease the number of fires caused by heating appliances and improve the safety of property in the long-term.
- 6) The Ministry of Education and Science should take an active role in developing educational programmes in schools and high schools to make students aware of fire safety prevention. This policy would become more effective in the coming years, thus reducing the number of fires.
- 7) To enforce state laws and regulations regarding fire safety, the State Fire and Rescue Service of Latvia should improve their monitoring and prevention procedures, improve the professional knowledge and skill of staff, ensure the installation of compulsory firefighting equipment, as well as taking part in public activities to promote fire safety.
- 8) Fire safety requires a comprehensive approach and this issue has to be dealt with in connection with a number of other existing problems in the country.
- 9) As one of the modern tools for fire prevention, the Building Information Modeling (BIM), which is an integrated smart monitoring technique, could be used to provide early detection and alarm responses, manage effective evacuation, and facilitate fire rescue and controlling efforts.

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