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USE OF PREVENTIVE MEASURES FOR REDUCTION IN THE NUMBER OF FIRES: POSSIBLE SOLUTIONS

Jelena Malahova[1], Dr.oec., assist.prof.; **Vladimirs Jemeljanovs**[2], Dr.sc.ing., prof. and **Karlis Ketners**[3], Dr.oec., prof.

[1, 2] Riga Technical University; [3] BA School of Business and Finance

Abstract. Possible fire risks are urgent taking into account the potential damages that could be caused by fires. One of the aspects of human safety is the prevention of risks and maintenance of adequate fire safety level at workplaces, public areas and in own dwelling. The study is aimed to develop proposals for reduction in the number of fires and victims, improve the preventive measures collectively implemented by the State Fire and Rescue Service and private persons. The study used the theoretical research methods: deconstruction, descriptive, analysis of aspects as well as the empirical research methods (survey) and data processing methods.

Key words: fire prevention.
JEL code: R19, L89

Introduction

Conduct of individuals is supervised and controlled by the State through issue of external regulatory enactments (laws and Cabinet regulations) specifying the rights of individuals and their obligations towards the State in various fields - also with regard to fire safety. Individuals have an obligation to follow the effective regulatory enactments. 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 (The Cabinet of Ministers, Fire Safety and Fire-fighting Law, 2013).

The author could agree with Korbes et al (2010) and Hoyos & Zimolong (2014) that one of crucial aspects of a human fire safety in the face of fire is the possibility of safe escape. An important precondition is that its fire safety facilities enable independent and adequate fire response performances by the building's occupants. In practice, it appears that the measures currently required by law do not always provide the support that people in burning buildings need. Consequently, understanding how individuals behave in the case of fire and fire evacuation is essential if we are to bring fire safety measures into line with occupants' needs during an incident (Kobes et al, 2010).

Besides, unintentional injury is a leading cause of mortality and disability among young and old. While evidence about the effectiveness of interventions in reducing injuries is accumulating, reviews of this evidence frequently fail to include details of implementation processes (Brussoni, et al, 2006). There is evidence that some interventions are effective in reducing the risk of fire-related injuries and in promoting fire prevention practices. Smoke alarms reduce risk of death in house fires (Marshall et al, 1998; Runyan et al, 1992; Rohde et al, 2016). Education, with or without safety equipment being provided, is effective in increasing the prevalence of functioning smoke alarms (Kendrick et al, 2012; DiGuiseppi et al,2001) and home safety education increases the prevalence of fire escape planning. A recent systematic review identified the main barriers and facilitators to implementing injury prevention interventions; these included the type of approach used (one-one; group work; partnership working; tailored methods), characteristics of the deliverer, the complexity of the intervention, accessibility to safety equipment and the importance of achieving behavioural change (Ingram et al, 2011). It is therefore important that interventions to

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

promote injury prevention take these barriers and facilitators into account.

Preventive fire safety interventions are aimed to limit the violations of Fire Safety Regulations, which provides for persons possibility to knowingly and willingly avoid of undesirable fire-related events. Preventive interventions are aimed at promoting personal awareness of requirements laid down in fire safety regulations and are focused on fulfilment of established requirements.

However, fire protection standards established in the country are met or ignored by natural persons, i.e. people (employees at their workplaces, businessmen organizing their business and arranging workplaces for their employees, people equipping their dwelling). In order to promote fire safety requirements, certain knowledge and skills are required. Fire safety regulations state that any natural person has the obligation to prevent a fire, know how to act in case of fire, to whom to report about fire. Everyone should be able to quickly and objectively assess the situation, own abilities, whether to act independently or call rescuers as soon as possible. In such cases, it is important that people do not lose the ability to quickly make the right decision how save themselves, their close people, neighbours and their property. To help avoid fire, it is important to explain to people how important it is to maintain in order their property and workplace in to feel safe, thus ensuring the fulfilment of prescribed fire safety requirements. A number of public opinion polls show that the society positively assesses SFRS (State Fire and Rescue Service), trusts in SFRS and is grateful when people and their property are rescued.

Within the research period, most fires in the residential sector have taken place in the cold season and in the beginning of the heating season. Apartment house managers for various reasons do not timely commence the heating season, which results in people taking other residential heating solutions - use various electric heaters, including homemade, sometimes heat their apartment by a gas stove or oven. By contrast, private house owners fire furnaces, stoves, fireplaces.

Electrical equipment that is used in the residential sector is not continuously monitored and maintained. Therefore, home electrical products often can cause fires. There are also cases when people are saving on the cost of repair and think that they themselves can repair electrical appliances at home. After such repairs there is a high risk of fire and saved money can turn into much greater losses.

According to SFRS information in mass media, 598 fires were registered in 2014, of which probable cause was burned soot, in 2015 - 588 cases (Leta, 2014).

Every year in more than 1,000 fires uncleaned chimneys are mentioned as a possible cause of fire, as well as faulty heating devices, violations of heating equipment operation rules. Already for more years, SFRS widely informs the public in autumn about coming cold weather with increasing number of fires where soot burns in the chimneys as well as surrounding wooden floors. It gives evidence that building owners are irresponsible - not ready for the heating season, chimneys are not cleaned or heating systems are damaged.

To study preventive measures for reduction in the number of fires implemented by SFRS, selection of necessary data was carried out as well as study of SFRS statistical data on fires within (see Fig. 1) and fire fatalities (see Fig. 2) within the last five years:

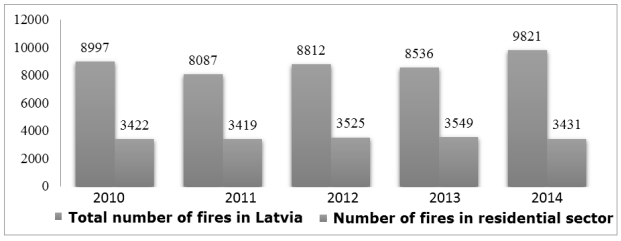

Fig. 1. **Fires in Latvia within 2010 and 2014**

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

Statistical data show that the total number of fires in Latvia within the last five years fluctuates between 8,000 to 10,000 fires per year.

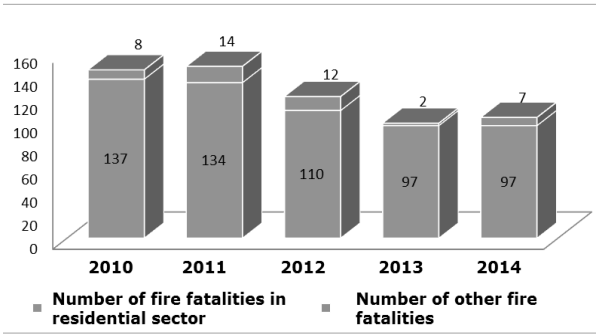

Fig. 2. **Number of fire fatalities within 2010 and 2014**

The number of fire fatalities in residential sector within the study period tends to decrease - from 137 at the beginning of the study period to 97 at the end of the study period.

Every year the number of fires in residential sector of regions several times exceeds that in towns of national importance. Analysing information summarized by SFRS on fires in residential sector, the potential fire causes can be divided into the following groups?: careless handling of fire; violations of heating equipment use regulations damage of electrical appliances and electrical equipment; violations of use regulations and other reasons (arson, children playing with fire, other unidentified reasons). SFRS information system registers a possible cause of the fire while the true causes in accordance with laws and regulations are investigated and established by the State Police, the number of fires according to their place of origin is shown in Table 1.

Table 1

Number of fires according to their place of origin

	2010	**2011**	**2012**	**2013**	**2014**
Waste dumps, refuse, unmanaged buildings	2464	2060	2650	2242	2992
Dead grass	2054	1663	1712	1764	2316
Construction projects	41	47	41	40	37
Warehouses	40	28	32	42	41
Transport industry	604	471	449	468	566
Production buildings	137	176	217	154	159
Public buildings	186	194	153	221	216
Agriculture	49	29	33	56	63
Residential sector	3422	3419	3525	3549	3431

Research results and discussion

In order to ascertain the views of Latvia residents about fire safety in residential sector and safety at workplaces, two questionnaires were developed. 200 respondents were interviewed in Riga and Jurmala on fire safety in dwellings and 100 respondents on safety, including fire safety at workplace. Respondents in the survey on fire safety in dwellings were mostly older than 50, of very different material and social position; however, people at this age still are very responsible for own and their family members' safety. Account was taken of the fact that older people have more free time to ponder the answers to the questionnaire, but did not take into account that a significant number of respondents will be of foreign nationalities. The survey was conducted on the streets, in customer service centres, parks, supermarkets. Admittedly, the respondents willingly involved in a conversation about fire safety in own dwelling, thus replying to the questions, asked further questions, particularly about smoke detectors, their price, installation, showed interest in dwelling insurance against fire damages.

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

Survey on safety at workplace involved respondents of different ages who work at workplaces belonging to individuals.

Respondents in the survey on safety at workplace were asked the following questions and gave the following answers to questions included in the survey questionnaire gave (Table 2).

1) Do you feel secure at your workplace?

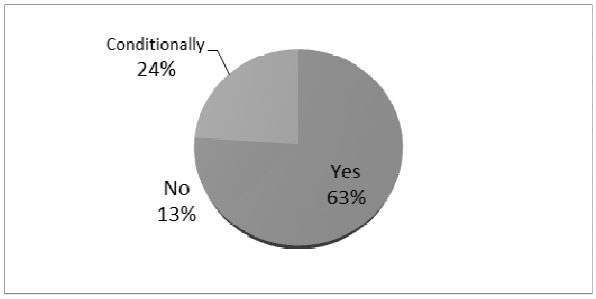

Fig. 3. **Answer to question No. 1 about safety at workplaces**

About two-thirds of respondents feel safe at their workplaces.

2) Are you trained in how to act in case of fire?

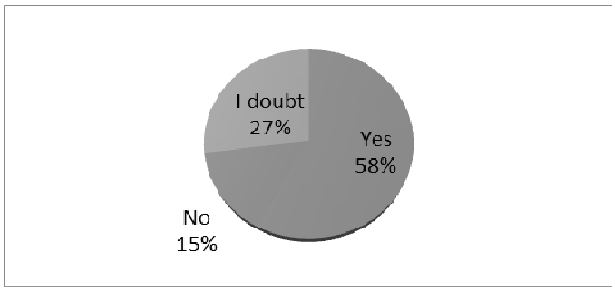

Fig. 4. **Answer to question No. 2 about safety at workplaces**

The survey results show that almost all respondents who feel secure at their workplaces have been trained in what to do in case of fire.

3) Do you evaluate your knowledge in the field of fire safety as sufficient?

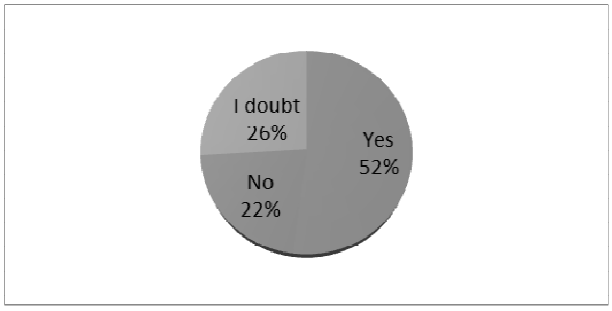

Fig. 4. **Answer to question No. 4 about safety at workplaces**

Approximately half of the respondents evaluate their knowledge of the fire safety as adequate, while one-quarter is not sure about it, and about a quarter admit that knowledge is insufficient. These answers show that every second respondent should work on improvement of their own knowledge and fire safety in general.

4) Have employees at your workplace been annually instructed in fire safety?

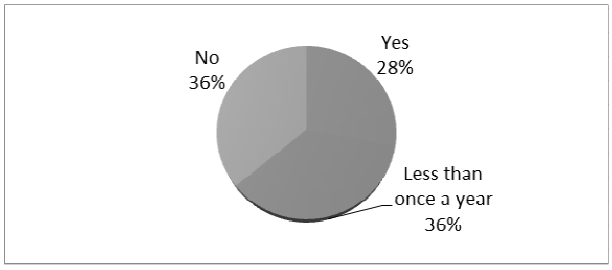

Fig. 5. **Answer to question No. 6 about safety at workplaces**

The respondents' answers indicate that in most cases employees have received instructions, but more than a third are not - perhaps these workers are self-employed or are working in small private companies where fire safety and security issues do not attract necessary attention.

5) How would you like to improve your knowledge of fire safety?

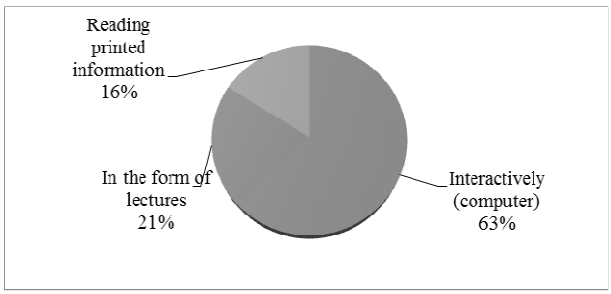

Fig. 6. **Answer to question No. 10 about safety at workplaces**

Respondents confirm that in the information technology era they would preferably improve their knowledge of fire safety interactively, i.e. by using the computer, mobile applications etc.

Respondents in the survey on fire safety in a dwelling were asked the following questions and accordingly expressed their opinion to the questions in the survey questionnaire.

1) Do you feel secure in your dwelling?

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

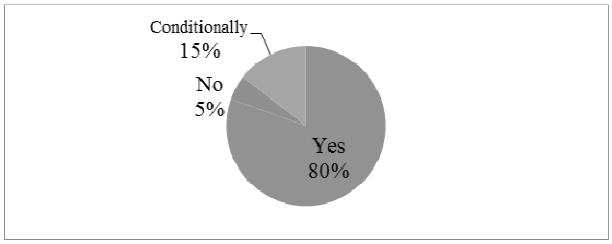

Fig. 7. **Answer to question No. 1 about safety at dwelling**

The majority of respondents are confident about safety at their dwelling but understand that living in an apartment building is exposed to fire hazards from neighbours and thus are concerned about safety of electric wiring in the house.

2) Do you know how to act in case of fire?

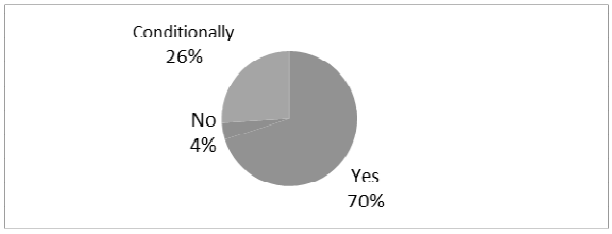

Fig. 8. **Answer to question No. 2 about safety in a dwelling**

The majority of respondents said they would know how to act correctly in case of fire, but a significant number of respondents were not sure about that and engaged in a conversation about the behaviour in case of fire, afterwards recognizing that their knowledge was insufficient.

3) Has ignition ever occurred in your dwelling (overturned candle, X-mas tree caught fire, burning waste, curtains etc.)?

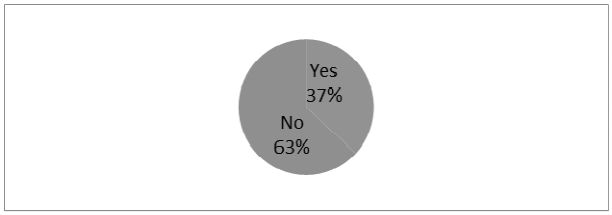

Fig. 9. **Answer to question No. 3 about safety in a dwelling**

The survey data show that more than one-third of respondents in their life have encountered a fire in their dwelling.

4) Did you extinguish fire yourself or called firefighters?

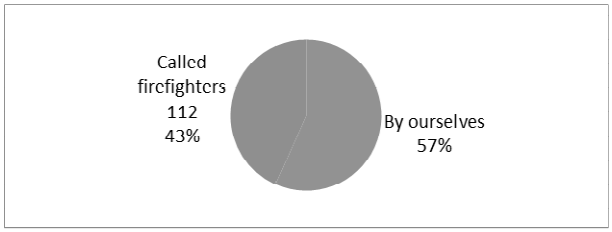

Fig. 10. **Answer to question No. 4 about safety at dwelling**

In most cases, the respondents have extinguished flame by themselves not allowing fire to spread.

5) Is smoke detector installed at your dwelling?

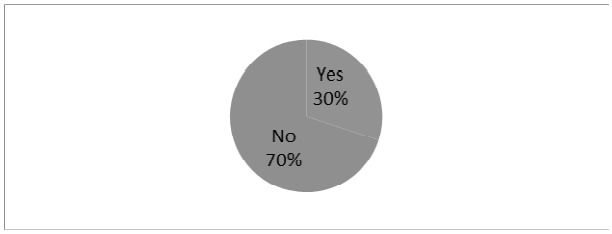

Fig. 11. **Answer to question No. 5 about safety at dwelling**

During the survey, the respondents showed interest in the use of smoke detectors, their installation as well as purchase options and price. Having received additional information, more respondents told that in the near future they would purchase and install smoke detectors in their dwelling.

In scope of the survey about smoke detectors carried out on SFRS website, the following information was obtained: 31 % of respondents confirmed that they use smoke detectors; 46 % told that they had not purchased them; and 23 % wanted to buy smoke detectors.

6) Do you have a fire extinguisher at home?

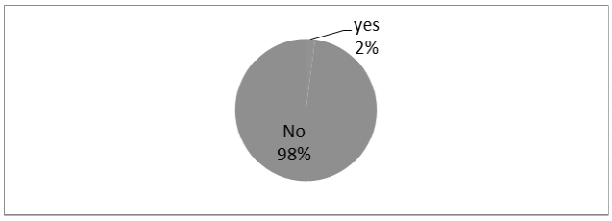

Fig. 12. **Answer to question No. 6 about safety at dwelling**

Survey data show that only 2 % of respondents have acquired fire extinguishers for safety of their dwelling.

7) Have you insured your dwelling against fire accidents?

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

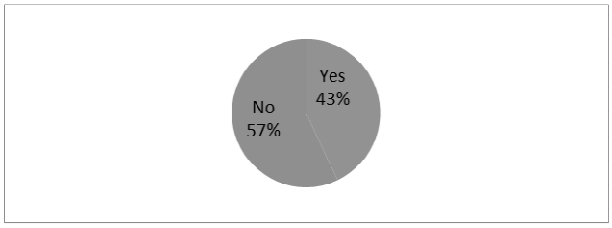

Fig. 13. **Answer to question No. 7 about safety at dwelling**

Almost a half of respondents have insured their dwelling against damages caused by fire, lightning strike or explosion.

8) Have you been close to the place of fire and has it urged you to do something to improve fire safety at your dwelling?

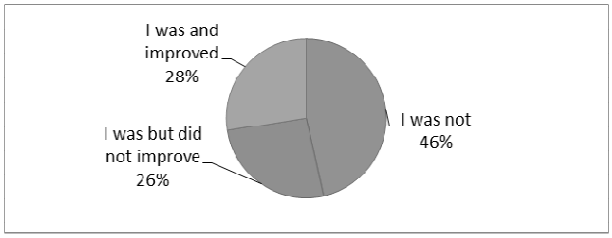

Fig. 14. **Answer to question No. 8 about safety at dwelling**

More than a half of respondents have seen a fire in close-up, and every second of them has thereafter improved the fire safety of own dwelling.

9) Do you know that you have the right to inform SFRS of cases where fire can break out and threaten people (unauthorized storage of flammable and explosive substances etc.)?

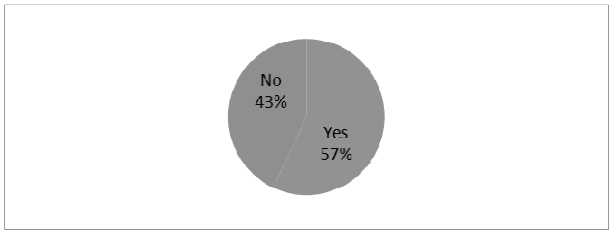

Fig. 15. **Answer to question No. 9 about safety at dwelling**

The majority of respondents are aware that they have the right to inform the SFRS of cases where fires threaten their housing. A number of respondents said that it was also their duty. Many would solve this problem with assistance of municipal police.

The survey results show that the respondents are interested in fire safety in their dwelling; therefore SFRS should work on new preventive measures and should certainly broaden the target audience.

To reduce the number of fires in residential sector, it is necessary to eliminate their main possible causes. Achievement of this goal, in turn, will require the continued public education on fire safety and timely informing the public about safety measures and fire-safe behaviour rules in order people with a minimum of resources could improve their safety and fire safety of their dwelling since sometimes a genuine desire and deliberation can do much.

It should be admitted that after Zolitude tragedy at the end of 2013 intensified fire safety checks in public buildings were carried out, and also people's attitude has changed considerably - we have become more attentive and careful in relation to safety. Response to the fire alarm sound signals has been improved, human escape exits have been arranged, practical training in fire safety is organized in larger and smaller public buildings.

Influence of insurance companies on fire safety

Article 1084 of Civil Law establishes that in order to protect the safety of the public, every owner of a structure shall maintain their structure in such condition that harm cannot result from it, to neighbours, passers-by or to users of it (The Cabinet of Ministers; The Civil Law, 2014).

Insurance companies offer different services to individuals, including property insurance and civil liability insurance. Property insurance against damage and loss has become one of the most popular types of insurance, including against losses and damages caused by fire. Demand determines supply, and all major insurance companies offer home insurance. Insurance companies are interested in less frequent pay-outs of insurance indemnity and possibly more insurance contracts.

Criteria are summarized, which are taken in consideration by insurers when making contracts on home insurance (see Table 2).

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

Law "On Insurance Contracts", Article 14, paragraph (2), specifies that prior to entering into an insurance contract and during the operation thereof the insurer has the right in accordance with the procedures set out in the insurance contract to inspect the insurance object in order to ascertain that changes in the initial information have not occurred (The Cabinet of Ministers; Law On Insurance Contracts, 2007).

Table 2

Criteria specified in home insurance forms of insurance companies

Criteria	Balta	Baltikums	BAN	ERGO	IF	Swedbank
Material of building carrying structure	+	+	+	+	+	+
Dwelling floor area	+	+	+	+	+	+
Insured amount	+	+	+	+	+	+
Quality of repair (finishing)	+	+	+	+	+	
Availability of security alarm	+	+	+		+	
Sauna, bathhouse, fireplace	+	+	+	+	+	
Building erection year	+				+	+
Days per year the apartment is populated		+	+	+		
Storey			+		+	
Availability of fire alarm		+	+		+	

Unfortunately, it is impossible to find out how often insurers use the statutory rights - check the insured object. From the standpoint of fire safety supervision, it is much more important to examine the object before its insurance. It goes without saying that for the representatives of the insurance company most important aspect is the insurance interest - not to suffer losses from occurrence of insured risk. The sum insured is an amount specified in the insurance contract for which real estate or dwelling is insured against losses and damages. In most cases, dwelling is insured only relying on information provided verbally by the policyholder.

Data summarized by "Swedbank" show that in 2012 in 56 % of home insurance cases where damages were paid, the reason was pipeline rupture and average compensation amount was 550 EUR. In turn, the greatest damages were caused to dwellings by fires, the average amount of compensation being above 5,400 EUR. Fires caused by lightning are also referable to these cases. Living in an apartment building, it is advisable to purchase also the civil liability insurance. In this case, the insurer under the terms of the contract will compensate the damages caused to a neighbour's property and health (Apollo, 2013).

Taking into consideration that SFRS fire inspectors carry out fire safety checks only in a small part of the residential sector, fire safety in the residential sector is dependent on the owners of apartments and apartment house managers. Management contracts concluded by the house manager with the apartment owner specifiy the owner's obligation to respect fire safety regulations set in regulatory enactments.

No dwelling is completely protected against fire, natural disasters or improper construction risks, which can cause damage to the dwelling and belongings, so it is recommended to carefully assess the risk coverage offered by insurers. Insurers consider as fire risk caused damages such damages and losses which are caused by fire, lightning and explosion.

Looking at experience of foreign countries, such as the United States, where insurance operates at a high level, the insurers stimulate the inhabitants themselves to care for the safety of their dwelling. It is very simple: criteria are set by which the insurance premium is calculated (the amount that the insured person pays for the insurance under the contract). The more of the established criteria are fulfilled by the insured person (installed smoke detectors, alarms, replaced wiring, used non-combustible materials

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

for dwelling construction or repair etc.), the lower the insurance premium will be. It can be compared with premium amount of driver's civil liability insurance: the more experienced the driver is, the cheaper the insurance policy is.

Some insurance companies reduce the price of the insurance policy if fire alarm is installed in the dwelling, the price difference being not large, but it is a step forward in improvement of fire safety with assistance of insurance company. Another noteworthy positive trend over the past two years is that almost all insurance companies offer civil liability insurance for dwelling, which protects individuals against unexpected expenses incurred unintentionally thus causing damage to the property of third parties.

Conclusions, proposals, recommendations

During the study period, the number of fires has decreased in 2009, 2010 and 2012 and increased in 2011 and 2013. The number of fire fatalities over time is similar to that of fires. A pronounced seasonality of fire fatalities is observed: the highest number of fatalities is in winter months, while during warm period considerably less die in fires.

1) Respondents' survey results show that people consider their safety, including fire safety at workplace and at home as important, and the respondents willingly engaged in conversation about practical fire safety improvement solutions. The survey results show that respondents would prefer to improve their knowledge on fire safety in an interactive way. Since a virtual stroll through the secure dwelling is available on SFRS website, the amount of its visitors has increased significantly.
2) A number of insurance companies in recent years have included the availability of fire alarm as a criterion for home insurance. It will encourage people to install fire alarms in their homes thus increasing the number of people who in case of fire could escape themselves and rescue close people as well as timely call rescuers, and hence reducing the number fire fatalities.
3) Effective regulatory enactments stipulate that employees, learners and students must be trained in fire safety, electrical safety, occupational health and safety, first aid and other fields; however, such fragmented system of training poses difficulties for employers, its implementation requires significant resources and professionally trained specialists.

In order to improve adults and children's knowledge of fire safety and wider involve individuals in reduction of fires and fire fatalities, the following proposals are made:

4) In order to coordinate education of children and adults in security issues including fire safety the Ministry of Interior should promote public safety, establish a working group for coordination of planned improvement of adult and children knowledge about various safety issues: fire safety, civil security, electrical safety, road traffic safety, labour protection, safety in places of entertainment, and other issues. The working group could involve SFRS, State Police, JSC "Latvenergo", Employers' Confederation of Latvia, Latvian Insurers Association, Latvian Firefighting Association etc.
5) In order to ensure the fulfilment of SFRS functions and tasks specified in laws and regulations, SFRS should improve the regulatory enactments, develop the equipment of its structural units, improve the professional knowledge and skills of its officials, also in the field of fire safety monitoring and prevention.
6) All these measures are aimed at effective operation of the institution, cooperation with the public and public information.

[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.

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[1] Jeļena Malahova. Tel.: + 371 67089099 E-mail address: jelena.rtu@inbox.lv.